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federal register

MONDAY, JANUARY 16, 1978
PART IV

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

■

AIRWORTHINESS REVIEW PROGRAM

Flight Amendments

[4910–13]

Title 14—Aeronautics and Space

CHAPTER I—FEDERAL AVIATION ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

[Docket Nos. 14684 and 14324; Amendment Nos. 1-29; 21-46; 23-21; 25-42; 27-14; 29-15; 91-145 and 121-1381]

AIRWORTHINESS REVIEW PROGRAM

Amendment No. 6: Flight Amendments

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The purpose of these amendments to the Federal Aviation Regulations is to update and improve—(1) the airworthiness standards applicable to aircraft performance, flight characteristics, flight manuals, and operating limitations; (2) the operating rules containing related airworthiness standards; and (3) the rules governing holders of type certificates. These amendments are part of the Airworthiness Review Program.

EFFECTIVE DATE: MARCH 1, 1978.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION: These amendments are the sixth in a series of amendments to be issued as part of the Airworthiness Review Program. The following series of amendments have previously been issued as part of this Airworthiness Review Program:

Title	*FR citation*
Form number and clarifying revisions.	(40 FR 2576; Jan. 14, 1975).
Rotorcraft anticollision light standards.	(41 FR 5290; Feb. 5, 1976).
Miscellaneous amendments.	(41 FR 55454; Dec. 20, 1976).
Powerplant amendments.	(42 FR 15034; March 17, 1977).
Equipment and systems amendments.	(42 FR 36960; July 18, 1977)

These amendments are based on two Notices of Proposed Rule Making—Notice 75-10 published in the FEDERAL REGISTER on March 7, 1975 (40 FR 10802); and Notice 75-25 published in the FEDERAL REGISTER on June 9, 1975 (40 FR 24664). The amendments based on Notice 75-10 were deferred in the series of amendments titled "Miscellaneous Amendments" so that they could be considered with the final disposition of certain proposals in Notice 75-25. The discussions of the comments received for the deferred proposals are included under the heading of the related Notice 75-25 proposals.

Interested persons have been afforded an opportunity to participate in the making of these amendments and due consideration has been given to all matter presented. A number of substantive changes and changes of an editorial and clarifying nature have been made to the proposed rules based upon relevant comments received and upon further review within the FAA. Except for minor editorial and clarifying changes and the substantive changes discussed below, these amendments and the reasons for them are the same as those contained in Notices 75-10 and 75-25.

DISCUSSION OF COMMENTS

The following discussion is keyed to the like-numbered proposals contained in Notice 75-25.

Proposal 6-1. No unfavorable comments were received on the proposal to amend § 1.1 by deleting the term "Accelerate-stop distance" and its definition. Accordingly, the proposal is adopted without substantive change.

Proposal 6-2. For a comment related to the proposal to amend § 1.2, see Proposal 6-34.

Proposal 6-3. One commentator suggested that proposed new § 21.5 concerning Airplane and Rotorcraft Flight Manuals be revised to make clear that other titles for the required Flight Manual, such as Pilot's Operating Handbook, will continue to be approved. The FAA has no objection to the use of the term Pilot's Operating Handbook as the main title. However, if an applicant chooses to use the title Pilot's Operating Handbook, he must include a statement on the title page indicating that the document is the FAA-required Airplane or Rotorcraft Flight Manual.

The same commentator pointed out that on airplanes of types for which Flight Manuals were not furnished in the past, much of the required information was furnished on placards and markings, and that, if this proposal is adopted, some of the placards would no longer be needed but would still be part of the airplane's certification basis. The FAA agrees that some placards may not be necessary after the information is furnished in a Flight Manual. However, application may be made to change the type design if the applicable regulations only require that the material be in either a Flight Manual or in any combination of approved manual materials, markings, and placards.

The same commentator also stated that proposed § 21.5(b) would penalize airplanes that were designed and tested to temperatures higher than the hot day condition prescribed in § 23.1043(b)(1). The FAA does not agree because the temperature for which cooling was demonstrated would be furnished in the Flight Manual as information, not as a limitation. It should be noted that, in response to Proposal 6-29, this commentator stated that there is no objection to furnishing the test temperature if it is not a limitation.

Two commentators stated that it should be made clear that, for rotorcraft originally certificated with a flight manual, the manual originally approved need not be revised to include the new requirements of this proposal. The FAA does not believe a revision is necessary since proposed § 21.5(b), in conjunction with proposed § 21.5(a), refers only to airplanes or rotorcraft that were not type certificated with an Airplane or Rotorcraft Flight Manual.

Another commentator said that requiring Flight Manuals to be furnished for aircraft previously type certificated without a Flight Manual places too large a burden on the holders of these type certificates. The FAA does not agree since the information to be included in the Flight Manual has already been furnished in other forms. In addition, a Flight Manual would provide the operator with essential information in a consolidated, organized form suitable for study and reference. The FAA believes that these benefits outweigh the burden of preparing and printing the Manual.

One commentator, who concurred with the proposal, recommended that the turbulent air penetration speed, least angle of glide speed, and least rate of descent speed (power off) be added to the required information. These are specific requirements which are not applicable to all categories of aircraft and the FAA does not believe they should be included in the rule.

The phrase "maximum anticipated air temperature" in proposed § 21.5(b)(2) is deleted and the phrase "maximum ambient atmospheric temperature" is inserted in its place to be consistent with Proposal 6-20 to amend § 23.1043 and the corresponding proposals for the other certification parts, which are being adopted in this series of amendments.

The proposal to add a new § 21.5 is adopted with the revision discussed above.

Proposal 6-4. For comments related to the proposal to amend § 23.25(b), see Proposal 6-5. The proposal to amend § 23.25(b) is adopted without substantive change.

Proposal 6-5. One commentator objected to the proposal to amend § 23.29, which would require the empty weight to be determined with "full" operating fluids, on the ground that this procedure would eliminate the option of "off loading" oil in order to maintain weight and center of gravity limits. The FAA does not agree. This option would not be eliminated by proposed § 23.29 since it merely establishes a new reference basis for empty weight. The same commentator stated that since this proposed rule is not retroactive, confusion will result because some aircraft will have oil included in the weight and balance and others will not. This commentator also suggested that the use of the same definition of empty weight by the FAA and the military would eliminate the difficulties encountered by pilots operating both military and civil aircraft. The FAA does not believe that the proposed change will cause confusion or difficulty in either situation cited by the commentator since

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the weight and balance data accompanying each airplane will specify whether oil is included in the empty weight. Further, this procedure should simplify weight and balance computations since fluids normally included will be accounted for without further additions to the empty weight.

One commentator objected to the proposals to amend §§ 27.29 and 29.29 on the ground that there is no benefit to be gained by changing the definition of empty weight. The FAA does not agree with this comment for the reasons stated in the Notice for these proposals. This commentator further objected to the proposal to amend § 27.29 on the ground that it would create a problem for helicopters that have a larger oil tank capacity than is required under all conditions, such as helicopters designed to accept auxiliary fuel tanks. The option of off-loading oil would not be eliminated by proposed § 27.29. In addition, the FAA believes that the change will accomplish its purpose of simplifying weight and balance computations for the great majority of helicopters.

Several commentators on the proposal to amend § 25.29 noted that the proposed rule would require certain fluids which, in transport category airplanes, are variable as a function of individual operator or mission requirements and of passenger seating density (such as potable water and lavatory pre-charge fluids) to be included in the empty weight. It was suggested that an exception be provided for those fluids that vary with operation or mission as well as those that are expendable in flight such as water intended for injection in the engines. The FAA believes that exceptions for the specific fluids noted are warranted for airplanes, but the FAA does not believe that an exception is appropriate for potable water or lavatory pre-charge water for rotorcraft. The proposals to amend §§ 23.29 and 25.29 are revised accordingly.

Proposal 6–6. A commentator objected to the proposed change to § 23.45, stating that a requirement to correct the performance to 80 percent relative humidity is not necessary, that it would increase the cost and complexity of certification without any increase in safety, and that it will create a new standard atmosphere that will result in confusion as to the basis for engine performance data. The power loss that is associated with changing from dry air to air at 80 percent relative humidity would cause a significant reduction in the climb performance of a reciprocating-engine powered airplane and should be considered. This reduction would be most evident where performance is marginal, e.g., during one-engine-inoperative climb. With regard to turbine engines, the FAA believes that the effect of humidity may be negligible on some types of engines, in which case no performance correction would be necessary. However, for some other types of turbine engines, a correction for humidity will increase the accuracy of the performance data. The FAA believes that the data required for making the corrections can be obtained simply and with inexpensive instrumentation. Further, the FAA does not believe that requiring a correction for humidity in the performance data for newly type-certificated airplanes will result in confusion. A transition period may exist during which the performance data for newly type-certificated airplanes will be corrected for humidity and that for other airplanes may not be. Such transition periods inevitably occur with the adoption of new regulatory provisions and the FAA does not believe that the transition in this case will present a significant problem.

The commentator further stated that present performance measurement accuracy is within the range of uncontrolled airplane-to-airplane variations, atmospheric variations other than humidity, and piloting variations, and that eliminating one variable whose effect is within the spread of other variables is not justifiable on a simple cost-benefit analysis. The FAA does not agree that the humidity correction should be omitted on the basis of conjecture that other variables may mask its effect. Certification flight testing is not allowed when atmospheric variables would affect data accuracy, and tests must be repeated as necessary to establish confidence in data accuracy.

In regard to the burden of correcting for humidity in type certification, the FAA believes that it should in many cases humidity is not significant or that it is covered by a conservative correction factor. Correction of performance data to standard atmospheric conditions of temperature and pressure is required in any case, and an additional correction for humidity should be a relatively small burden.

The proposal for § 23.45 is adopted without substantive change.

Proposal 6–7. No unfavorable comments were received on the proposal to amend § 23.49. Accordingly, the proposal is adopted without substantive change.

Proposal 6–8. One commentator suggested that, for consistency with certain foreign requirements, proposed §§ 23.51 (c)(1)(ii) and (c)(2)(i) should be revised to read 1.2 V_{S_1}, instead of 1.3 V_{S_1}. The FAA does not believe that the recommended change is necessary. Proposed §§ 23.51 (c)(1)(ii) and (c)(2)(i) already provide for a speed less than 1.3 V_{S_1}.

The first commentator also stated that proposed § 23.51(c)(1)(ii) should be revised so that it refers to the complete failure of a single engine (on multi-engine airplanes) instead of complete engine failure which would introduce a double failure concept not inherent in these rules. The FAA does not agree. Proposed § 23.51(c)(1)(ii), which is consistent with current § 23.51(a)(2)(ii) in this regard, only requires that "complete engine failure" be investigated if a speed of less than 1.3 V_{S_1} is demonstrated at a height of 50 feet. In addition, current § 23.51(a)(2)(ii) has been consistently interpreted to require that for multi-engine airplanes which meet the powerplant isolation requirements of § 23.903 (c) in the takeoff configuration, only one engine need be made inoperative in the specified investigations.

One commentator objected to the extension of takeoff performance determination requirements to airplanes of 6,000 pounds and less maximum weight, for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3.

Another commentator recommended that those provisions of the existing rule which relate to nosewheel and tailwheel liftoff speeds be retained and that their applicability be extended to all airplanes. These provisions were originally imposed in lieu of a requirement for approved takeoff performance data for airplanes of 6,000 pounds and less maximum weight. In view of the requirements which are being adopted, and in view of satisfactory service history for airplanes of more than 6,000 pounds maximum weight, the FAA does not believe these provisions should be retained or that their applicability should be extended to all airplanes.

The proposal to revise § 23.51 is adopted without substantive change.

Proposal 6–9. One commentator objected to the application of proposed § 23.65, concerning all-engines operating climb requirements, to airplanes of 6,000 pounds or less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3.

Another commentator stated that use of a reduced propeller pitch under proposed § 23.65(b) is not consistent with safety requirements, because it would either deny the pilot performance in actual operation or the protection of limiting the engine to a safe speed. The FAA does not agree. Present § 23.33 defines the pitch and speed limitations for propellers which are to be used in service. Proposed § 23.65(b), which is identical to the present § 23.65(a)(2), merely authorizes the use of a special test propeller pitch setting if it is necessary to obtain rated engine r.p.m. at V_x.

In proposed § 23.65(c), reference to the airplane configuration was inadvertently omitted. The configuration should be the same as that specified in proposed § 23.65 (a), and proposed 23.65(c) is therefore revised to state that the climb gradient is to be met with the airplane in the configuration prescribed in paragraph (a). In addition, § 23.65(a)(4) is revised to cover means other than cowl flaps for controlling the engine cooling air supply. This change is necessary to provide for turbine engines. The proposal to revise § 23.65 is adopted with the revisions discussed above.

Proposal 6–10. One commentator suggested that a speed to be used in calcu-

lating the climb gradients should be specified in proposed § 23.67(c) for purposes of uniformity, but did not make a specific proposal. The FAA believes that the applicant should be allowed to select a climb speed if the airplane meets the minimum gradient and rate of climb at that speed. The proposal to amend § 23.67 is adopted without substantive change.

Proposal 6–11. One commentator objected to the application of proposed § 23.75, concerning landing distance requirements, to airplanes of 6,000 pounds or less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3. This commentator also stated that proposed § 23.75(e), concerning wheel brake pressures, is a design requirement and should therefore be placed in Subpart D of Part 23. The FAA does not agree because proposed § 23.75(e) refers to the pressures used in determining the landing performance. The commentator further suggested that the FAA should consider issuing advisory material as to what is considered safe and reliable under proposed § 23.75(f). The wording of proposed § 23.75(f) is the same as that of present § 25.75(b)(3), and this wording has been administered without difficulty for many years. However, the FAA will consider issuing advisory material at a future date if the need is shown.

Another commentator stated that he would not support the inclusion of reverse thrust as an acceptable "other means" of retarding the airplane in determining the landing distance under proposed § 23.75(f), because the landing distance is demonstrated on a dry runway with no provision for a field length factor. The FAA agrees that the effect of wet runways would have to be taken into account in any determination that a means of retarding the airplane is safe and reliable and that consistent results can be expected in service use. It should be noted that proposed § 23.1587(a)(6) (Proposal 6–31), as adopted, requires that the kind of surface used in the landing distance tests be described in the Airplane Flight Manual. The proposal to revise § 23.75 is adopted without substantive change.

Proposal 6–12. One commentator objected to the application of proposed § 23.77, concerning balked landing performance, to airplanes of 6,000 pounds or less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3. Proposed § 23.77 is adopted without substantive change.

Proposals 6–13 and 2–6. One commentator stated that the option in proposed (and current) § 23.149(a) for the applicant to choose zero yaw or an angle of bank is inconsistent because straight flight with zero yaw (zero sideslip) can only be achieved with some degree of bank. The FAA agrees that bank may be needed to establish straight flight with zero yaw following the failure of a powerplant at low airspeed. The proposed language is the same as that of the current rule and an angle of bank of up to 5 degrees to maintain straight flight has been allowed under the current rule. The directional controllability that must be provided for compliance with §§ 23.147 and 23.205 ensures that bank angles up to 5 degrees under these flight conditions will not be accompanied by excessive yaw angles. Certain design or control features may influence the use of roll control immediately following the failure of a powerplant. Therefore, the proposal (as well as the current rule) allows reference to a zero yaw angle, without bank, for determining the V_{MC} of airplanes which incorporate such features.

Section 23.149(a) is revised in accordance with the discussion of Proposal 6–41 with respect to the modes of failure which must be simulated in demonstrating V_{MC}. The revision requires that the method used to simulate critical engine failure must represent the most critical mode of powerplant failure with respect to controllability that is expected in service, rather than (all) modes of powerplant failure expected in service.

Proposal 2–6 to amend § 23.149(b) (Notice 75–10) was reproposed in Proposal 6–13 for the purpose of clarity. No unfavorable comments were received on proposed §§ 23.149 (b), (c), and (d), and they are adopted without substantive change.

Proposal 6–14. One commentator objected to the application of proposed § 23.161 to airplanes of 6,000 pounds and less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3.

Since § 23.21(a) requires that each requirement of this subpart must be met at each appropriate combination of weight and center of gravity within the range of loading conditions for which certification is requested, proposed § 23.161(c)(2)(ii) is revised by deleting the reference to center of gravity and proposed § 23.161(c)(2)(iii) is withdrawn.

Proposal 6–15. No unfavorable comments were received on the proposal to amend § 23.177. Accordingly, the proposal is adopted without substantive change. For comments related to the proposal to amend § 23.177, see Proposal 6–16.

Proposal 6–16. One commentator objected to proposed § 23.181(b), which would require that short period lateral or directional oscillations and combined lateral-directional oscillations ("Dutch roll") be damped to $\frac{1}{10}$ amplitude in 7 cycles. The commentator stated that this proposal is more stringent with regard to combined lateral-directional oscillations than proposed § 25.181 (Proposal 6–43) and that proposed § 25.181 retains certain necessary requirements for other short period oscillations that are not contained in proposed § 23.181. Proposed § 25.181(a) would require that oscillations other than combined lateral-directional oscillations be heavily damped, and proposed § 25.181(b) would require combined lateral-directional oscillations to be positively (but not heavily) damped. The FAA agrees that a similar distinction should be made in § 23.181 between combined lateral-directional ("Dutch roll") oscillations and other longitudinal, lateral, and directional oscillations.

Current §§ 23.177 (a)(4) and (b)(3) (which are deleted by Proposal 6–15) require any short period lateral or directional oscillation to be heavily damped. After considering the comment and after further review, the FAA believes that the current requirement for heavy damping should be retained for short period lateral and directional oscillations other than "Dutch roll" (combined lateral-directional) oscillations. With respect to combined lateral-directional oscillations, the FAA believes that these oscillations do not need to be heavily damped and that the proposed requirement for Part 23 airplanes would provide a satisfactory damping ratio.

The FAA believes the difference between Part 23 and Part 25 requirements with respect to combined lateral-directional oscillations is justified since airplanes certificated under Part 25 have very large variations in size, weight, and moment of inertia, which affect the lateral-directional characteristics and pilot reaction to these characteristics. The FAA therefore believes that it is appropriate that the damping requirement in § 25.181(b) be stated in general terms, as reflected in Proposal 6–43.

The proposal to amend § 23.181 is adopted with the revisions discussed above.

Proposal 6–17. Proposed new § 23.183 would establish a limit on the rate of spiral divergence by requiring that the angle of bank may not increase to more than 40 degrees in less than 12 seconds after the controls are released in a 20-degree banked turn under specified conditions. One commentator objected to the proposal stating that no need had been shown for the proposal and that the tests referred to in the notice were not definitive. After comparing available data on the subject of spiral divergence, the FAA believes that rulemaking on this subject is premature. Accordingly, the proposal to add a new § 23.183 is withdrawn.

Proposal 6–18. Many comments were received on the proposal to amend § 23.221. In view of the conflicting views expressed in these comments, and after further consideration by the FAA, the FAA believes that the proposal to amend § 23.221 is premature, and it is withdrawn.

Proposal 6–19. One commentator stated that the proposal to amend § 23.729(f)(1) is redundant and that the requirement proposed is already in effect. The FAA does not agree with the comment for the reasons stated in the notice.

The proposal to amend § 23.729(f)(1) is adopted as proposed except that the last three words, "the aural warning", of the proposed sentence are replaced with

the words "the warning device" so that the wording of the sentence is consistent with the remainder of § 23.729(f).

For other comments related to the proposal to amend § 23.729, see Proposal 6–51.

Proposal 6–20. For comments related to the proposal to revise § 23.1043(b), see Proposal 6–23.

Proposal 6–21. One commentator objected to the proposal to amend § 23.1047 for reasons stated in his comments on Proposal 6–3, concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3. The proposal to amend § 23.1047 is adopted without substantive change.

[For discussion concerning new § 23.1353(g), see Proposals 6–57 and 2–87.]

Proposal 6–22. No unfavorable comments were received on the proposal to revise § 23.1501. Accordingly, the proposal is adopted without substantive change.

Proposal 6–23. The proposal to revise § 23.1521(e) is one proposal in a series of proposals on powerplant cooling requirements and ambient temperature operating limitations and information for Parts 23, 25, 27, and 29 aircraft. This series consists of proposals 6–20, 6–23, 6–29, 6–52, 6–54, 6–56, 6–68, 6–71, 6–74, 6–82, 6–85, and 6–88.

Proposed § 23.1521(e) in conjunction with proposed § 23.1043(b) (Proposal 6–20) would require that an ambient temperature operating limitation be established as the maximum atmospheric temperature at which compliance with the powerplant cooling requirements is shown. In response to these proposals, one commentator stated that no justification for safety or other reasons has been presented for establishing the proposed operating limitations, and that he believes that no safety justification exists. The commentator also stated that the FAA cooling tests and correction factors are very conservative, that it would be necessary to correct cooling tests to at least the equivalent of 125 degrees F at sea level to avoid restrictive operating limitations, and that this would result in increased cooling drag and poorer performance. Another commentator, in regard to proposed § 27.1521(f) (Proposal 6–71), also stated that an ambient temperature limitation has not been shown to be necessary.

After considering these comments, and after further review, the FAA believes that it does not now have enough information to justify the proposed requirements for reciprocating engines in Part 23 airplanes and Part 27 rotocraft. However, because of the differences between reciprocating and turbine engine installations, particularly in regard to engine components and accessories, and because of the effects of high temperature operation on turbines, Part 23 already requires the establishment of ambient temperature limitations for turbine engines, and for the same reasons the FAA believes that ambient temperature limitations for turbine engines should also be established for Part 27 helicopters. Parts 25 and 29 already require temperature limitations for reciprocating engines (as well as turbine engines) because the reciprocating engines in these aircraft are generally more complex than those used in Part 23 and Part 27 aircraft.

Accordingly, proposed §§ 23.1521(e) and 27.1521(f) are revised to require the establishment of ambient atmospheric temperature limitations for turbine but not for reciprocating engines and proposed §§ 25.1521(e) and 29.1521(e) are adopted without substantive change. In addition, proposed §§ 23.1043(b), 25.1043(b), 27.1043(b), and 29.1043(b), as adopted, are revised to omit the reference to a limitation on the operation of the aircraft, since the establishment of ambient temperature operating limitations is prescribed in proposed §§ 23.1521(e), 25.1521(e), 27.1521(f), and 29.1521(e). For reciprocating engines, §§ 23.1587 and 27.1587 are revised to require that the maximum ambient air temperature for which compliance with the engine cooling requirements was shown must be included in the performance information section of the Flight Manual.

One commentator recommended that the 100-degrees F minimum in proposed § 25.1043(b) be deleted, since the ambient temperature at which compliance with the cooling requirements is shown becomes an operating limitation on the airplane and airworthiness is not affected as long as the limitation is followed. The FAA believes that the 100-degree F minimum is appropriate since a lower temperature would be impractical and unrealistic considering summer operations in the United States. It should be noted that an exception to the minimum is provided for winterization installations.

This commentator also stated that the explanation for proposed § 25.1043(b) implies that only a test demonstration at 100 degrees F or higher is acceptable. This is incorrect. Section 23.1043(a)(1) and corresponding provisions in Parts 25, 27, and 29 clearly indicate that tests may be conducted under other conditions and corrected to the prescribed conditions.

One commentator recommended the deletion of the requirements in proposed §§ 27.1583(b) and 29.1583(b) for an explanation of the powerplant limitations in the Airplane Flight Manual, since such explanations would be redundant. A similar comment was received in response to proposed § 25.1583(b). The intent of the proposals was not to require an explanation of each limitation. A separate explanation would not be necessary for a limitation that is self-explanatory. For clarification, proposed §§ 23.1583(b)(2), 25.1583(b)(2), 27.1583(b)(2), and 29.1583(b)(2) are revised to require an explanation of limitations "when appropriate."

In regard to proposed § 23.1583(b), one commentator stated that contrary to the FAA statement in the notice, the establishment of the test temperature as a limitation has not been required in the past and should not be a limitation. The FAA disagrees. Current § 23.1583(j) requires that, for turbine engines, the temperatures used in the climb test prescribed in § 23.1043(b)(2), be furnished as operating limitations in the Airplane Flight Manual. Proposed § 23.1583(b) merely makes it clear that any operating limitations that are established under § 23.1521 must be furnished in the Airplane Flight Manual. In view of the adoption of proposed § 23.1583(b) as revised, § 23.1583(j) is deleted and marked "Reserved."

With regard to the proposal to amend § 25.1583 (Proposal 6–56), one commentator recommended the deletion of proposed paragraph (b)(3) concerning powerplant limitations, and paragraph (i) concerning maneuvering load factors. The commentator stated that if the engine instrument markings have to be changed, it should be handled by a service bulletin. The FAA does not agree. The relation between the powerplant limitations and the instrument markings should be explained in the Manual. The commentator also stated that the load factor (number) is meaningless to the pilot as he cannot determine what it is during a pull-up maneuver. He stated that correlation with bank angle is acceptable, but that transport aircraft do not exceed 60 degree bank angles. The FAA believes that the maneuvering load factor should be retained in the Flight Manual because it is established as an operating limitation under § 25.1531, and the correlation with bank angle provides useful information to the pilot concerning the strength limitations of the airplane.

The proposals to amend §§ 23.1583, 25.1583, 27.1583 and 29.1583 are adopted with the revision discussed above.

For consistency in the terminology used in the cooling tests requirements, a nonsubstantive change is being made to §§ 23.1043(a)(1), 23.1043(d), 27.1043(a)(1), 27.1043(d), 29.1043(a)(1), and 29.1043(d) by deleting the words "maximum anticipated air temperature" and inserting in their place the words "maximum ambient atmospheric temperature".

Proposal 6–24. One commentator objected to proposed § 23.1523, which concerns the establishment of the minimum flight crew, stating that it is not necessary to make all aircraft conform to the requirements of Part 25. The FAA believes that proposed § 23.1523 specifies the appropriate requirement that should be considered in determining the minimum flight crew for Part 23 airplanes.

Another commentator said that specification of minimum crew is an operational item that may vary with the type of operation, e.g., for compensation or hire which by law must be conducted in accordance with the highest standards. He concluded that rules specifying the number of crew members for specific operations should be in the operating regulations. The FAA agrees that certain rules concerning the number of crew members properly belong in the operat-

ing rules, and this is done, for example, in Subpart M of Part 121. However, under current § 23.1523, the minimum crew is established for VFR only, without requiring consideration of the additional crew duties that arise when IFR operations are authorized. These duties may be imposed by the design and operating characteristics of the aircraft and by its installed equipment. The FAA believes that they must therefore be evaluated during the type-certification process. The proposal to revise § 23.1523 is adopted without substantive change.

Proposal 6–25. One commentator objected to proposed § 23.1541 concerning placards in airplanes of 6,000 pounds or less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3. Proposed § 23.1541 is adopted without substantive change.

Proposal 6–26. One commentator objected to proposed § 23.1559 concerning placards in airplanes of 6,000 pounds or less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of those comments, see Proposal 6–3. Proposed § 23.1559 is adopted without substantive change.

Proposal 6–27. Proposed § 23.1567(b)(2) would require that utility category airplanes that do not meet the spin requirements for acrobatic category airplanes have a placard in clear view of the pilot stating "Spins prohibited." One commentator said that the proposal is redundant and would add to the already confusing proliferation of cockpit placards. The FAA does not agree since the proposal would prevent any possible confusion as to whether a particular utility category airplane has been approved for spins. The proposal is adopted without substantive change.

Proposals 6–28, 2–39, 2–43, and 2–45. Proposed § 23.1581(a) is revised in accordance with the discussion of the proposal to amend § 25.1581 (Proposal 6–55). For another comment related to Proposal 6–28, see Proposal 6–3.

Disposition of Proposal 2–39 to add a new § 23.1353(f) (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–28. For comments related to proposed § 23.1353(f) and for an explanation of the revision to proposed § 23.1353(f), see the discussion of Proposal 2–87 under Proposal 6–57. Disposition of Proposal 2–45 to revise § 23.1581(b) and to add a new § 23.1581(d) (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–28.

One commentator, who agreed in general with proposed § 23.1581(b), recommended several clarifications. He indicated that the title "Pilot's Operating Handbok" should be allowed as an alternative to "Airplane Flight Manual." The FAA has no objection to the title "Pilot's Operating Handbook" if the title page also includes a statement indicating that the document is an FAA-required Airplane or Rotorcraft Flight Manual.

The commentator also indicated that the FAA should delete any requirement for individual page approval for operating limitations in Handbooks that meet a specification acceptable to the Administrator. Proposed § 23.1581(b)(1) would require approval of each page containing the prescribed operating limitations whereas current § 23.1581(b) requires that each part of the Airplane Flight manual containing information presented in §§ 23.1583 through 23.1589 be approved.

The intent of proposed §§ 23.1581(b)(1) and (b)(2) was to require that the presentation of operating limitations be approved by the FAA and be clearly identified as such while at the same time providing an option for the presentation of the other required information. This option would have provided that each page containing the information prescribed in §§ 23.1585 through 23.1589 had to be determined in accordance with the applicable requirements of this part and had to be approved or the information presented in its entirety in a manner acceptable to the Administrator.

In light of the comments received and after further review, the FAA believes that this intent will be accomplished in a simpler manner, and will be more consistent with Parts 25, 27, and 29 flight manual requirements, by retaining the current requirements and providing an alternative to the current requirements in a separate paragraph which provides that each part containing operating limitations must be approved and limited to such information, and the information prescribed in §§ 23.1585 through 23.1589 must be determined in accordance with the applicable requirements of this part and presented in a manner acceptable to the Administrator. Proposed §§ 23.1581 (b)(1) and (b)(2) are revised to reflect the changes discussed above.

The references in proposed §§ 23.1581(b)(1) and (b)(2) to the information prescribed in §§ 23.1581(c) (paragraph (a)(2) as adopted) have been deleted to be consistent with the flight manual requirements of Parts 25, 27, and 29.

One commentator objected to Proposal 2–45 on the grounds that procedures, performance data, and loading information for any airplane certificated under Part 23 would not have to be approved by the FAA. This comment evidently refers to proposed § 23.1581(b)(2)(i) (which is incorporated into paragraph (b)(2) as adopted), under which the information prescribed in §§ 23.1585 through 23.1589 would not be identified as FAA-approved, if this information in its entirety is presented in a manner acceptable to the Administrator. The FAA does not agree with the comment. Under the proposal, the information would have to be determined in accordance with the applicable requirements of Part 23. In finding that a manual is acceptable, the FAA would review the manual to determine that the required information is complete and accurate. The manual would also be reviewed to ensure that any additional information provided by the applicant is not in conflict with required information or contrary to the applicable airworthiness requirements. The FAA believes that § 23.1581(b)(2) will provide an adequate method of review of the information prescribed in §§ 23.1585 through 23.1589.

The proposals to amend § 23.1581 are adopted with the revisions discussed above.

Disposition of Proposal 2–43 to amend § 23.1555 (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–28. No unfavorable comments were received on Proposal 2–43, however, proposed § 23.1555(c)(3) is revised by deleting the words "and in the Airplane Flight Manual" in view of the requirements of §§ 23.1581 and 23.1587(a)(2), as adopted.

Proposal 6–29. For comments related to the proposal to revise § 23.1583(b), see Proposal 6–23.

Proposal 6–30. One commentator objected to the application of proposed § 23.1585, concerning operating procedures, to airplanes of 6,000 pounds or less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3.

The proposal to amend § 23.1585 is adopted without substantive change.

[For discussion concerning new § 23.1585(e), see Proposals 6–57 and 2–87.]

Proposals 6–31 and 2–46. One commentator objected to the application of proposed § 23.1587, concerning performance information, to airplanes of 6,000 pounds or less maximum weight for reasons stated in his comments on Proposal 6–3 concerning Flight Manuals. For a discussion of these comments, see Proposal 6–3.

Another commentator stated, in response to proposed § 23.1587(a)(7), which would require information on the steady rate or gradient of climb, that if gradient data are presented, conversion charts should be included, and that ideally each determination should be available; however, he concluded that the option of one or the other should be deleted and a definite requirement adopted. The commentator misinterpreted the proposed requirement. Section 23.65(c), as adopted by this amendment, requires the determination of a gradient of climb for turbine engine powered airplanes. Proposed § 23.1587(a)(7) is worded so as to take into account the requirement of § 23.65(c), not to provide an option for the applicant, i.e., whether gradient of climb or rate of climb is furnished under § 23.1587(a)(7) will be determined by the applicable requirement of §§ 23.65 and 23.77.

Section 23.1587 is adopted as proposed, except that a new § 23.1587(a)(9) has been added to include information on the maximum ambient temperature at which compliance with the cooling requirements is shown for reciprocating engines. This addition is explained in the discussion of the comments on Proposal 6–23.

Disposition of Proposal 2-46 (Notice 75-10), which proposed to delete the second sentence of present § 23.1587(a)(2), was deferred so it could be considered with Proposal 6-31. No unfavorable comments were received on Proposal 2-46. Proposal 2-46 was reproposed in Proposal 6-31, and is adopted without substantive change with the adoption of Proposal 6-31.

Proposal 6-32. Proposed new § 25.21(f) would require that when surface winds must be considered, the wind velocity must be measured at or corrected to a height of 10 meters above the surface, because the National Weather Service is standardizing on a height of 10 meters for reporting winds at airports. One commentator said that since the purpose of the proposal is standardization of Airplane Flight Manual performance information with respect to reported winds for takeoff or landing in service operations, the requirement should be placed in the flight manual requirements under § 25.1587(c)(1)(i) instead of in § 25.21. The FAA agrees that this is one purpose of the proposal but there are flight requirements other than those concerning performance information that require consideration of surface winds. Therefore, the FAA believes that it is more appropriate to include the proposed requirement in § 25.21. However, proposed § 25.21(f) is revised to clarify its applicability.

The proposed change to § 25.21(d), which deals with tolerances for variables in flight testing, would delete the requirement that the tolerance on wind during takeoff and landing tests must be based on the wind measured at a height of 6 feet above the runway. The commentator said that performance analysis is usually based on winds at the height of the mean aerodynamic center of the airplane above the runway surface, and that the data in the Airplane Flight Manual is then corrected to the currently used height of 50 feet. The commentator recommended that this procedure be continued, except that the wind velocities in the Flight Manual should be based on a height of 10 meters instead of 50 feet. The FAA believes that the proposed deletion of the 6-foot height from § 25.21(d), together with proposed § 25.21(f), lbs revised, would allow continued use of the procedure recommended by the applicant.

The commentator also suggested that the correction chart in Civil Aeronautics Manual 4b Appendix A, Figure 2, be considered for inclusion in Part 25. The FAA does not believe that it is necessary to include this information in the rules.

The proposal to amend § 25.21 is adopted with the revisions discussed above.

Proposal 6-33. For comments related to the proposal to amend § 25.29, see Proposal 6-5.

Proposal 6-34. Several commentators objected to the method of computing V_1 (takeoff decision speed) in proposed § 25.107(a) on the grounds that—(1) the speed increment between V_{EF} (engine failure speed) and V_1 should not be determined with all engines operating because the accelerate-stop distance determined under proposed § 25.109(a) would then be unnecessarily large for the critical engine failure condition (especially for twin-engine airplanes); and (2) placing the 2.0-second time delay between V_{EF} and V_1 in proposed § 25.107(a)(2)(ii) does not adequately provide for hetse instances in which the pilot may have to analyze and react to an event that occurs immediately before reaching V_1.

It was recommended that proposed § 25.107(a) be revised so that V_1 is determined by adding to V_{EF} 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 test pilot recognizes and reacts to the engine failure, as indicated by the pilot's application of the first retarding means during accelerate-stop tests (the 2.0-second minimum time delay that was proposed to be included between V_{EF} and V_1 would be deleted). It was further recommended that proposed § 25.109(a) be revised so that a 2.0-second time delay following V_1 is incorporated into the determination of accelerate-stop distances, as follows: (1) for the engine failure case, the acceleration of the airplane from V_{EF} would be with the critical engine inoperative and would continue for 2.0 seconds after reaching V_1; and (2) for the other event case, the acceleration of the airplane would be with all engines operating and would continue for 2.0 seconds after reaching V_1.

After considering all of the comments on these proposals and after further review, the FAA agrees with these comments and the recommendations. The FAA believes that the recommended revisions would provide for events other than engine failure, even though the speed increment between V_{EF} and V_1 would be determined with the critical engine inoperative instead of all engines operating, because the accelerate-stop distance for the other event case would be determined with all engines operating from the start of takeoff until 2.0 seconds after V_1 is reached. Further, the FAA believes that deleting the 2.0 second minimum time delay from the determination of V_1 and inserting a 2.0-second delay after V_1 in the determination of the accelerate-stop distance would be more appropriate for most rejected takeoff situations, since stopping requires a positive decision and action by the pilot. Proposed §§ 25.107(a) and 25.109(a) are revised accordingly.

Several commentators objected to the 2.0-second (minimum) time delay used in computing V_1 under proposed § 25.107(a)(2)(ii) on the grounds that it would increase the required take-off runway lengths, particularly in the engine failure case, and that such increases are not justified. One commentator recommended that the time delay be reduced to 1.0 second. The revisions discussed above significantly reduce the effect of the 2.0-second time delay on the required accelerate-stop distance in the engine failure case. Under § 25.107(a) as proposed, the airplane would be accelerated to a V_1 speed equal to V_{EF} (engine failure speed) plus the speed gained with all engines operating during a total time interval of about 3 seconds (i.e., during the time required for the test pilot to recognize and react to an engine failure in accelerate-stop tests, plus a 2.0-second time delay for service operations). Under proposed § 25.109(a), the accelerate-stop distance for the engine failure case would be determined by accelerating the airplane from V_{EF} to the V_1 speed determined under proposed § 25.107(a), but with the critical engine inoperative instead of with all engines operating. As pointed out by one of the commentators, the total time interval between engine failure and application of the first retarding means could then become about 6 seconds for a twin-engine airplane in the engine failure case, and the distance traversed during the additional 3 seconds (beyond the time interval prescribed in § 25.107(a)) would be included in the accelerate-stop distance. However, under the revisions incorporated in §§ 25.107(a) and 25.109(a) as adopted, the revised V_1 speed is equal to V_{EF} plus the speed gained with the critical engine inoperative during the test pilot's recognition-reaction time interval with no further time delay. The accelerate-stop distance for the engine failure case is then determined by accelerating the airplane with one engine inoperative from V_{EF} to the revised V_1 speed and then for an additional 2.0 seconds, before the first retarding means is applied. Under these revisions, a 2.0-second allowance for time delays in service operation is retained, but the total time interval between V_{EF} and application of the first retarding means in the engine failure case would be significantly reduced (for example the reduction could be from about 6 seconds to about 3 seconds for a twin engine airplane). The accelerate-stop distance for the engine failure case would be reduced accordingly. The FAA does not believe that any further revision is warranted because the 2.0-second delay (incorporated into § 25.109 as adopted rather than § 25.107) is necessary to allow for a surprise element and other operational factors not covered in accelerate-stop tests.

One commentator proposed that V_1 speeds be established as recognition speeds for both engine failure and other event cases. However, it is not clear how a recognition time for "other events" would be determined since there is a large variety of possible events that could lead to a rejected takeoff.

Another commentator, in addition to suggesting changes similar to those already made as discussed above, recommended that V_1 be established as a failure recognition speed which would be determined by adding to the speed at which the initial failure is assumed to

occur, the time between the failure and the pilot's recognition of the failure (assumed to be 2.0 seconds before his reaction to the failure), and the time, not less than 2.0 seconds, to allow for time delays in service under reasonably unfavorable operating conditions. The FAA does not agree that there should be a 2.0-second minimum delay, regardless of the pilot's actual reaction time, in determining V_1 under § 25.107(a), because proposed § 25.109(a) as revised will require that the accelerate-stop distance computations include acceleration of the airplane for 2.0 seconds after V_1 is reached.

This commentator further proposed that closing of the throttles be specified in proposed § 25.109 as the first action to be taken in stopping the airplane, with subsequent actions at intervals of not less than one second. Current § 25.101(h) already requires that the procedures used in determining the accelerate-stop distance must be able to be consistently executed in service by crews of average skill, and must include allowance for any time delays in the execution of the procedures that may be reasonably expected in service. The order in which the retarding devices are applied and the subsequent time delays will be established during type certification under the general provisions of § 25.101(h).

One commentator objected to the requirement in proposed § 25.107(a) that V_{EF} may not be less than V_{MCG} (minimum control speed on the ground) determined under (proposed) § 25.149(e). The commentator stated that it should only be required that V_1 not be less than V_{MCG} because if an engine failure is recognized between V_{EF} and V_1 the takeoff should be aborted. However, under proposed § 25.107(a) and 25.109(a), as revised V_1 will be placed at the speed at which the test pilot recognizes and reacts to an engine failure during accelerate-stop tests and the 2.0-second time delay will be inserted after V_1 instead of between V_{EF} and V_1 as proposed. This revision allows V_1 to be very close to V_{EF}. Therefore, the effect on takeoff and accelerate-stop distances of requiring that V_{EF} not be less than V_{MCG} has been significantly reduced because of the deletion of the minimum 2.0-second delay between V_{EF} and V_1. In addition, the FAA believes that V_{EF} should not be less than V_{MCG} so that there will be at least a small margin between V_{MCG} and V_1 to ensure controllability of the airplane at V_1.

One commentator recommended that the proposals containing V_1 and accelerate-stop distances be made retroactive to existing transport category airplanes one year after the date of their adoption. Current § 25.101(h) already provides that the procedures used in determining accelerate-stop distances include allowance for time delays reasonably expected in service. The purpose of the present proposals is to clarify and standardize the method of including an appropriate time delay in the accelerate-stop performance determination for airplanes type certificated in the future.

In regard to proposal 6–2, which would change the definition of V_1 in § 1.2 from "critical engine failure speed" to "takeoff decision speed," one commentator considered the proposed definition to be inadequate because "decision" is an undefined quantity. The commentator recommended that the proposal be revised to state that V_1 means the speed at which the flight crew has recognized an engine failure or other event and takes action either to reject or continue the takeoff. The significance of V_1 with respect to accelerate-stop distance, takeoff distance, and the related operating procedures is explained in the Airplane Flight Manual and the FAA believes it is too complex to be completely described in a brief definition in § 1.2. Accordingly, the proposed amendment of § 1.2 is adopted without substantive change.

The proposals to revise §§ 25.107(a) and 25.109(a) are adopted with the revisions discussed above.

Proposal 6–35. One commentator stated that if the intent of proposed §§ 25.107 (d) and (e)(1)(iv) with respect to the engine-out V_{MU} is to ensure controllability, the V_R–5 tests required by § 25.107(e)(3) should be expanded to require the test over the full range of certification conditions and all references to one-engine-inoperative V_{MU} should be deleted from §§ 25.107(d) and (e). The FAA does not agree with this recommendation because it would ignore the performance aspects (thrust-to-weight ratio) of the one-engine-inoperative V_{MU} demonstration.

Another commentator stated that flight test experience has shown that trim and control drag is accounted for with the thrust/weight ratio corresponding to the one-engine-inoperative condition used in the test, and that actual engine-out V_{MU} tests result in the same V_{MU} as tests conducted at the simulated engine-out thrust-to-weight ratio. The FAA agrees, and the last sentence of proposed § 25.107(e)(iv) is deleted. The proposal to amend § 25.107 is adopted with the revision discussed above.

Proposal 6–36. For comments related to proposed § 25.109(a), see Proposal 6–34.

Proposal 6–37. One commentator agreed with the proposed change to § 25.111(a)(2), which would delete the reference to V_1 and substitute V_{EF} in its place to make § 25.111(a) consistent with proposed § 25.107(a) (Proposal 6–34). However, this commentator did not agree with making the same change to § 25.111 (a)(3), and said that the present reference to V_1 in that paragraph is correct for the new definition of V_1 (i.e., as defined in proposed §§ 1.2 and 25.107(a)). The FAA does not agree with the comment on proposed § 25.111(a)(3) because it would leave a gap in the requirements for the speed range between V_{EF} and V_1.

Accordingly, the proposal to amend §§ 25.111 (a)(2) and (a)(3) is adopted without substantive change.

Proposal 6–38. Proposed § 25.121(e) would require the determination of the vertical distance required to make a transition from a 3-degree descent path in the landing configuration with the critical engine inoperative to a stabilized climb condition. Several commentators stated that the vertical distance determined in this manner should not be considered a minimum decision height for approaches. The FAA agrees, since the establishment of decision height requires consideration of many operational factors. Some commentators stated that the landing configuration in the proposal is not appropriate for one-engine-inoperative approaches. One commentator recommended that the horizontal as well as the vertical distance for transition to approach climb be determined, and referred to the work of the ICAO Obstacle Clearance Panel on this subject. Another commentator recommended that the required determination take into account the minimum control speed, V_{MC}. In light of the comments received, and after further review, the FAA believes that proposal 6–38 should be withdrawn.

Proposal 6–39. Several commentators objected to the proposal to amend § 25.123(a) on the ground that current § 25.123(a) is conservative and has the advantage of greater simplicity. The FAA agrees and the proposal to amend § 25.123(a) is therefore withdrawn.

Proposal 6–40. One commentator recommended that proposed § 25.143(b) be withdrawn and that current §25.143(b) be retained on the ground that there are areas within the flight envelope from takeoff to landing where the failure of a second engine cannot be handled smoothly and safely. The commentator also stated that the proposed amendment is vague and could produce confusion with respect to time between failures, and that it could be interpreted to require a combination of double engine failure and configuration changes. The FAA agrees that the proposed rule requires some clarification, but does not believe that the current § 25.143(b) should be retained. With respect to failure of a second engine on airplanes with three or more engines, the FAA believes that failure of a second engine can be reasonably expected in the enroute, approach, and landing stages of flight after failure of one engine earlier in the flight.

Therefore, proposed § 25.143(b) is revised to require consideration of the sudden failure of the second critical engine when the airplane is in a trimmed condition with one engine inoperative in the enroute, approach, and landing configurations. This revision also clarifies the requirement with respect to time between engine failures by providing that the airplane is in a trimmed condition with one engine inoperative when the second engine is failed. In regard to combination of engine failure and configuration changes, it should be noted that the introductory sentence of proposed § 25.143(b) refers to "probable operating conditions," and that some change of configuration may be desirable after engine failure, e.g., retracting the landing gear for a go-around after engine failure in the landing configuration.

Another commentator considered the proposed configuration change requirement to be too general and vague and suggested that the proposed requirement contain certain specific criteria. The commentator also recommended that interpretative material be included in the rule or in the associated Flight Test Guide. The FAA does not agree. The FAA believes that the wording of the proposed rule is clear and would accomplish the intended purpose.

The proposal to amend § 25.143(b) is adopted with the revision discussed above.

No unfavorable comments were received on the proposal to amend § 25.143 (c), which would reduce the maximum allowable rudder force for temporary application in meeting the controllability requirements, from 180 pounds to 150 pounds. Accordingly, the proposal is adopted without substantive change. For consistency with § 25.143(c), as adopted, and since flight test experience has shown that 180 pounds may make control difficult for some pilots under some flight conditions, § 25.147(a) is amended by deleting the reference to "180 pounds" and inserting in its place "150 pounds".

Proposal 6–41. One commentator recommended deletion of proposed § 25.149 (a), which would require that the method used to simulate critical engine failure must represent the modes of powerplant failure expected in service. The FAA does not agree. This provision is necessary to ensure that the most adverse condition with respect to controllability is considered. To clarify this intent, § 25.149(a) is revised to require consideration of the most critical mode of powerplant failure with respect to controllability expected in service. This commentator objected specificaly to dynamic engine cut demonstrations because of the hazards involved. The FAA believes that dynamic effects should be considered during type certification, since they might occur in service operations.

Upon further review, the FAA believes that specific guidance as to the setting of the propeller on propeller-driven airplanes is necessary with regard to proposed § 25.149(c). Current § 25.149(b) (8) specifies the setting of the propeller for reciprocating engine-powered airplanes. Current § 25.149(c) (5) specifies that for turbine engine-powered airplanes, the airplane must be ". . . in the most critical takeoff configuration existing along the flight path . . ." and has been administered to require that the setting of the propeller of turbine engine-powered, propeller-driven airplanes be the same as that specified in current § 25.149(b) (8). Accordingly, current § 25.149(b) (8) is retained and redesignated § 25.149(c) (7), to be applicable to all propeller-driven airplanes.

One commentator stated that the pilot should be provided with information regarding the effects of bank angle on V_{MC}. The FAA does not have enough information at this time to justify the suggested requirement.

Proposed § 25.149(e) would require the determination of a minimum control speed on the ground, V_{MCG}, for use in establishing takeoff speeds under proposed § 25.107 (see Proposal 6–34). One commentator recommended that the second sentence of proposed § 25.149(e) be revised to read "During this demonstration, the permissible lateral deviation of the path of the airplane would be limited to 30 feet." He said that the revision would eliminate the possibility of misinterpretation. The FAA believes that the language of the proposal is clear; however, it may be too restrictive in requiring the ground track to be parallel to or converging toward the centerline of the runway when the airplane is rotated for takeoff, and thereby unnecessarily delay rotation in determining takeoff performance under §§ 25.107(e) and 25.111. Section 25.149(e) is therefore revised to state that the airplane's path, from the point at which the critical engine is made inoperative to the point at which recovery to a direction parallel to the runway centerline is completed, may not deviate more than 30 feet laterally from the centerline. The adopted rule would allow the airplane to be rotated for takeoff before recovery to a direction parallel to the runway centerline is completed; however, it should be noted that it requires that V_{M3G} most be determined to enable the takeoff to be safely continued using normal piloting skill. The commentator also recommended that proposed §§ 25.149 (e) (3) and (e) (5) be deleted because flight tests have proven that gross weight and center of gravity have no effect on V_{MCG}. The FAA does not agree. The airplane's acceleration varies with its weight, and this may affect directional control and lateral deviation. The center-of-gravity location may also affect directional stability and control on the ground.

One commentator stated that proposed § 25.149(e) would allow a lateral deviation of 30 feet during the determination of V_{MCG}, whereas the current FAA Flight Test Handbook recommends 25 feet and the Air Force requires 25 feet. The commentator recommended that 25 feet be specified in the adopted rule. The FAA believes that the 30-foot deviation limit will assist in international standardization in this area. In addition it should be noted that § 25.107(a) (1) as adopted (see discussion of Proposal 6–34) requires V_{EF} to be not less than V_{MCG} and V_1 to be greater than V_{EF}, thus providing a small controllability margin at V_1.

Several commentators recommended that the proposal be revised to allow the use of nose wheel steering in the determination of V_{MCG} under § 25.149(e), if control is through the rudder pedals and the demonstration is made on a wet runway. The FAA does not agree. The effectiveness of nose wheel steering depends to a large degree on runway friction characteristics and the load on the nose wheel. Certification tests on a wet runway would not cover the more extreme slippery runway conditions or all possible variations in takeoff conditions and techniques likely to occur in service. The FAA therefore believes that V_{MCG} should be determined without the use of nose wheel steering, as stated in proposed § 25.149(e).

In regard to the airplane configuration used in determining V_{MCG}, one commentator recommended that proposed § 25.149(e) (1) be revised to specify each takeoff configuration instead of the most critical takeoff configuration, to allow a separate V_{MCG} for different flap settings. The FAA agrees that an applicant should be allowed to determine a separate V_{MCG} for different takeoff configurations but believes that the applicant should also have the option of determining a V_{MCG} value for only the most critical takeoff configuration. Proposed § 25.149(e) (1) is revised accordingly.

Proposed § 25.149(e) (2) would require that V_{MCG} be determined with maximum permissible takeoff power or thrust on the operating engines; however, the word "permissible," in relation to power or thrust, is not defined or used elsewhere in the performance and flight characteristics requirements. For consistency with §§ 25.101(c) and 25.149(c) (1), the word "permissible" is replaced by "available" in § 25.149(e) (2) as adopted. It should be noted that § 25.101(c) refers to the propulsive thrust available under the particular flight condition and thus provides for any difference between the takeoff thrust set during takeoff and the thrust available in flight for a go-around.

Proposed §§ 25.149 (f), (g), and (h) would require the determination of two new minimum control speeds, V_{MCL} and V_{MCL-2}, associated with an engine failure during landing approaches that are initiated with all engines operating and with one engine inoperative, respectively. One commentator said that these proposals are inconsistent with the V_{MCL} definitions being considered in the development of wet runway landing performance rules. The commentator recommended that these proposals be deleted until an acceptable rational landing rule is established. Another commentator stated that V_{MCL} and V_{MCL-2} would serve no useful purpose and may confuse flight crews. The FAA does not agree with these comments. These proposals are intended to cover the controllability aspects of an engine failure during landing approach. Proposed § 25.149 (f) as revised is intended to determine a minimum control speed for the situation where an engine fails after power or thrust has been increased to make a go-around from an approach with all engines operating. For airplanes with three or more engines, proposed §§ 25.149 (g) and (h) as revised are intended to determine a minimum speed for maintaining safe control during the power or thrust changes that are likely to be made following the failure of a second engine during an approach initiated with one engine inoperative. The

FAA believes that these proposals, with revisions discussed, should be adopted at this time to provide information for use in pilot training and service operations.

One commentator noted that proposed §§ 25.149(f)(5), (g)(5), and (h)(2) specify "maximum permissible power" in the determination of V_{MC_L} and $V_{MC_{L-2}}$. The commentator recommended that this be changed to "takeoff or maximum permissible power" as used in present § 25.149. Another commentator said that it is not clear whether "maximum permissible thrust" in proposed §§ 25.149 (f), (g), and (h) means maximum takeoff (or contingency) thrust, or whether a lower thrust can be scheduled. This commentator also stated that takeoff (or contingency) thrust would represent an increase in severity with respect to both the British Civil Air Regulations and present § 25.149(d), and that the thrust to be associated with recovering control following a sudden engine failure in §§ 25.149 (f) and (g) should be the power required for a 3-degree approach, and the thrust range to be associated with maintaining straight flight thereafter should be from minimum power to power for level flight or maximum power, whichever occurs first.

As explained in the preceding discussion of § 25.149(e)(2), current § 25.149 (c)(1) uses the words "maximum available takeoff power or thrust". The FAA believes that, for V_{MCL}, the power or thrust condition at the time of engine failure should be the thrust associated with a go-around and therefore believes that maximum available takeoff power or thrust should be prescribed in § 25.149 (f) since the approach climb requirements in § 25.121(d) allow use of available takeoff power or thrust. Proposed § 25.149(f) is revised accordingly.

However, since there are no performance requirements for a go-around with two engines inoperative, the FAA believes that the initial power condition at the time of failure of the second engine in § 25.149(g) for $V_{MC_{L-2}}$ should be that for a 3-degree approach with one engine inoperative. This is one of the initial power conditions prescribed in proposed § 25.149(h). In regard to the maximum power or thrust to be applied after the second engine is made inoperative, the FAA believes that the value of $V_{MC_{L-2}}$ to be furnished as information to the pilot should be based on the power or thrust that provides the maximum performance capability of the airplane without exceeding the powerplant limitations, i.e., maximum available takeoff power or thrust at the upper end of the range, and minimum available power or thrust at the lower end of the range. Proposed § 25.149(g) is revised accordingly.

Since V_{MC_L} will be determined with maximum available takeoff power, proposed § 25.149(h) is revised so that the requirement of changing the power on the operating engines after failure of the critical engine only applies to $V_{MC_{L-2}}$.

One commentator said that the critical weight for V_{MC_L} can be the lowest weight, when a 5-degree bank angle is used, and he therefore recommended that proposed §§ 25.149 (f)(4) and (g)(4) be revised to specify the most unfavorable weight in the range of landing weights, instead of the maximum sea level landing weight (or any lesser weight necessary to show V_{MC_L}). The FAA agrees that light weight may be critical for V_{MC_L} or $V_{MC_{L-2}}$ but does not believe that the recommended wording change is necessary. The proposal is consistent with current § 25.149(c)(4), and light weight conditions are considered under the current rule.

One commentator stated that the proposal requres determination of V_{MC_L} and $V_{MC_{L-2}}$ but does not appear to require that this information be made available to flight crews or that it be used in determining the approach speed. The commentator recommended that the proposal be changed to require that V_{MC_L} and $V_{MC_{L-2}}$ be included in the Airplane Flight Manual and also that the landing performance requirements in § 25.125 be amended to take account of V_{MC_L}. The FAA does not have sufficient information to justify changing the landing performance requirements in the manner recommended by the commentator. However, information regarding V_{MC_L} and $V_{MC_{L-2}}$ would be required to be furnished in the Airplane Flight Manual pursuant to the provisions of § 25.1585(a)(1).

For a comment related to the clause "either with zero yaw or with an angle of bank of not more than 5 degrees", which is contained in proposed §§ 25.149 (e), 25.149(f), and 25.149(g), see Proposal 6–13.

The proposal to amend § 25.149 is adopted with the revisions discussed above.

Proposal 6–42. One commentator stated that the exception in proposed § 25.177(b)(2) for the speed range from V_{MO}/M_{MO} to V_{FC}/M_{FC} should also be applicable to the speed range from 1.2 V_{S_1} to V_{MO}/M_{MO}. The FAA does not agree. V_{MO}/M_{MO} is the maximum operating limit speed. Gradual divergence that is easily recognizable and controllable by the pilot is allowed in the speed range above V_{MO}/M_{MO} because it is expected that operation at speeds above V_{MO}/M_{MO} will occur only for brief periods and that flight control demands will in general be limited to the restoration of flight at speeds below V_{MO}/M_{MO}.

Accordingly, the proposal to revise § 25.177(b) is adopted as proposed except that a provision for maximum flap extended speed and maximum landing gear extended speed has been added for clarification and consistency with the present rule.

Proposal 6–43. Proposed § 25.181(b) would require that combined lateral-directional ("Dutch roll") oscillations be positively damped, i.e., diminish after a disturbance, but it does not specify the degree of damping. One commentator recommended that the proposal be revised to state that lateral-directional oscillations should be damped but that neutral damping or mild divergence would be acceptable if it is easily controllable by the pilot. The commentator said the proposal is unnecessarily restrictive following the failure of a stability augmentation device, since the device must be designed to meet § 25.21(e), and that the damping required should be related to the frequency and amplitude of the oscillation, the pilot tasks, and environmental effects. The commentator also said that, if unsatisfactory damping following a failure is confined to an avoidable flight area or configuration and is controllable to return the aircraft to a satisfactory condition for safe flight, the lack of appreciable positive damping may be acceptable. The FAA does not agree with this recommendation. Current § 25.181 requires any short period oscillation to be heavily damped, and the proposal would require that combined lateral-directional oscillations be positively damped instead of heavily damped. The change recommended by the commentator would increase the pilot's tasks and could result in an unsafe situation when operating in rough air. Section 25.672(c) already allows degradation of stability and other flight characteristics after any single failure in a stability augmentation system if the airplane is safely controllable and the resulting stability characteristics allow continued safe flight and landing.

Another commentator recommended that the proposal should be changed to raise the lower limit of the speed range for positive stability from the stalling speed to 1.2V_{S_1}. The proposal is the same as the current rule with respect to the lower speed limit of the speed range for positive stability and the FAA does not have sufficient information at the present time to justify raising the lower speed limit to 1.2 V_{S_1}.

The proposal to revise § 25.181 is adopted without substantive change.

Proposal 6–44. One commentator recommended that the proposal to amend § 25.201 and the proposal to amend § 25.207 (Proposal 6–45) be withdrawn in light of current FAA studies on landing distances which may result in a new stall requirement. The FAA does not agree with this recommendation because the proposals for §§ 25.201 and 25.207 deal with stall demonstration and stall warning, and current studies for the landing distance rules do not include changes to §§ 25.201 or 25.207.

Another commentator stated that many modern airplanes are accepted as having correct stalling characteristics even though these occur before reaching the angle of attack for maximum lift, and suggested that the phrase "at an angle of attack measurably greater than that for maximum lift" be deleted from proposed § 25.201(d)(1). Proposed § 25.201 (d)(2) sets forth an exception to the requirements of proposed § 25.201(d)(1)

(this would be a relaxation of the requirement in current § 25.201(c)(2) with respect to those instances in which the airplane may be considered to be stalled). The FAA does not believe any further relaxation would be justified.

One commentator expressed concern that proposed § 25.201 might result in unwarranted increases in operational speeds and runway length requirements; however, no explanation of this comment was provided. Some operating speeds are affected by stalling speeds which are determined under §§ 25.103, 25.203, and 25.201. Proposed § 25.201(d)(2) provides that for an airplane demonstrating an unmistakable inherent aerodynamic warning in a particular configuration of a magnitude and severity that is a strong and effective deterrent to further speed reduction, the airplane may be considered stalled when it reaches the speed at which the effective deterrent is clearly manifested. (This exception is present in the current rule but is only applicable to those airplanes demonstrating the required degree of warning in all required configurations). The FAA believes that it is necessary that an applicant be allowed to limit the stall demonstration to the speed where a strong and effective deterrent (such as severe buffeting) is clearly manifested because operation of the airplane at any lower airspeed may be hazardous. Therefore, the FAA believes that any increase in an operating airspeed because a stall demonstration was limited to the airspeed at which there exists an effective deterrent, as provided in proposed §25.201(d)(2), is justified.

Accordingly, the proposal to amend § 25.201 is adopted as proposed, except that a nonsubstantive change is made to proposed § 25.201(d)(2) to clarify its intent. The proposal to amend § 25.207 is adopted without substantive change.

Proposal 6–45. For comments related to the proposal to amend § 25.207, see Proposal 6–44.

Proposal 6–46. Proposed § 25.233(a) would change the requirements concerning ground looping tendency in cross winds by substituting "25 knots" in place of "0.2V_{S_0}" for the prescribed wind velocity. Several commentators objected to the use of 25 knots for the required wind velocity, stating that the present requirement corresponds to about 20 knots for most airplanes, and that standardizing on a height of 10 meters above the surface for airport wind velocities (see Proposal 6–32 for § 25.21(f)) would also increase the required cross wind component (as compared with the present practice of correcting wind velocity to a height of 50 feet). The FAA agrees that 20 knots would be an appropriate minimum value for the cross wind component; however, this would be less severe than the present rule for airplanes with a stalling speed (V_{S_0}) greater than 100 knots. Therefore, § 25.233(a) is revised to replace "0.2Vs" with "20 knots or 0.2 V_{S_0}, whichever is greater, except that the wind velocity need not exceed 25 knots.".

One commentator suggested that the rule be written to allow the use of analysis to show acceptable ground handling characteristics for cross wind components greater than 20 knots. The FAA does not agree that analytic methods are reliable for this purpose. (See discussion of Proposal 6–47).

Proposal 6–47. Proposed § 25.237(a)(1) would establish 25 knots as the minimum cross wind component for landplanes, to be demonstrated on dry runways. Several commentators objected to the use of 25 knots for the required minimum wind velocity. For reasons explained in the discussion of Proposal 6–46, proposed §§ 25.237 (a) and (b) are revised, consistent with § 25.233 as adopted, by replacing "25 knots" with "20 knots or 0.2 V_{S_0}, whichever is greater, except that it need not exceed 25 knots."

Proposed § 25.237(a)(2) would require that a safe cross wind component be established for wet runways, but would allow this to be determined by analysis in lieu of demonstration. Two commentators recommended that the proposal concerning wet runways be deleted, since there is no definition of "wet," and they considered the current rules for cross wind operation to be adequate for either wet or dry cases. Two other commentators doubted the validity of analytic methods for establishing a safe cross wind component for wet runways. In light of the comments received, and after further review, the FAA believes that proposed § 25.237(a)(2) is premature and it is withdrawn.

Proposal 6–48. Two commentators recommended that proposed § 25.251(e) be revised to prescribe an acceleration of ±0.1 g, instead of ±0.05 g, in defining the onset of buffet. One of the commentators stated that this change would ensure a level of buffet that would be distinguishable under turbulent air conditions. The commentator stated that contrary to the explanation in the notice, test pilots have signified the onset of buffet when the buffet level at a flight station was greater than ±0.1 g, and that defining buffet onset in § 25.251(e) as ±0.05 g would unnecessarily limit the altitude-payload capability of the airplane. After considering the comments received, and after further review, the FAA does not believe it has enough information at this time to specify an acceleration value for the onset of perceptible buffeting which would be applicable to all airplanes. Accordingly, the proposal is withdrawn.

Proposal 6–49. Proposed new § 25.255 would establish requirements for maneuvering and dive recovery characteristics with the airplane out of trim by the amount resulting from a three-second movement of the primary longitudinal trim system at its normal rate with no aerodynamic load, or the maximum mistrim that can be sustained by the autopilot while maintaining level flight in the high speed cruising condition, whichever is greater. One commentator said that the requirement would appear not to apply to a manual trim system, and that this should be made clear. The intent of the proposal is to provide a basic maneuvering stability and dive recovery requirement regardless of the type of trim system used in the airplane.

To make this intent clear, the first sentence of the lead-in of proposed § 25.255 is revised by inserting the parenthetic "(or an equivalent degree of trim for airplanes that do not have a power operated trim system)". In addition, current § 25.655(b) requires that if an adjustable stabilizer is used, it must have stops that will limit the range of travel to the maximum for which the airplane is shown to meet the trim requirements of § 25.161. Therefore, the first sentence of the lead-in of proposed § 25.255 is also revised by inserting an exception indicating that the trim movement need not exceed the range established by stops in the trim system, including those required by § 25.655(b) for adjustable stabilizers. It should be noted that the word "primary" in the first sentence of the lead-in of proposed § 25.255 is being deleted since its usage in this context is inappropriate. The same commentator also said that he does not understand the phrase relating to the autopilot, but believes there is a need for an analysis to show whether greater mistrim can result from autopilot or other system malfunction, or from normal autopilot functioning such as when flying on altitude hold through updrafts. The phrase in the proposal relating to autopilots is intended to provide for circumstances in which the trim system is actuated, either by a runaway or by the pilot, while the autopilot is engaged, and the autopilot is then disengaged when the degree of mistrim reaches the point where the autopilot can no longer hold level flight. The FAA believes that this is an appropriate test criterion. In addition, it should be noted that autopilot malfunctions are covered under § 25.1329.

One commentator recommended that the proposed wording "at its normal rate with no aerodynamic load" in the lead-in of proposed § 25.255 be replaced by "at the rate existing for the specified flight condition." The FAA agrees that where the trim system is designed to vary the rate of trim movement according to the flight condition (e.g., as a function of the dynamic pressure), this variation may be taken into account; however, the effects of aerodynamic loads on trim movement may vary in a complex manner, e.g., with center of gravity, airspeed, and system friction. As stated in the notice, the proposal is intended to simulate a typical out-of-trim condition. The FAA believes that the requirement should be specified so that the required trim change can be determined by a relatively simple and uniform procedure. Accordingly, § 25.255 as adopted is revised to specify a three-second movement of the trim system at the normal rate for the particular flight condition with no aerodynamic load.

One commentator recommended that § 25.255(a) be changed to read: "The slope of the stick force vs. g (curve) for load factors between −1g and +2.5g

must be positive at speeds up to V_{FC}/M_{FC} or aural warning (speed) except that a 'flattening' of the stick force gradient or a reduction in stick force is permissible if it does not result in the tendency to overcontrol. Lesser acceleration values may be used at altitudes where buffet envelopes are established in accordance with § 25.251(e)." The FAA disagrees with the recommendation. Current § 25.253(b) already allows M_{FC} to be the same as the Mach number at which effective speed warning occurs for altitudes where Mach number is the limiting factor. At lower altitudes where airspeed is the limiting factor, V_{FC} under § 25.253(b) must be higher than the aural warning speed under § 25.1303 (c)(1). Recoveries from severe upsets or evasive maneuvers are likely to be made in this altitude range at speeds above the aural warning speed. Therefore, the FAA believes that the proposed requirement should be met at speeds up to V_{FC}/M_{FC}. In addition, to minimize the possibility of over-control and overstressing the airplane structure, the FAA believes that a reduction in stick force (negative slope of the stick force per g curve) should not be allowed at speeds up to V_{FC}/M_{FC}. However, it should be noted that flattening of the stick force gradient would be allowed under the proposal as long as the slope is positive.

The changes to proposed § 25.255(a) recommended by this commentator include deleting the proposed requirement for the speed range between V_{FC}/M_{FC} and V_{DF}/M_{DF} (the demonstrated flight dive speed). For this speed range, the proposal states that there may not be reversal of the primary longitudinal control force. Speeds above V_{FC}/M_{FC} have been reached during recovery from upsets in severe turbulence. The FAA believes that reversal of the direction of the control force (as shown on the stick force per g diagram) should not be allowed at speeds up to V_{DF}/M_{DF}, because force reversal on the primary control could be confusing to the pilots and contribute to hazardous over-control in severe turbulence.

Proposed § 25.255(a) provides that acceleration values less than those prescribed may be used at altitudes and speeds where buffet envelopes are established in accordance with § 25.251(e). One commentator objected to this provision and suggested that the proposal be revised to state that, at speeds up to V_{FC}/M_{FC}, the stick force curve must have a positive slope, and at speeds up to V_{DF}/M_{DF} there may not be a reversal of the primary longitudinal control force for normal acceleration values between -1 g and the lesser of 2.5 g and a normal acceleration corresponding, in the particular circumstances of weight, altitude, and air speed or Mach number, to buffeting or other phenomena, of such intensity as to be a strong deterrent to further application of primary longitudinal control force. The FAA does not believe that the buffeting criteria suggested by the commentator would be appropriate, since severe buffeting could mask the normal stick force gradient characteristics.

Another commentator suggested that the proposal be revised to state that "where buffet envelopes are established in accordance with § 25.251(e), the corresponding lesser acceleration values may be used." The FAA disagrees with the recommendation. The suggested wording would indicate that the requirement for positive maneuvering stability (stick force per g) is limited to the load factors within the buffet onset envelopes (i.e., perceptible buffeting) determined under § 25.251(e). However, § 25.251(e) also requires that probable inadvertent excursions beyond the boundaries of the buffet onset envelopes may not result in unsafe conditions. The FAA believes that positive maneuvering stability should be required for inadvertent excursions beyond the buffet onset boundaries, since a pilot is likely to exceed these boundaries in recovering from an upset.

Accordingly, § 25.255 is clarified by deleting the specific acceleration (g) values and exception clause in paragraph (a), and by setting forth a revised exception clause in a paragraph (e) which states that the accelerations need not exceed the maneuvering load factors associated with probable inadvertent excursions beyond the boundaries of the buffet onset envelopes determined under § 25.251(e). For consistency with the structural strength requirements, § 25.255(e) as adopted also states that the accelerations need not exceed the limit maneuvering load factors prescribed in §§ 25.333(b) and 25.337.

In addition, the other paragraphs of proposed § 25.255 have been restructured and redesignated for clarity. The second sentence of proposed § 25.255(d) would provide for the use of longitudinal trim to assist in producing the required 1.5 g for recovery. One commentator suggested that a clause be inserted to require that it be possible to produce at least 1.2 g without use of the longitudinal trim system and without exceeding a longitudinal control force of 125 lbs. The FAA believes that the recommended change is unnecessary because proposed § 25.255(d) already provides that longitudinal trim can only be used to assit in producing 1.5 g if it meets certain requirements.

Proposed § 25.255(d) requires that if the longitudinal trim is used to assist in the dive recovery, it must be shown that the trim can be actuated in the nose up direction with the primary surface (e.g., elevators) loaded to produce the least of the nose up control forces specified in paragraphs (d)(1), (d)(2), and (d)(3). One commentator recommended that proposed paragraph (d)(1) be deleted and that paragraph (d)(2) be changed to "125 pounds." The FAA does not agree. In an upset, the initial attempt at recovery is likely to be made with the primary pitch control, and on some airplane designs the airloads on the horizontal tail surfaces tend to prevent movement of the trim system at high speeds. The change recommended by the commentator assumes, in effect, that the pilots will actuate the trim in time to obtain recovery before they apply more than 125 pounds on the primary control. This may not be a valid assumption in extreme upset conditions.

One commentator stated that it is impracticable to demonstrate 1.5g, and less than 1 g, at V_{DF}/M_{DF} in a flight test without exceeding V_{DF}/M_{DF}, and that some alleviation should be provided to cover this. Proposed § 25.255(d), which states that it must be possible from an overspeed condition at V_{DF}/M_{DF} to produce at least 1.5 g for recovery by applying not more than 125 pounds of control force, would only require that the test be started at V_{DF}/M_{DF}. With regard to accelerations less than 1 g, the commentator has apparently misinterpreted the requirement of proposed § 25.255(f). The intent of the requirement in proposed § 25.255(f) is that the entry speeds for flight test investigations at acceleration values less than 1 g should be limited to the extent necessary to accomplish a recovery without exceeding V_{DF}/M_{DF}. To clarify this intent, proposed § 25.255(f) is revised and incorporated into § 25.255(e).

Another commentator recommended certain changes in the arrangement of paragraphs in § 25.255 along with other changes already discussed above. The FAA believes, however, that the paragraphs of proposed § 25.255, as revised, are in the most appropriate order for clarity.

One commentator stated that proposed § 25.255 should be changed to be consistent with the manner in which the out-of-trim special condition has been applied in certification tests since 1965. The wording of the special conditions for various airplanes, and of related regulations §§ 25.251 and 25.253, has changed between 1965 and the present time. The proposal in the notice is based on the wording of recent special conditions.

Proposal 6–50. Proposed § 25.703 would require a takeoff warning system to warn the pilots during the initial portion of the takeoff roll if the airplane is in a configuration that would prevent successful completion of the takeoff. One commentator recommended that the proposed requirement for both aural and visual warnings be changed to require either an aural or visual warning. Another commentator questioned the desirability of a visual warning, particularly at night, citing the time that may be lost in searching for a visual warning. The FAA agrees with the latter comment. Accordingly, the requirement for an aural warning is retained and the requirement for a visual warning is withdrawn.

One commentator recommended that the words "including any of the following" (configurations) in proposed § 25.703(a) be changed to "consisting of the following" (configurations). The FAA does not agree since a particular airplane design may incorporate some other variable geometry device that would not allow a safe takeoff when in the wrong position.

The same commentator stated that proposed § 25.703(c), which would re-

quire that the means used to activate the system function properly throughout the ranges of takeoff weights, altitudes, and temperatures for which certification is requested, is superfluous and should be deleted. The FAA believes that this paragraph should be retained to clearly define the scope of the requirements.

This commentator also recommended deletion of proposed § 25.703(d) which would require that the system be designed to provide reliable sensing of an unsafe position of each critical aerodynamic surface. The commentator stated that such a system would be unworkable, over-sophisticated, and could degrade flight safety through numerous nuisance warnings. He pointed out that critical aerodynamic surfaces would include ailerons, rudder, and spoilers, and that "proper" position of such surfaces during takeoff would be affected by cross winds, engine failure, etc. The FAA agrees that the requirements in proposed § 25.703(d) could result in a warning system so complex that its effectiveness may be impaired. Proposed paragraph (d) is therefore withdrawn.

In regard to proposed § 25.703(b), one commentator recommended that consideration be given to a system cutoff at some significant airspeed, e.g., 100 knots. It was stated that any valid warning would probably have sounded by the time that speed is reached and the cutoff would preclude unwarranted aborts due to warning system malfunction at high speeds. Proposed § 25.703(b) would require the warning to continue until the configuration is changed to allow a safe takeoff, the takeoff roll is terminated, or the warning is manually deactivated by the pilot. The FAA agrees that a system cutoff at high speeds should be permitted, but believes that the cutoff should not be set below the V_1 speed, since the takeoff can be rejected within the established accelerate-stop distance from any speed up to V_1. Since the next speed above V_1 that can be sensed by a simple means is V_R (e.g., by nose gear switches), the FAA believes that deactivation of the takeoff warning system should be allowed when the airplane is rotated for takeoff. Proposed § 25.703 is revised accordingly.

With respect to the requirement in proposed § 25.703(b) that the warning must continue until the takeoff roll is terminated, the intention of the proposal was not to require that the warning must continue until the airplane is brought to a full stop, but that it must continue until action is taken by the pilot to terminate the takeoff roll, for example by closing all throttles. Proposed § 25.703 (b) is revised accordingly.

Another commentator objected to the proposal, stating that the warning system would eliminate reliance on the checklist and induce more hazards than it is designed to eliminate. The FAA does not agree that the warning system would eliminate reliance on the checklist; instead it would serve as a back-up for the checklist, particularly in unusual situations, e.g., where the checklist is interrupted or the takeoff is delayed. The commentator stated that the additional aural warning system would add to the problem of cockpit confusion caused by the multitude of aural warning requirements. The FAA does not agree since the takeoff warning would occur during the initial portion of the takeoff roll and therefore should not be confused with flight over-speed warning, stall warning, or landing gear warning during approach. The commentator added that it is doubtful if a reliable, practical, safe system can be designed, much less for a cost that would approximate the possible benefits. The FAA does not agree since such systems have been developed and used on relatively complex airplanes. The warning systems can be simpler on airplanes having fewer or less critical variable geometry devices.

One commentator recommended that consideration be given to including unreleased brakes in the takeoff warning system in view of the serious consequences of failing to release brakes fully before takeoff. The FAA does not now have sufficient information to justify adopting the suggestion made by this commentator.

The proposed new § 25.703 is adopted with the revisions discussed above and a nonsubstantive revision for clarity.

Proposal 6–51. One commentator suggested the use of the word "suspended" rather than "silenced" in proposed § 25.729(e)(3). The FAA agrees with this suggestion, since it would result in consistency of wording between this section and proposed § 23.729(f)(1). Section 25.729(e)(3) is revised accordingly.

Proposal 6–52. For comments related to the proposal to revise § 25.1043(b), see Proposal 6–23.

Proposal 6–53. No unfavorable comments were received on the proposal to revise § 25.1501. Accordingly, the proposal is adopted without substantive change.

Proposal 6–54. For comments related to the proposal to revise § 25.1521(e), see Proposal 6–23.

Proposals 6–55 and 2–96. One commentator recommended that proposed § 25.1581(a)(2), which would require that the Airplane Flight Manual contain "Other information necessary for safety," be deleted. He stated that the proposed requirement would be far too broad, and could include all information now provided in the crew operating manual. The FAA agrees that the proposed wording may be too broad, but does not agree that all requirements for additional information should be eliminated. Section 25.1581(a)(2) as adopted requires other information that is necessary for safe operation because of design, operating, or handling characteristics. This wording is the same as current § 25.1581(c), except that the word "unusual" is deleted for the reasons stated in notice.

The same commentator also recommended deletion of proposed § 25.1581 (b), which would require that each part of the manual containing required information be approved, segregated, identified, and clearly distinguished from each unapproved part of the manual. The commentator stated that he is not aware of any unapproved sections of the Airplane Flight Manual, and that the proposal implies a crew manual with the FAA limitation data so marked. The FAA does not agree with the recommended deletion of this requirement. The proposed paragraph is the same as current § 25.1581(b), and is intended to cover cases where the applicant desires to include information in the manual that is not required by the FAA.

Proposal 6–55 to amend § 25.1581 is adopted with the revisions discussed above.

The disposition of Proposal 2–96, which proposed to add a new § 25.1581 (d) (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–55. No unfavorable comments were received on Proposal 2–96 and the proposal to add a new § 25.1581(d) is adopted without substantive change.

Proposal 6–56. For comments related to the proposal to amend § 25.1583, see Proposal 6–23.

Proposals 6–57 and 2–87. No unfavorable comments were received on the proposal to amend § 25.1585. Accordingly, the proposal is adopted without substantive change.

Disposition of Proposal 2–87 to amend § 25.1353 (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–57. Proposals 2–39, 2–131, and 2–186 to amend §§ 23.1353, 27.-1353, and 29.1353, respectively (Notice 75–10), are substantively identical to Proposal 2–87 and all of these proposals are discussed below.

Commentators suggested that proposed §§ 25.1353(c)(5) and 29.1353(c)(5) be revised by adding the word "or" between paragraphs (c)(5)(i) and (c)(5)(ii) to allow an alternative design. The commentators misinterpreted the proposal. The sections as adopted provide for three alternatives with an "or" understood between paragraphs (c)(5)(ii) and (c)(5)(iii) and with an "or" understood between paragraphs (c)(5)(i) and (c)(5)(ii).

One commentator suggested that the proposals should be broadened to include nickel cadmium battery installations other than those capable of being used to start an engine or an auxiliary power unit. The proposals apply only to nickel cadmium batteries that are subject to a rapid drain because they are used to start an engine or auxiliary power unit. The FAA does not have enough information to indicate that in other installations the drain on nickel cadmium batteries is sufficiently rapid to require compliance with the proposed provisions.

One commentator objected to proposed §§ 27.1353(f) and 29.1353(c)(5) on the basis that the requirement should be limited to nickel cadmium batteries other than 20-cell batteries and to only certain battery locations. The commentator also stated that the requirement for helicopters should be different from that for airplanes since helicopters are

able to execute an emergency landing much quicker than airplanes. The FAA has insufficient information at the present time to warrant any of the distinctions suggested by the commentator.

The FAA believes that the requirement in proposed § 25.1353(c)(5) concerning operating procedures in the Airplane Flight Manual should be transferred to § 25.1585(a), since that section pertains to operating procedures. The proposal for § 25.1353(c)(5) is revised and § 25.1585(a) amended accordingly. The remainder of proposed § 25.1353(c)(5) is redesignated § 25.1353(c)(6) in view of the adoption of a new § 25.1353(c)(5) in Amendment No. 5. The same revisions are also made to proposed §§ 23.1353(f), 27.1353(f), and 29.1353(c)(5), designated as §§ 23.1353(g), 27.1353(g), and 29.1353(c)(6), respectively, and to §§ 23.1585, 27.1585, and 29.1585.

Proposals 6–58 and 2–98. Proposed §§ 25.1587 (c)(5) and (c)(6), which would add requirements for information on the vertical distance for transition to approach climb determined under proposed § 25.121(e) (Proposal 6–38), and on the en route net flight path data determined under proposed § 25.123 (Proposal 6–39), are withdrawn in view of the withdrawal of Proposals 6–38 and 6–39.

Disposition of Proposal 2–98 to revise § 25.1587 (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–58. No unfavorable comments were received on Proposal 2–98 and it is adopted as proposed except that the reference in proposed § 25.1587(b)(4) to § 25.101(c) is changed to reference §§ 25.101 (f), (g), and (h), Current § 25.1587(c)(3), on which proposed § 25.1587(b)(4) is based, was adopted as part of the recodification of Part 4b of the Civil Air Regulations, effective February 1, 1965 (29 FR 18289). Specifically, § 25.1587 replaced § 4b.743 of the CARs and § 4T.743 of Special Civil Air Regulation 422B. Section 4T.743(c), which was replaced by § 25.1587(c)(3), referenced § 4T.111(c) and the requirements of § 4T.111(c) are now contained in §§ 25.101 (f), (g), and (h), not § 25.101(c) as the current rule indicates. The purpose of the recodification program was simply to clarify the regulations. No substantive changes, other than relaxatory ones that were completely noncontroversial, were intended. The FAA believes that the change being made is a nonsubstantive editorial change since § 25.1587(c)(3) has been consistently interpreted in accordance with the rule as originally set forth in § 4T.743(c) of Special Civil Air Regulation 422B.

Proposal 6–59. For comments related to the proposal to amend § 27.25(b), see Proposal 6–5. The proposal to amend § 27.25(b) is adopted without substantive change.

Proposal 6–60. For comments related to the proposal to amend § 27.29, see Proposal 6–5.

Proposal 6–61. Proposed new §§ 27.33 (e) and 29.33(e) (Proposal 6–77 would require a main rotor low-speed warning for each single engine helicopter and each multiengine helicopter that does not have an approved device that automatically increases power on the operating engines when one engine fails. Several commentators stated that operating experience does not indicate the need for a main rotor low-speed warning and that the instruments furnished the pilot are adequate to monitor rotor r.p.m. safely. One of these commentators also stated that if the warning is set high enough to be effective, the pilot will rely on it in lieu of monitoring rotor r.p.m. as he should and that the warning will activate during low r.p.m. transients which are entirely safe and this may cause pilot action that is unsafe. The commentator stated that since the National Transportation Safety Board (NTSB) has recommended an engine failure warning device on all turbine engines, this proposal should be withdrawn or deferred until action has been taken on the NTSB recommendations. The FAA does not agree. In regard to the comments concerning monitoring of instruments and rotor r.p.m. by the pilot, it should be noted that one of the main reasons for providing rotor low-speed warning is to assist the pilot in maintaining safe rotor speed after an engine failure when his attention is directed to flight path control and emergency procedures. With respect to activation of the warning during low-rotor r.p.m. transients, the FAA believes that the warning can be set to avoid nuisance warnings in normal maneuvers and still meet the requirements of this section. The NTSB Release for Safety Recommendations A–75–72 and 73, issued September 2, 1975, recommended that Parts 27 and 29 be amended to require that all turbine engine-powered helicopters be equipped with a prominent engine-out visual warning system and an aural warning system which can be heard with or without the use of a headset. The FAA believes, as stated in its response to the NTSB, that the proposed requirement for rotor low-speed warning is more desirable than an engine-out warning since a rotor low-speed warning would warn the pilot of an unsafe low rotor speed due to any cause, including engine failure, and will continue the warning function during power-off descent and landing.

One commentator noted that the FAA has imposed special conditions requiring engine-out warnings on certain turbine engine-powered helicopters, and stated that engine-out warnings should not be required in addition to rotor low-speed warning. The FAA does not believe it will be necessary to issue a special condition requiring installation of an engine-out warning on those helicopters with a rotor low-speed warning.

One commentator objected to the deletion of §§ 27.33(b)(3) and 29.33(b)(3). Current §§ 27.33 (b)(1), (b)(2), and (b)(3) (and §§ 29.33 (b)(1), (b)(2), (b)(3)) provide, for all rotorcraft, three alternative methods for showing that main rotor speeds substantially less than the minimum approved main rotor speed will not occur under any sustained flight condition with power on. One of the alternatives, paragraph (b)(3), is to provide adequate means to warn the pilot of unsafe main rotor speeds, but the proposal would delete this paragraph, thus requiring all rotorcraft to comply with paragraph (b)(1) or (b)(2). This was not the intent of the proposal. Accordingly, §§ 27.33(b)(3) and 29.33(b)(3) are retained. In addition, for clarification, the lead-in of §§ 27.33(b) and 29.33(b) are revised so that they are only applicable to rotorcraft that are not required to have a main rotor low-speed warning under § 27.33(e) or § 29.33(e), respectively.

Proposal 6–62. Two commentators objected to the proposals for §§ 27.45 and 29.45, stating that the basis for humidity levels has not been determined and varies between engines. These commentators further stated that there is no industry agreement on the effect of humidity on power or that humidity has a significant effect on power. The effects of humidity on the power of reciprocating engines are well understood and are generally the same between engine types. The effects of humidity on the power or thrust of turbine engines may differ between engine types. The proposal, however, establishes a reference humidity structure for the development of rotorcraft performance data. It does not prejudge the nature of the corrections, if any, which may be required. Each turbine engine must be evaluated to determine the effect of humidity on thrust or power, and, where rotorcraft performance is affected, it must be based on the humidity reference condition.

One commentator objected to the proposals on the basis that the humidity reference for turbine engine-powered rotorcraft may not be representative of average humidity conditions encountered in service. No safety problem has been identified with the use of the proposed humidity reference in the type certification of transport category airplanes, and the reference is considered equally valid for the type certification of rotorcraft.

One commentator questioned why a reciprocating engine-powered rotorcraft would be required to use a humidity correction different from that for turbine engine-powered rotorcraft. The humidity correction proposed for reciprocating engine-powered rotorcraft is similar to the current requirements for reciprocating engine-powered transport category airplanes and the proposed humidity correction for turbine engine-powered rotorcraft is similar to the current requirements for turbine engine-powered transport category airplanes, and the requirements for transport category airplanes have been administered without difficulty. In addition, the humidity correction requirements for turbine engine-powered rotorcraft are based on the fact that the power or thrust of turbine engines diminishes significantly as the ambient atmospheric temperature is increased. Power or thrust variations related to humidity could therefore have

an adverse effect upon safety at temperatures above standard.

The proposal to revise § 27.45 and the proposal to amend § 29.45 are adopted without substantive change.

Proposals 6–63 and 2–100. Under proposed § 27.65(b)(2), if the never-exceed speed V_{NE} is less than the best rate-of-climb speed V_Y at any altitude within the range for which certification is requested, the steady rate of climb must be determined over the entire range of weights, temperatures, and altitudes for which certification is requested. One commentator recommended that the rate of climb information be required only for the range of altitudes where V_{NE} is less than V_Y, instead of the entire range of altitudes. The FAA disagrees. The climb performance and speed of a helicopter may change significantly below, as well as above, the altitude at which V_{NE} is less than V_Y. However, after further review, the FAA believes that it is only necessary that climb data be determined over the range of altitudes from 2,000 feet below the altitude at which V_{NE} is equal to V_Y up to the maximum altitude for which certification is requested. The proposal to amend § 27.65 is revised accordingly.

In addition, proposed § 27.65(b)(2)(i) is revised to allow the rate-of-climb to be determined at the climb speed selected by the applicant (instead of the most favorable climb speed) at or below V_{NE}. The FAA believes that the proposed paragraph (b)(2)(i) would impose an unnecessary burden on the applicant and result in complex operating information, since the most favorable climb speed may be a function of several variables.

Disposition of Proposal 2–100 to amend § 27.65(a)(2) (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–63. No unfavorable comments were received on the proposal to amend § 27.65(a)(2). Accordingly, the proposal is adopted without substantive change.

Proposal 6–64. Proposed § 27.67(c) would require the determination of the one-engine-inoperative steady rate of climb with maximum continuous power on the operating engines, and (for helicopters for which certification for the use of 30-minute power is requested) at 30-minute power. One commentator said that there is no need to show the climb performance data for both the maximum continuous and 30-minute power levels and, therefore, the word "and" preceding the parenthetical expression should be changed to "or". The FAA does not agree. Even though an applicant may request certification for the use of 30-minute power, climb performance data for maximum continuous power should be furnished to the pilot for use in operations that may require more than 30 minutes to reach a safe landing area after failure of one engine, e.g., over-water operations. Accordingly, § 27.67(c) is adopted without substantive change.

Proposal 6–65. No unfavorable comments were received on the proposal to revise § 27.75(a)(2)(ii). Accordingly, the proposal is adopted without substantive change.

Proposal 6–66. No unfavorable comments were received on the proposal to amend § 27.143. Accordingly, the proposal is adopted without substantive change.

Proposal 6–67. No unfavorable comments were received on the proposal to revise § 27.175(c). Accordingly, the proposal is adopted without substantive change.

Proposal 6–68. For comments related to the proposal to revise § 27.1043(b), see Proposal 6–23.

In addition, a nonsubstantive editorial change is being made to the lead-in of § 27.1043(a) to reference § 27.1041(b) instead of § 27.104(b).

Proposal 6–69. No unfavorable comments were received on the proposal to revise § 27.1501. Accordingly, the proposal is adopted without substantive change.

Proposals 6–70 and 2–135. Disposition of Proposal 2–135 to amend § 27.1545 (Notice 75–10) was deferred so it could be considered in connection with Proposal 6–70 to amend § 27.1505. No unfavorable comment was received on Proposal 2–135. Accordingly, the proposal is adopted without substantive change.

Proposed §§ 27.1505(c) and 29.1505(c) (Proposals 6–70 and 6–84, respectively) would allow the establishment of a never exceed speed, V_{NE} (power-off), that is less than V_{NE} with power on, if V_{NE} (power-off) is not less than a speed midway between the power-on V_{NE} and the speed for maximum range in autorotation at maximum weight. One commentator recommended that "V_Y or the climb speed selected by the applicant in demonstrating compliance with the climb requirements" be inserted in proposed § 27.1505(c) in place of the speed for maximum range in autorotation. The commentator stated that since determination of the speed for maximum range in autorotation is not presently required, the substitution of the climb speed (which is determined under the climb requirements in §§ 27.65 or 27.67) would accomplish the intent of placing a lower limit on V_{NE} (power-off) without unnecessary additional demonstration requirements.

After further consideration, the FAA believes that the speed used in determining climb performance (one-engine-inoperative climb performance, if applicable) should be used in establishing a V_{NE} (power-off) for both Part 27 and 29 helicopters, instead of the speed for maximum range in autorotation at maximum weight. The speed midway between power-on V_{NE} and the appropriate climb speed is expected to be high enough to provide the pilot with an adequate range of speeds and glide angles during autorotation. In addition, the determination of V_{NE} (power-off) will be based on information already required to be furnished by the applicant which would not be the case if the speed for maximum range in autorotation were prescribed since it is only required to be determined for certain Part 29 Category B helicopters. The proposals to amend §§ 27.1505 and 29.1505 are revised accordingly.

Proposal 6–71. For comments related to the proposal to add a new § 27.1521(f), see Proposal 6–23.

Proposal 6–72. No unfavorable comments were received on the proposal to add a new § 27.1527. Accordingly, the proposal is adopted without substantive change.

[For discussion concerning the amendment of § 27.1545, see Proposals 6–70 and 2–135.]

Proposals 6–73, 2–139 and 2–140. No unfavorable comments were received on Proposal 6–73 to amend § 27.1581. The proposal is adopted without substantive change, except that proposed § 27.1581(a)(2) is revised in accordance with the discussion of the proposal to amend § 25.1581 (Proposal 6–55).

Disposition of Proposals 2–139 to amend § 27.1581 and 2–140 to amend § 27.1587 was deferred so that these proposals could be considered in connection with Proposal 6–73. No unfavorable comments were received on Proposal 2–139 or Proposal 2–140. Proposal 2–139 to amend § 27.1581 is adopted without substantive change. For reasons that are stated in the discussion of Proposal 6–23 for § 23.1521(e), Proposal 2–140 to amend § 27.1587 is revised by adding a new § 27.1587(a)(2)(iii) requiring information on the maximum ambient atmospheric temperature at which compliance with the cooling requirements was shown. Additionally, the parenthetical phrase "(if provided)" is deleted from § 27.1587(b) since the amendment to § 27.1581 requires that a Rotorcraft Flight Manual be furnished for each rotorcraft. The proposal to amend § 27.1587 is adopted with the changes discussed above.

Proposal 6–74. For comments related to the proposal to amend § 27.1583, see Proposal 6–23.

Proposals 6–75 and 2–131. Proposed §§ 27.1585(c) and 29.1585(c) would require the operating procedures section of the Rotorcraft Flight Manual to contain information on the procedures for reducing airspeed to V_{NE} (power-off) for helicopters for which a V_{NE} (power-off) is established under §§ 27.1505(c) and 29.1501(c), respectively. One commentator stated that he did not favor systematically placing explicit engine, altitude, and V_{NE} (power-off) limitations in the "limitations" chapter of the Flight Manual. The commentator apparently misinterpreted the proposal, as it would affect only the operating procedures section, not the limitations section. The commentator also stated that these explanations should only be required when they bring significant information to the pilot and when the limitation results from an indirect and not an obvious cause. The FAA believes that in view of the surprise element that may be associated with engine failure in service operations, the procedure for reducing airspeed to not more than V_{NE} (power-off) should be furnished for each helicopter for which a V_{NE} (power-off) is established. Accordingly, the proposals for §§ 27.1585(c) and 29.1585(c) are adopted without substantive change.

Disposition of Proposal 2–131 to amend § 27.1353 (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–73. For comments related to proposed § 27.1353(f) and for an explanation of the revision to proposed § 27.1353(f), see the discussion of Proposal 2–87 under Proposal 6–57.

Proposal 6–76. For comments related to the proposal to amend § 29.29, see Proposal 6–5.

Proposal 6–77. For comments related to the proposed amendment of § 29.33, see Proposal 6–61 for § 27.33.

Proposal 6–78. For comments related to proposed § 29.45, see Proposal 6–62.

Proposal 6–79. One commentator recommended that proposed § 29.65(c) be revised to require climb data only for those altitudes where V_{NE} is less than V_Y at sea level. For a discussion of this comment and the explanation for the revisions to proposed § 29.65(c), see Proposal 6–63. This commentator also stated that proposed § 29.65(c) is superfluous for Category B rotorcraft since its duplicates the requirement of proposed § 29.65(a)(4). The FAA agrees that some clarification is needed and proposed § 29.65 (a) and (c) are revised to list all of the Category B requirements in paragraph (a) and to make paragraph (c) applicable only to Category A helicopters. For an explanation of the revisions to proposed § 29.65(c)(1), see the discussion of the revision to proposed § 27.65(b)(2)(i) under Proposal 6–63. Accordingly, the proposal is adopted with the revisions discussed above and under Proposal 6–63.

Proposal 6–80. No unfavorable comments were received on the proposal to amend § 29.143. Accordingly, the proposal is adopted without substantive change.

Proposal 6–81. No unfavorable comments were received on the proposal to revise § 29.175(c). Accordingly, the proposal is adopted without substantive change.

Proposal 6–82. For comments related to the proposal to revise § 29.1043(b), see Proposal 6–23.

Proposal 6–83. No unfavorable comments were received on the proposal to revise § 29.1501. Accordingly, the proposal is adopted without substantive change.

Proposals 6–84 and 2–188. For comments related to Proposal 6–84 to amend § 29.1505, and for an explanation of the revisions to proposed § 29.1505(c), see Proposal 6–70.

Disposition of Proposal 2–188 to amend § 29.1545 (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–84 to amend § 29.1505. No unfavorable comments were received on Proposal 2–188. Accordingly, the proposal is adopted without substantive change.

Proposal 6–85. For comments related to the proposal to revise § 29.1521(e), see Proposal 6–23.

Proposal 6–86. No unfavorable comments were received on the proposal to add a new § 29.1527. Accordingly, the proposal is adopted without substantive change.

[For discussion concerning the amendment of § 29.1545, see Proposals 6–84 and 2–188.]

Proposals 6–87 and 2–192. Proposal 6–87 proposed to revise § 29.1581(a) and (b) and to delete § 29.1581(c) and mark it "[Reserved]." Disposition of Proposal 2–192 to add a new § 29.1581(d) (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–87.

No unfavorable comment was received on Proposals 6–87 or 2–192. These proposals to amend § 29.1581 are adopted without substantive change except that proposed § 29.1581(a)(2) is revised in accordance with the discussion of the proposal to amend § 25.1581 (Proposal 6–55).

Proposal 6–88. For comments related to the proposal to amend § 29.1583, see Proposal 6–23.

Proposals 6–89 and 2–186. For comments related to Proposal 6–89 to add a new § 29.1585(c), see Proposal 6–75.

Disposition of Proposal 2–186 to amend § 29.1353 (Notice 75–10) was deferred so that it could be considered in connection with Proposal 6–89. For comments related to proposed § 29.1353(c), see the discussion of Proposal 2–87 under Proposal 6–57.

Proposal 6–90. No unfavorable comments were received on the proposal to amend § 91.31. Accordingly, the proposal to amend § 91.31 is adopted without substantive change.

Proposal 6–91. The proposal to amend § 91.37 was made to implement Proposals 2–49, 2–51, 2–52, and 2–93 to amend §§ 25.105, 25.125, 25.241 and 25.1533, respectively, contained in Airworthiness Review Notice No. 2 (Notice 75–10). Since the proposed amendments to Part 25 have been withdrawn (41 FR 55454), Proposal 6–91 is also withdrawn.

Proposal 6–92. Proposed § 121.141(b) would authorize an air carrier to revise the operating procedures and the format of the performance data for the applicable Airplane or Rotorcraft Flight Manual and include the revised information in the operator's manual required by § 121.133, if the revised procedures and performance data presentation are approved by the Administrator and are clearly identified as flight manual requirements. One commentator said that there was no need for the identification of the flight manual material. This requirement is in the current rule and the FAA does not have sufficient information at the present time to justify deleting it, especially with regard to the operating limitations.

The commentator also suggested that the second sentence of proposed § 121.141 (b) would be clarified by inserting a clause indicating that if the certificate holder elects to carry the manual required by § 121.133, he must retain all of the limitations section (of the flight manual) as written, unless deviations are specifically authorized by the Administrator. The FAA does not believe that the suggested change is necessary or appropriate. Proposed § 121.141(b) would not authorize a change in the substance or presentation of the operating limitations required for the applicable flight manual. Accordingly, the proposal to revise § 121.141(b) is adopted without substantive change.

DRAFTING INFORMATION

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ADOPTION OF THE AMENDMENT

Accordingly, Parts 1, 21, 23, 25, 27, 29, 91, and 121 of the Federal Aviation Regulations are amended as follows, effective March 1, 1978:

PART 1—DEFINITIONS AND ABBREVIATIONS

§ 1.1 [Amended]

1. By amending § 1.1 by deleting the term "Accelerate-stop distance" and its definition.

§ 1.2 [Amended]

2. By amending § 1.2 by revising the definition of V_1 to read as follows:

* * * * *

V_1 means takeoff decision speed (formerly denoted as critical engine failure speed).

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS

3. By adding a new § 21.5 following § 21.3 to read as follows:

§ 21.5 Airplane or Rotorcraft Flight Manual.

(a) With each airplane or rotorcraft that was not type certificated with an Airplane or Rotorcraft Flight Manual and that has had no flight time prior to March 1, 1979, the holder of a Type Certificate (including a Supplemental Type Certificate) or the licensee of a Type Certificate shall make available to the owner at the time of delivery of the aircraft a current approved Airplane or Rotorcraft Flight Manual.

(b) The Airplane or Rotorcraft Flight Manual required by paragraph (a) of this section must contain the following information:

(1) The operating limitations and information required to be furnished in an Airplane or Rotorcraft Flight Manual or in manual material, markings, and placards, by the applicable regulations under which the airplane or rotorcraft was type certificated.

(2) The maximum ambient atmospheric temperature for which engine cooling was demonstrated must be stated in the performance information section of the Flight Manual, if the applicable regulations under which the aircraft was type certificated do not require ambient temperature or engine cooling operating limitations in the Flight Manual.

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

§ 23.25 [Amended]

4. By adding at the end of § 23.25(b)(2) the word "and", by deleting § 23.25(b)(3), and by redesignating § 23.25(b)(4) as § 23.25(b)(3).

5. By amending § 23.29 by deleting paragraphs (a)(4) and (a)(5); by adding the word "and" after (a)(2); and by revising paragraph (a)(3) to read as follows:

§ 23.29 Empty weight and corresponding center of gravity.

(a) * * *

(3) Full operating fluids, including—

(i) Oil;

(ii) Hydraulic fluid; and

(iii) Other fluids required for normal operation of airplane systems, except potable water, lavatory precharge water, and water intended for injection in the engines.

* * * * *

6. By revising § 23.45 to read as follows:

§ 23.45 General.

(a) Unless otherwise prescribed, the performance requirements of this subpart must be met for still air and a standard atmosphere.

(b) The performance must correspond to the propulsive thrust available under the particular ambient atmospheric conditions, the particular flight condition, and the relative humidity specified in paragraphs (d) or (e) of this section, as appropriate.

(c) The available propulsive thrust must correspond to engine power or thrust, not exceeding the approved power or thrust, less—

(1) Installation losses; and

(2) The power or equivalent thrust absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

(d) For reciprocating engine-powered airplanes, the performance, as affected by engine power, must be based on a relative humidity of 80 percent in a standard atmosphere.

(e) For turbine engine-powered airplanes, the performance, as affected by engine power or thrust, must be based on a relative humidity of—

(1) 80 percent, at and below standard temperature; and

(2) 34 percent, at and above standard temperature plus 50 degrees F.

Between these two temperatures, the relative humidity must vary linearly.

7. By revising §§ 23.49 (a)(1) and (c)(1), and by adding a new § 23.49(e) to read as follows:

§ 23.49 Stalling speed.

(a) V_{S_0} is the stalling speed, if obtainable, or the minimum steady speed, in knots (CAS), at which the airplane is controllable, with the—

(1) Applicable power or thrust condition set forth in paragraph (e) of this section;

* * * * *

(c) V_{S_1} is the calibrated stalling speed, if obtainable, or the minimum steady speed, in knots, at which the airplane is controllable with the—

(1) Applicable power or thrust condition set forth in paragraph (e) of this section;

* * * * *

(e) The following power or thrust conditions must be used to meet the requirements of this section:

(1) For reciprocating engine-powered airplanes, engines idling, throttles 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 may not be greater than zero at the stalling speed, or, if the resultant thrust has no appreciable effect on the stalling speed, with engines idling and throttles closed.

8. By revising § 23.51 to read as follows:

§ 23.51 Takeoff.

(a) For each airplane (except a skiplane for which landplane takeoff data has been determined under this paragraph and furnished in the Airplane Flight Manual) the distance required to takeoff and climb over a 50-foot obstacle must be determined with—

(1) The engines operating within approved operating limitations; and

(2) The cowl flaps in the normal takeoff position.

(b) For multiengine airplanes, the lift-off speed, V_{LOF}, may not be less than V_{MC} determined in accordance with § 23.149.

(c) Upon reaching a height of 50 feet above the takeoff surface level, the airplane must have reached a speed of not less than the following:

(1) For multiengine airplanes, the higher of—

(i) 1.1 V_{MC}; or

(ii) 1.3 V_{S_1}, or any lesser speed, not less than Vx plus 4 knots, that is shown to be safe under all conditions, including turbulence and complete engine failure.

(2) For single engine airplanes—

(i) 1.3 V_{S_1}; or

(ii) Any lesser speed, not less than Vx plus 4 knots, that is shown to be safe under all conditions, including turbulence and complete engine failure.

(d) The starting point for measuring seaplane and amphibian takeoff distance may be the point at which a speed of not more than three knots is reached.

(e) Takeoffs made to determine the data required by this section may not require exceptional piloting skill or exceptionally favorable conditions.

9. By revising § 23.65 to read as follows:

§ 23.65 Climb: All engines operating.

(a) Each airplane must have a steady rate of climb at sea level of at least 300 feet per minute and a steady angle of climb of at least 1:12 for landplanes or 1:15 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; and

(4) 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 through 23.1047.

(b) Each airplane with engines for which the takeoff and maximum continuous power ratings are identical and that has fixed-pitch, two-position, or similar propellers, may use a lower propeller pitch setting than that allowed by § 23.33 to obtain rated engine r.p.m. at V_X, if—

(1) The airplane shows marginal performance (such as when it can meet the rate of climb requirements of paragraph (a) of this section but has difficulty in meeting the angle of climb requirements of paragraph (a) of this section or of § 23.77); and

(2) Acceptable engine cooling is shown at the lower speed associated with the best angle of climb.

(c) Each turbine engine-powered airplane must be able to maintain a steady gradient of climb of at least 4 percent at a pressure altitude of 5,000 feet and a temperature of 81 degrees F (standard temperature plus 40 degree F) with the airplane in the configuration prescribed in paragraph (a) of this section.

10. By amending § 23.67 as follows:

1. By inserting the words "reciprocating engine-powered" after the first word "Each" in the lead-in sentence of § 23.67(a).

2. By inserting the words "reciprocating engine-powered" after the first word "For" in the lead-in sentence of § 23.67(b).

3. By adding new §§ 23.67 (c) and (d) to read as follows:

§ 23.67 Climb: One engine inoperative.

* * * * *

(c) For turbine-powered multiengine airplanes the following apply:

(1) The steady gradient of climb must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant, with the—

(i) Critical engine inoperative, and its propeller in the minimum drag position;

(ii) Remaining engines at not more than maximum continuous power or thrust;

(iii) Landing gear retracted;

(iv) Wing flaps in the most favorable position; and

(v) The means for controlling the engine cooling air supply in the position used in the engine cooling tests required by §§ 23.1041 through 23.1047.

(2) Each airplane must be able to maintain the following climb gradients with the airplane in the configuration prescribed in paragraph (c)(1) of this section:

(i) 1.2 percent (or, if greater, a gradient equivalent to a rate of climb of 0.027 Vs_0^2) at a pressure altitude of 5,000 feet and standard temperature (41 degrees F).

(ii) 0.6 percent (or, if greater, a gradient equivalent to a rate of climb of 0.014 Vs_0^2) at a pressure altitude of 5,000 feet and 81 degrees F (standard temperature plus 40 degrees F).

(3) The minimum climb gradient specified in paragraphs (c)(2) (i) and (ii) of this section must vary linearly between 41 degrees F and 81 degrees F and must change at the same rate up to the maximum operating temperature approved for the airplane.

(4) In paragraphs (c)(2) (i) and (ii) of this section, rate of climb is expressed in feet per minute and Vs_0 is expressed in knots.

(d) For all multiengine airplanes, the speed for best rate of climb with one engine inoperative must be determined.

11. By revising § 23.75 to read as follows:

§ 23.75 Landing.

For airplanes (except skiplanes for which landplane landing data have been determined under this section and furnished in the Airplane Flight Manual), the horizontal distance necessary to land and come to a complete stop (or to a speed of approximately 3 knots for water landings of seaplanes and amphibians) from a point 50 feet above the landing surface must be determined as follows:

(a) A steady gliding approach with a calibrated airspeed of at least 1.3 Vs_1 must be maintained down to the 50-foot height.

(b) The landing may not require exceptional piloting skill or exceptionally favorable conditions.

(c) The landing must be made without excessive vertical acceleration or tendency to bounce, nose over, ground loop, porpoise, or water loop.

(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.

(e) The pressures on the wheel braking system may not exceed those specified by the brake manufacturer.

(f) Means other than wheel brakes may be used if that means—

(1) Is safe and reliable;

(2) Is used so that consistent results can be expected in service; and

(3) Is such that exceptional skill is not required to control the airplane.

12. By revising § 23.77 to read as follows:

§ 23.77 Balked landing.

(a) For balked landings, each airplane must be able to maintain a steady angle of climb at sea level of at least 1:30 with—

(1) Takeoff power on each engine;

(2) The landing gear extended; and

(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 or exceptional piloting skill, they may be retracted.

(b) Each turbine engine-powered airplane must be able to maintain a steady rate of climb of at least zero at a pressure altitude of 5,000 feet at 81 degrees F (standard temperature plus 40 degrees F), with the airplane in the configuration prescribed in paragraph (a) of this section.

13. By revising § 23.149 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 recover control of the airplane with that engine still inoperative, and maintain straight flight either with zero yaw or, at the option of the applicant, with an angle of bank of not more than five degrees. The method used to simulate critical engine failure must represent the most critical mode of powerplant failure with respect to controllability expected in service.

(b) For reciprocating engine-powered airplanes, V_{MC} may not exceed 1.2 Vs_1 (where Vs_1 is determined at the maximum takeoff weight) with—

(1) Takeoff or maximum available power on the engines;

(2) The most unfavorable center of gravity;

(3) The airplane trimmed for takeoff;

(4) The maximum sea level takeoff weight (or any lesser weight necessary to show V_{MC});

(5) Flaps in the takeoff position;

(6) Landing gear retracted;

(7) Cowl flaps in the normal takeoff position;

(8) The propeller of the inoperative engine—

(i) Windmilling;

(ii) In the most probable position for the specific design of the propeller control; or

(iii) Feathered, if the airplane has an automatic feathering device; and

(9) The airplane airborne and the ground effect negligible.

(c) For turbine engine-powered airplanes, V_{MC} may not exceed 1.2 Vs_1 (where Vs_1 is determined at the maximum takeoff weight) with—

(1) Maximum available takeoff power or thrust on the engines;

(2) The most unfavorable center of gravity;

(3) The airplane trimmed for takeoff;

(4) The maximum sea level takeoff weight (or any lesser weight necessary to show V_{MC});

(5) The airplane in the most critical takeoff configuration, except with the landing gear retracted; and

(6) The airplane airborne and the ground effect negligible.

(d) At V_{MC}, the rudder pedal force required to maintain control may not exceed 150 pounds, and it may not be necessary to reduce power or thrust of the operative engines. During recovery, the airplane may not assume any dangerous attitude and it must be possible to prevent a heading change of more than 20 degrees.

14. By revising § 23.161(c) to read as follows:

§ 23.161 Trim.

* * * * *

(c) *Longitudinal trim.* The airplane must maintain longitudinal trim under each of the following conditions:

(1) A climb with maximum continuous power at a speed between Vx and 1.4 Vs_1, with—

(i) The landing gear and wing flaps retracted; and

(ii) The landing gear retracted and the wing flaps in the takeoff position.

(2) A power approach with a 3 degree angle of descent, the landing gear extended, and with—

(i) The wing flaps retracted and at a speed of 1.4 Vs_1; and

(ii) The applicable airspeed and flap position used in showing compliance with § 23.75.

(3) Level flight at any speed from 0.9 V_H to either Vx or 1.4 Vs_1, with the landing gear and wing flaps retracted.

* * * * *

§ 23.177 [Amended]

15. By deleting §§ 23.177(a)(4) and (b)(3) and revising the heading of the section to read "Static directional and lateral stability."

16. By revising § 23.181 and its heading to read as follows:

§ 23.181 Dynamic stability.

(a) Any short period oscillation not including combined lateral-directional oscillations occurring between the stalling speed and the maximum allowable speed appropriate to the configuration of the airplane must be heavily damped with the primary controls—

(1) Free; and

(2) In a fixed position.

(b) Any combined lateral-directional oscillations ("Dutch roll") occurring between the stalling speed and the maximum allowable speed appropriate to the configuration of the airplane must be damped to 1/10 amplitude in 7 cycles with the primary controls—

(1) Free; and

(2) In a fixed position.

17. By amending § 23.729(f)(1) by revising the last sentence to read as follows:

§ 23.729 Retracting mechanism.

(1) * * * If there is a manual shut-off for the warning device prescribed in this paragraph, the warning system must be designed so that, when the warning has been suspended after one or more

throttles are closed, subsequent retardation of any throttle to or beyond the position for normal landing approach will activate the warning device.

* * * * *

18. By amending §§ 23.1043(a)(1) and (d) by deleting the words "maximum anticipated air temperature" and inserting in their place the words "maximum ambient atmospheric temperature" and by revising § 23.1043(b) to read as follows:

§ 23.1043 Cooling tests.

* * * * *

(b) *Maximum ambient atmospheric temperature.* A maximum ambient atmospheric temperature corresponding to sea level conditions of at least 100 degrees F must be established. The assumed temperature lapse rate is 3.6 degrees F per thousand feet of altitude above sea level until a temperature of −69.7 degrees F is reached, above which altitude the temperature is considered constant at −69.7 degrees F. However, for winterization installations, the applicant may select a maximum ambient atmospheric temperature corresponding to sea level conditions of less than 100 degrees F.

* * * * *

§ 23.1047 [Amended]

19. By amending § 23.1047 by striking the reference to "§ 23.65(a)(1)" in § 23.1047(b)(1) and by inserting "§ 23.65" in its place.

20. By adding a new § 23.1353(g) to read as follows:

§ 23.1353 Storage battery design and installation.

* * * * *

(g) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have—

(1) A system to control the charging rate of the battery automatically so as to prevent battery overheating;

(2) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or

(3) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

21. By revising § 23.1501 to read as follows:

§ 23.1501 General.

(a) Each operating limitation specified in §§ 23.1505 through 23.1527 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crewmembers as prescribed in §§ 23.1541 through 23.1589.

22. By adding a new § 23.1521(e) to read as follows:

§ 23.1521 Powerplant limitations.

* * * * *

(e) *Ambient temperature.* For turbine engines, 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.

23. By revising § 23.1523 to read as follows:

§ 23.1523 Minimum flight crew.

The minimum flight crew must be established so that it is sufficient for safe operation considering—

(a) The workload on individual crewmembers;

(b) The accessibility and ease of operation of necessary controls by the appropriate crewmember; and

(c) The kinds of operation authorized under § 23.1525.

24. By deleting § 23.1541(d) and by revising § 23.1541(c) to read as follows:

§ 23.1541 General.

* * * * *

(c) For airplanes which are to be certificated in more than one category—

(1) The applicant must select one category upon which the placards and markings are to be based; and

(2) The placards and marking information for all categories in which the airplane is to be certificated must be furnished in the Airplane Flight Manual.

25. By striking the word "and" from § 23.1555(c)(2), redesignating § 23.1555(c)(3) as (c)(4), and by adding a new (c)(3), and amending § 23.1555(d) to read as follows:

§ 23.1555 Control markings.

* * * * *

(c) * * *

(3) The conditions under which the full amount of usable fuel in any restricted usage fuel tank can safely be used must be stated on a placard adjacent to the selector valve for that tank; and

* * * * *

(d) Usable fuel capacity must be marked as follows:

(1) For fuel systems having no selector controls, the usable fuel capacity of the system must be indicated at the fuel quantity indicator.

(2) For fuel systems having selector controls, the usable fuel capacity available at each selector control position must be indicated near the selector control.

* * * * *

26. By deleting § 23.1559(a)(3), by striking the words "of more than 6,000 pounds maximum weight" from the first sentence of § 23.1559(a)(2), and by revising § 23.1559(a)(1) to read as follows:

§ 23.1559 Operations limitations placard.

(a) * * *

(1) For airplanes certificated in one category: The markings and placards installed in this airplane contain operating limitations which must be complied with when operating this airplane in the _____ category. (Insert category.) Other operating limitations which must be complied with when operating this airplane in this category are contained in the Airplane Flight Manual.

* * * * *

27. By revising § 23.1567(b) to read as follows:

§ 23.1567 Flight maneuver placard.

* * * * *

(b) For utility category airplanes, there must be—

(1) A placard in clear view of the pilot stating: "Acrobatic maneuvers are limited to the following _____" (list approved maneuvers and the recommended entry speed for each); and

(2) For those airplanes that do not meet the spin requirements for acrobatic category airplanes, an additional placard in clear view of the pilot stating: "Spins Prohibited."

* * * * *

28. By deleting § 23.1581(c) and marking it "[Reserved]", by revising §§ 23.1581 (a) and (b), and by adding a new § 23.1581(d) to read as follows:

§ 23.1581 General.

(a) *Furnishing information.* An Airplane Flight Manual must be furnished with each airplane, and it must contain the following:

(1) Information required by §§ 23.1583 through 23.1589.

(2) Other information that is necessary for safe operation because of design, operating, or handling characteristics.

(b) *Approved information.* (1) Except as provided in paragraph (b)(2) of this section, each part of the Airplane Flight Manual containing information prescribed in §§ 23.1583 through 23.1589 must be approved, segregated, identified and clearly distinguished from each unapproved part of that Airplane Flight Manual.

(2) The requirements of paragraph (b)(1) of this section do not apply if the following is met:

(i) Each part of the Airplane Flight Manual containing information prescribed in § 23.1583 must be limited to such information, and must be approved, identified, and clearly distinguished from each other part of the Airplane Flight Manual.

(ii) The information prescribed in §§ 23.1585 through 23.1589 must be determined in accordance with the applicable requirements of this part and presented in its entirety in a manner acceptable to the Administrator.

(3) Each page of the Airplane Flight Manual containing information pre-

scribed in this section must be of a type that is not easily erased, disfigured, or misplaced, and is capable of being inserted in a manual provided by the applicant, or in a folder, or in any other permanent binder.

(c) [Reserved]

(d) *Table of contents.* Each Airplane Flight Manual must include a table of contents if the complexity of the manual indicates a need for it.

29. By deleting § 23.1583(j) and marking it "[Reserved]", and by revising § 23.1583(b) to read as follows:

§ 23.1583 Operating limitations.

* * * * *

(b) *Powerplant limitations.* The following information must be furnished:

(1) Limitations required by § 23.1521.

(2) Explanation of the limitations, when appropriate.

(3) Information necessary for marking the instruments required by §§ 23.1549 through 23.1553.

* * * * *

30. By deleting § 23.1585(b) and marking it "[Reserved]", and by revising § 23.1585(a) and adding new §§ 23.1585 (c)(4) and (e) to read as follows:

§ 23.1585 Operating procedures.

(a) For each airplane, information concerning normal and emergency procedures and other pertinent information necessary to safe operation must be furnished, including—

(1) The demonstrated crosswind velocity and procedures and information pertinent to operation of the airplane in crosswinds; and

(2) The airspeeds, procedures, and information pertinent to the use of the following airspeeds:

(i) The recommended climb speed and any variation with altitude.

(ii) V_x and any variation with altitude.

(iii) The approach speeds, including speeds for transition to the balked landing condition.

(b) [Reserved]

(c) * * *

(4) Procedures for takeoff determined in accordance with § 23.51.

* * * * *

(e) 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.

31. By revising § 23.1587 to read as follows:

§ 23.1587 Performance information.

(a) *General.* For each airplane, the following information must be furnished:

(1) Any loss of altitude more than 100 feet, or any pitch more than 30 degrees below flight level, occurring during the recovery part of the maneuver prescribed in § 23.201(b).

(2) The conditions under which the full amount of usable fuel in each tank can safely be used.

(3) The stalling speed, V_{S_0}, at maximum weight.

(4) The stalling speed, V_{S_1}, at maximum weight and with landing gear and wing flaps retracted, and the effect upon this stalling speed of angles of bank up to 60 degrees.

(5) The takeoff distance determined under § 23.51, the airspeed at the 50-foot height, the airplane configuration (if pertinent), the kind of surface in the tests, and the pertinent information with respect to cowl flap position, use of flight path control devices, and use of the landing gear retraction system.

(6) The landing distance determined under § 23.75, the airplane configuration (if pertinent), the kind of surface used in the tests, and the pertinent information with respect to flap position and the use of flight path control devices.

(7) The steady rate or gradient of climb determined under §§ 23.65 and 23.77, the airspeed, power, and the airplane configuration.

(8) The calculated approximate effect on takeoff distance (paragraph (a)(5) of this section), landing distance (paragraph (a)(6) of this section), and steady rates of climb (paragraph (a)(7) of this section), of variations in—

(i) Altitude from sea level to 8,000 feet; and

(ii) Temperature at these altitudes from 60 degrees F below standard to 40 degrees F above standard.

(9) For reciprocating engine-powered airplanes, the maximum atmospheric temperature at which compliance with the cooling provisions of §§ 23.1041 through 23.1047 is shown.

(b) *Skiplanes.* For skiplanes, a statement of the approximate reduction in climb performance may be used instead of complete new data for skiplane configuration, if—

(1) The landing gear is fixed in both landplane and skiplane configurations;

(2) The climb requirements are not critical; and

(3) The climb reduction in the skiplane configurations is small (30 to 50 feet per minute).

(c) *Multiengine airplanes.* For multiengine airplanes, the following information must be furnished:

(1) The loss of altitude during the one-engine-inoperative stall shown under § 23.205 (as measured from the altitude at which the airplane starts to pitch uncontrollably to the altitude at which level flight is regained) and the pitch angle during that maneuver.

(2) The best rate of climb speed or the minimum rate of descent speed with one engine inoperative.

(3) The speed used in showing compliance with the cooling and climb requirements of § 23.1047(d)(5), if this speed is greater than the best rate of climb speed with one engine inoperative.

(4) The steady rate or gradient of climb determined under § 23.67 and the airspeed, power, and airplane configuration.

(5) The calculated approximate effect on the climb performance determined under § 23.67 of variations in—

(i) Altitude from sea level to 8,000 feet in a standard atmosphere and cruise configuration; and

(ii) Temperature, at those altitudes, from 60 degrees F below standard to 40 degrees F above standard.

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

32. By deleting "—measured at a height of six feet above the runway." in the last phrase of § 25.21(d) and by adding a period in its place, and by adding a new § 25.21(f) to read as follows:

§ 25.21 Proof of compliance.

* * * * *

(f) In meeting the requirements of §§ 25.105(d), 25.125, 25.233, and 25.237, the wind velocity must be measured at a height of 10 meters above the surface, or corrected for the difference between the height at which the wind velocity is measured and the 10-meter height.

33. By amending § 25.29 by adding the word "and" at the end of paragraph (a)(2); by deleting paragraph (a)(4); and by revising paragraph (a)(3) to read as follows:

§ 25.29 Empty weight and corresponding center of gravity.

(a) * * *

(3) Full operating fluids, including—

(i) Oil;

(ii) Hydraulic fluid; and

(iii) Other fluids required for normal operation of airplane systems, except potable water, lavatory precharge water, and water intended for injection in the engines.

* * * * *

34. By revising § 25.107(a), (d), and (e)(1)(iv) to read as follows:

§ 25.107 Takeoff speeds.

(a) V_1 must be established in relation to V_{EF} as follows:

(1) V_{EF} is the calibrated airspeed at which the critical engine is assumed to fail. V_{EF} must be selected by the applicant, but may not be less than V_{MCG} determined under § 25.149(e).

(2) V_1, in terms of calibrated airspeed, is the takeoff decision speed selected by the applicant; however, V_1 may 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 accelerate-stop tests.

* * * * *

(d) V_{MU} is the calibrated airspeed at and above which the airplane can safely lift off the ground, and continue the takeoff. V_{MU} speeds must be selected by the applicant throughout the range of thrust-to-weight ratios to be certificated. These speeds may be established from free air data if these data are verified by ground takeoff tests.

(e) * * *
(1) * * *
(iv) A speed that, if the airplane is rotated at its maximum practicable rate, will result in a V_{LOF} of not less than 110 percent of V_{MU} in the all-engines-operating condition and not less than 105 percent of V_{MU} determined at the thrust-to-weight ratio corresponding to the one-engine-inoperative condition.

* * * * *

35. By revising § 25.109(a) to read as follows:

§ 25.109 Accelerate-stop distance.

(a) The accelerate-stop distance is the greater of the following distances:
(1) The sum of the distances necessary to—
(i) Accelerate the airplane from a standing start to V_{EF} with all engines operating;
(ii) Accelerate the airplane from V_{EF} to V_1 and continue the acceleration for 2.0 seconds after V_1 is reached, assuming the critical engine fails at V_{EF}; and
(iii) Come to a full stop from the point reached at the end of the acceleration period prescribed in paragraph (a)(1)(ii) of this section, assuming that the pilot does not apply any means of retarding the airplane until that point is reached and that the critical engine is still inoperative.
(2) The sum of the distances necessary to—
(i) Accelerate the airplane from a standing start to V_1 and continue the acceleration for 2.0 seconds after V_1 is reached with all engines operating; and
(ii) Come to a full stop from the point reached at the end of the acceleration period prescribed in paragraph (a)(2)(i) of this section, assuming that the pilot does not apply any means of retarding the airplane until that point is reached and that all engines are still operating.

* * * * *

§ 25.111 [Amended]

36. By amending §§ 25.111(a)(2) and (a)(3) by deleting the symbol "V_1" and substituting in both places the symbol "V_{EF}".

37. By amending § 25.143 by deleting the value "180" under the column heading "Yaw" in the table of § 25.143(c) and inserting the value "150" in its place, and by revising § 25.143(b) to read as follows:

§ 25.143 General.

* * * * *

(b) It must be possible to make a smooth transition from one flight condition to any other flight condition without exceptional piloting skill, alertness, or strength, and without danger of exceeding the airplane limit-load factor under any probable operating conditions, including—
(1) The sudden failure of the critical engine;
(2) For airplanes with three or more engines, the sudden failure of the second critical engine when the airplane is in the en route, approach, or landing configuration and is trimmed with the critical engine inoperative; and
(3) Configuration changes, including deployment or retraction of deceleration devices.

* * * * *

§ 25.147 [Amended]

38. By amending § 25.147 by deleting the number "180" in paragraph (a) and inserting in its place the number "150".

39. By amending § 25.149 by—
1. Deleting paragraph (b) and redesignating paragraph (a) as paragraph (b);
2. Deleting the number "180" in paragraph (d) and inserting in its place the number "150"; and
3. By deleting the word "and" after (c)(5); by deleting the period at the end of (c)(6) and inserting in its place a semicolon and the word "and"; and by revising the paragraph (c) lead-in and adding new paragraphs (a), (c)(7), (e), (f), (g), and (h) to read as follows:

§ 25.149 Minimum control speed.

(a) In establishing the minimum control speeds required by this section, the method used to simulate critical engine failure must represent the most critical mode of powerplant failure with respect to controllability expected in service.

* * * * *

(c) V_{MC} may not exceed 1.2 Vs with—

* * * * *

(7) If applicable, the propeller of the inoperative engine—
(i) Windmilling;
(ii) In the most probable position for the specific design of the propeller control; or
(iii) Feathered, if the airplane has an automatic feathering device acceptable for showing compliance with the climb requirements of § 25.121.

* * * * *

(e) V_{MC_G}, the minimum control speed on the ground, is the calibrated airspeed during the takeoff run, at which, when the critical engine is suddenly made inoperative, it is possible to recover control of the airplane with the use of primary aerodynamic controls alone (without the use of nose-wheel steering) to enable the takeoff to be safely continued using normal piloting skill and rudder control forces not exceeding 150 pounds. In the determination of V_{MC_G}, 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_{MC_G} 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 or thrust 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.
(f) V_{MC_L}, the minimum control speed during landing approach with all engines operating, is the calibrated airspeed at which, when the critical engine is suddenly made inoperative, it is possible to recover control of the airplane with that engine still inoperative, and maintain straight flight either with zero yaw or, at the option of the applicant, with an angle of bank of not more than 5 degrees. V_{MC_L} must be established with—
(1) The airplane in the most critical configuration for approach with all engines operating;
(2) The most unfavorable center of gravity;
(3) The airplane trimmed for approach with all engines operating;
(4) The maximum sea level landing weight (or any lesser weight necessary to show V_{MC_L}); and
(5) Maximum available takeoff power or thrust on the operating engines.
(g) For airplanes with three or more engines, $V_{MC_{L-2}}$, the minimum control speed during landing approach with one critical engine inoperative, is the calibrated airspeed at which, when a second critical engine is suddenly made inoperative, it is possible to recover control of the airplane with both engines still inoperative and maintain straight flight either with zero yaw or, at the option of the applicant, with an angle of bank of not more than 5 degrees. $V_{MC_{L-2}}$, must be established with—
(1) The airplane in the most critical configuration for approach with the critical engine inoperative;
(2) The most unfavorable center of gravity;
(3) The airplane trimmed for approach with the critical engine inoperative;
(4) The maximum sea level landing weight (or any lesser weight necessary to show $V_{MC_{L-2}}$);
(5) The power or thrust on the operating engines required to maintain an approach path angle of 3 degrees when one critical engine is inoperative; and
(6) The power or thrust on the operating engines rapidly changed, immediately after the second critical engine is made inoperative, from the power or thrust prescribed in paragraph (g)(5) of this section to—
(i) Minimum available power or thrust; and
(ii) Maximum available takeoff power or thrust.
(h) The rudder control forces required to maintain control at V_{MC_L} and $V_{MC_{L-2}}$ may not exceed 150 pounds, nor may it be necessary to reduce the power or thrust of the operating engines. In addition, the airplane may not assume any dangerous attitudes or require exceptional piloting skill, alertness, or

strength to prevent a divergence in the approach flight path that would jeopardize continued safe approach when—

(1) The critical engine is suddenly made inoperative; and

(2) For the determination of V_{MCL-2}, the power or thrust on the operating engines is changed in accordance with paragraph (g)(6) of this section.

40. By revising § 25.177(b) to read as follows:

§ 25.177 Static directional and lateral stability.

* * * * *

(b) The static lateral stability (as shown by the tendency to raise the low wing in a sideslip with the aileron controls free and for any landing gear and flap position and symmetrical power condition) may not be negative at any airspeed (except speeds higher than V_{FE} or V_{LE}, when appropriate) in the following airspeed ranges:

(1) From 1.2 V_{S_1} to V_{MO}/M_{MO}.

(2) From V_{MO}/M_{MO} to V_{FC}/M_{FC} unless the Administrator finds that the divergence is—

(i) Gradual;

(ii) Easily recognizable by the pilot; and

(iii) Easily controllable by the pilot.

* * * * *

41. By revising § 25.181 and its heading to read as follows:

§ 25.181 Dynamic stability.

(a) Any short period oscillation, not including combined lateral-directional oscillations, occurring between stalling speed and maximum allowable speed appropriate to the configuration of the airplane must be heavily damped with the primary controls—

(1) Free; and

(2) In a fixed position.

(b) Any combined lateral-directional oscillations ("Dutch roll") occurring between stalling speed and maximum allowable speed appropriate to the configuration of the airplane must be positively damped with controls free, and must be controllable with normal use of the primary controls without requiring exceptional pilot skill.

42. By deleting § 25.201(c)(2), redesignating § 25.201 (c)(3) as (c)(2), and by adding a new § 25.201(d) to read as follows:

§ 25.201 Stall demonstration.

* * * * *

(d) Occurrence of stall is defined as follows:

(1) The airplane may be considered stalled when, at an angle of attack measurably greater than that for maximum lift, the inherent flight characteristics give a clear and distinctive indication to the pilot that the airplane is stalled. Typical indications of a stall, occurring either individually or in combination, are—

(i) A nose-down pitch that cannot be readily arrested;

(ii) A roll that cannot be readily arrested; or

(iii) If clear enough, a loss of control effectiveness, an abrupt change in control force or motion, or a distinctive shaking of the pilot's controls.

(2) For any configuration in which the airplane demonstrates an unmistakable inherent aerodynamic warning of a magnitude and severity that is a strong and effective deterrent to further speed reduction, the airplane may be considered stalled when it reaches the speed at which the effective deterrent is clearly manifested.

43. By deleting the term "§ 25.201(c)(2)" in § 25.207(c) and inserting in its place the term "§ 25.201(d)", and by adding a sentence at the end of § 25.207 (b) to read as follows:

§ 25.207 Stall warning.

* * * * *

(b) * * * If a warning device is used, it must provide a warning in each of the airplane configurations prescribed in paragraph (a) of this section at the speed prescribed in paragraph (c) of this section.

* * * * *

§ 25.233 [Amended]

44. By amending § 25.233(a) by deleting "0.2 V_{S_0}" and substituting "20 knots or 0.2 V_{S_0}, whichever is greater, except that the wind velocity need not exceed 25 knots."

45. By revising § 25.237 to read as follows:

§ 25.237 Wind velocities.

(a) For landplanes and amphibians, a 90-degree cross component of wind velocity, demonstrated to be safe for takeoff and landing, must be established for dry runways and must be at least 20 knots or 0.2 V_{S_0}, whichever is greater, except that it need not exceed 25 knots.

(b) For seaplanes and amphibians, the following applies:

(1) A 90-degree cross component of wind velocity, up to which takeoff and landing is safe under all water conditions that may reasonably be expected in normal operation, must be established and must be at least 20 knots or 0.2 V_{S_0}, whichever is greater, except that it need not exceed 25 knots.

(2) A wind velocity, for which taxiing is safe in any direction under all water conditions that may reasonably be expected in normal operation, must be established and must be at least 20 knots or 0.2 V_{S_0}, whichever is greater, except that it need not exceed 25 knots.

46. By adding a new § 25.255 following § 25.253 to read as follows:

§ 25.255 Out-of-trim characteristics.

(a) From an initial condition with the airplane trimmed at cruise speeds up to V_{MO}/M_{MO}, the airplane must have satisfactory maneuvering stability and controllability with the degree of out-of-trim in both the airplane nose-up and nose-down directions, which results from the greater of—

(1) A three-second movement of the longitudinal trim system at its normal rate for the particular flight condition with no aerodynamic load (or an equivalent degree of trim for airplanes that do not have a power-operated trim system), except as limited by stops in the trim system, including those required by § 25.655(b) for adjustable stabilizers; or

(2) The maximum mistrim that can be sustained by the autopilot while maintaining level flight in the high speed cruising condition.

(b) In the out-of-trim condition specified in paragraph (a) of this section, when the normal acceleration is varied from +1 g to the positive and negative values specified in paragraph (c) of this section—

(1) The stick force vs. g curve must have a positive slope at any speed up to and including V_{FC}/M_{FC}; and

(2) At speeds between V_{FC}/M_{FC} and V_{DF}/M_{DF} the direction of the primary longitudinal control force may not reverse.

(c) Except as provided in paragraphs (d) and (e) of this section, compliance with the provisions of paragraph (a) of this section must be demonstrated in flight over the acceleration range—

(1) −1 g to +2.5 g; or

(2) 0 g to 2.0 g, and extrapolating by an acceptable method to −1 g and +2.5 g.

(d) If the procedure set forth in paragraph (c)(2) of this section is used to demonstrate compliance and marginal conditions exist during flight test with regard to reversal of primary longitudinal control force, flight tests must be accomplished from the normal acceleration at which a marginal condition is found to exist to the applicable limit specified in paragraph (b)(1) of this section.

(e) During flight tests required by paragraph (a) of this section, the limit maneuvering load factors prescribed in §§ 25.333(b) and 25.337, and the maneuvering load factors associated with probable inadvertent excursions beyond the boundaries of the buffet onset envelopes determined under § 25.251(e), need not be exceeded. In addition, the entry speeds for flight test demonstrations at normal acceleration values less than 1 g must be limited to the extent necessary to accomplish a recovery without exceeding V_{DF}/M_{DF}.

(f) In the out-of-trim condition specified in paragraph (a) of this section, it must be possible from an overspeed condition at V_{DF}/M_{DF} to produce at least 1.5 g for recovery by applying not more than 125 pounds of longitudinal control force using either the primary longitudinal control alone or the primary longitudinal control and the longitudinal trim system. If the longitudinal trim is used to assist in producing the required load factor, it must be shown at V_{DF}/M_{DF} that the longitudinal trim can be actuated in the airplane nose-up direction with the primary surface loaded to correspond to the least of the following airplane nose-up control forces:

(1) The maximum control forces expected in service as specified in §§ 25.301 and 25.397.

(2) The control force required to produce 1.5 g.

(3) The control force corresponding to buffeting or other phenomena of such intensity that it is a strong deterrent to further application of primary longitudinal control force.

47. By adding a new § 25.703 following § 25.701 to read as follows:

§ 25.703 Takeoff warning system.

A takeoff warning system must be installed and must meet the following requirements:

(a) The system must provide to the pilots an aural warning that is automatically activated during the initial portion of the takeoff roll if the airplane is in a configuration, including any of the following, that would not allow a safe takeoff:

(1) The wing flaps or leading edge devices are not within the approved range of takeoff positions.

(2) Wing spoilers (except lateral control spoilers meeting the requirements of § 25.671), speed brakes, or longitudinal trim devices are in a position that would not allow a safe takeoff.

(b) The warning required by paragraph (a) of this section must continue until—

(1) The configuration is changed to allow a safe takeoff;

(2) Action is taken by the pilot to terminate the takeoff roll;

(3) The airplane is rotated for takeoff; or

(4) The warning is manually deactivated by the pilot.

(c) The means used to activate the system must function properly throughout the ranges of takeoff weights, altitudes, and temperatures for which certification is requested.

48. By revising § 25.729(e)(3) to read as follows:

§ 25.729 Retracting mechanism.

* * * * *

(e) * * *

(3) If there is a manual shutoff for the aural warning device prescribed in paragraph (e)(2) of this section, the warning system must be designed so that, when the warning has been suspended after one or more throttles are closed, subsequent retardation of any throttle to or beyond the position for a normal landing approach will activate the aural warning.

* * * * *

49. By revising § 25.1043(b) to read as follows:

§ 25.1043 Cooling tests.

* * * * *

(b) *Maximum ambient atmospheric temperature.* A maximum ambient atmospheric temperature corresponding to sea level conditions of at least 100 degrees F must be established. The assumed temperature lapse rate is 3.6 degrees F per thousand feet of altitude above sea level until a temperature of −69.7 degrees F is reached, above which altitude the temperature is considered constant at −69.7 degrees F. However, for winterization installations, the applicant may select a maximum ambient atmospheric temperature corresponding to sea level conditions of less than 100 degrees F.

* * * * *

50. By adding a new § 25.1353(c)(6) to read as follows:

§ 25.1353 Electrical equipment and installations.

* * * * *

(c) * * *

(6) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have—

(i) A system to control the charging rate of the battery automatically so as to prevent battery overheating;

(ii) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or

(iii) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

51. By revising § 25.1501 to read as follows:

§ 25.1501 General.

(a) Each operating limitation specified in §§ 25.1503 through 25.1533 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crewmembers as prescribed in §§ 25.1541 through 25.1587.

52. By revising § 25.1521(e) to read as follows:

§ 25.1521 Powerplant limitations.

* * * * *

(e) *Ambient temperature.* 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 §§ 25.1041 through 25.1045 is shown.

53. By deleting § 25.1581(c) and marking it "[Reserved]"; and by revising § 25.1581 (a) and (b) and adding a new § 25.1581(d) to read as follows:

§ 25.1581 General.

(a) *Furnishing information.* An Airplane Flight Manual must be furnished with each airplane, and it must contain the following:

(1) Information required by §§ 25.1583 through 25.1587.

(2) Other information that is necessary for safe operation because of design, operating, or handling characteristics.

(b) *Approved information.* Each part of the manual listed in §§ 25.1583 through 25.1587, that is appropriate to the airplane, must be furnished, verified, and approved, and must be segregated, identified, and clearly distinguished from each unapproved part of that manual.

(c) [Reserved]

(d) Each Airplane Flight Manual must include a table of contents if the complexity of the manual indicates a need for it.

54. By revising § 25.1583 (b) and (c) and by adding a new § 25.1583(i) to read as follows:

§ 25.1583 Operating limitations.

* * * * *

(b) *Powerplant limitations.* The following information must be furnished:

(1) Limitations required by § 25.1521.

(2) Explanation of the limitations, when appropriate.

(3) Information necessary for marking the instruments required by §§ 25.1549 through 25.1553.

(c) *Weight and loading distribution.* The weight and center of gravity limits required by §§ 25.25 and 25.27 must be furnished in the Airplane Flight Manual. All of the following information must be presented either in the Airplane Flight Manual or in a separate weight and balance control and loading document which is incorporated by reference in the Airplane Flight Manual:

(1) The condition of the airplane and the items included in the empty weight as defined in accordance with § 25.29.

(2) Loading instructions necessary to ensure loading of the airplane within the weight and center of gravity limits, and to maintain the loading within these limits in flight.

(3) If certification for more than one center of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate center of gravity range.

* * * * *

(i) *Maneuvering flight load factors.* The positive maneuvering limit load factors for which the structure is proven, described in terms of accelerations, and a statement that these accelerations limit the angle of bank in turns and limit the severity of pull-up maneuvers, must be furnished.

55. By deleting the word "and" from the end of §§ 25.1585(a)(6) and (a)(9); by adding a semicolon and the word "and" at the end of §§ 25.1585(a)(9); and by revising §§ 25.1595(a)(7) and (c) and adding a new § 25.1585(a)(10) to read as follows.

§ 25.1585 Operating procedures.

(a) * * *

(7) Use of fuel jettisoning equipment, including any operating precautions relevant to the use of the system;

* * * * *

(10) Disconecting the battery from its charging source, if compliance is shown with § 25.1353(c)(6)(ii) or (c)(6)(iii).

* * * * *

(c) The buffet onset envelopes determined under § 25.251 must be furnished. The buffet onset envelopes presented may reflect the center of gravity at which the airplane is normally loaded

during cruise if corrections for the effect of different center of gravity locations are furnished.

56. By revising § 25.1587 to read as follows:

§ 25.1587 Performance information.

(a) Each Airplane Flight Manual must contain information to permit conversion of the indicated temperature to free air temperature if other than a free air temperature indicator is used to comply with the requirements of § 25.1303(a)(1).

(b) Each Airplane Flight Manual must contain the performance information computed under the applicable provisions of this Part (including §§ 25.115, 25.123, and 25.125 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the airplane, and must contain the following:

(1) The conditions under which the performance information was obtained, including the speeds associated with the performance information.

(2) Vs determined in accordance with § 25.103.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) Procedures established under §§ 25.101 (f), (g), and (h) that are related to the limitations and information required by § 25.1533 and by this paragraph. These procedures must be in the form of guidance material, including any relevant limitations or information.

(5) An explanation of significant or unusual flight or ground handling characteristics of the airplane.

PART 27—AIRWORTHINESS STANDARDS: NORMAL CATEGORY ROTORCRAFT

§ 27.25 [Amended]

57. By deleting § 27.25(b)(1)(iii) and adding the word "and" at the end of § 27.25(b)(1)(i).

58. By amending § 27.29 by adding the word "and" at the end of paragraph (a)(2); by deleting paragraphs (a)(4) and (a)(5) and by revising paragraph (a)(3) to read as follows:

§ 27.29 Empty weight and corresponding center of gravity.

(a) * * *

(3) Full operating fluids, including—

(i) Oil;

(ii) Hydraulic fluid; and

(iii) Other fluids required for normal operation of rotorcraft systems, except water intended for injection in the engines.

* * * * *

59. By revising the lead in of § 27.33 (b) and by adding a new § 27.33(e) to read as follows:

§ 27.33 Main rotor speed and pitch limits.

* * * * *

(b) *Normal main rotor high pitch limits (power-on).* For rotorcraft, except helicopters required to have a main rotor low speed warning under paragraph (e) of this section, it must be shown with power on and without exceeding approved engine maximum limitations, that main rotor speeds substantially less than the minimum approved main rotor speed will not occur under any sustained flight condition. This must be met by— * * *

* * * * *

(e) *Main rotor low speed warning for helicopters.* For each single engine helicopter, and each multiengine helicopter that does not have an approved device that automatically increases power on the operating engines when one engine fails, there must be a main rotor low speed warning which meets the following requirements:

(1) The warning must be furnished to the pilot in all flight conditions, including power-on and power-off flight, when the speed of a main rotor approaches a value that can jeopardize safe flight.

(2) The warning may be furnished either through the inherent aerodynamic qualities of the helicopter or by a device.

(3) The warning must be clear and distinct under all conditions, and must be clearly distinguishable from all other warnings. A visual device that requires the attention of the crew within the cockpit is not acceptable by itself.

(4) If a warning device is used, the device must automatically deactivate and reset when the low-speed condition is corrected. If the device has an audible warning, it must also be equipped with a means for the pilot to manually silence the audible warning before the low-speed condition is corrected.

60. By revising § 27.45 including the heading to read as follows:

§ 27.45 General.

(a) Unless otherwise prescribed, the performance requirements of this subpart must be met for still air and a standard atmosphere.

(b) The performance must correspond to the engine power available under the particular ambient atmospheric conditions, the particular flight condition, and the relative humidity specified in paragraphs (d) or (e) of this section, as appropriate.

(c) The available power 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.

(d) For reciprocating engine-powered rotorcraft, the performance, as affected by engine power, must be based on a relative humidity of 80 percent in a standard atmosphere.

(e) For turbine engine-powered rotorcraft, the performance, as affected by engine power, must be based on a relative humidity of—

(1) 80 percent, at and below standard temperature; and

(2) 34 percent, at and above standard temperature plus 50 degrees F. Between these two temperatures, the relative humidity must vary linearly.

61. By changing the heading of § 27.65 and by revising §§ 27.65 (a)(2) and (b) to read as follows:

§ 27.65 Climb; All engines operating.

(a) * * *

(2) The climb gradient, at the rate of climb determined in accordance with paragraph (a)(1) of this section, must be either—

(i) At least 1:10 if the horizontal distance required to take off and climb over a 50-foot obstacle is determined for each weight, altitude, and temperature within the range for which certification is requested; or

(ii) At least 1:6 under standard sea level conditions.

(b) Each helicopter must meet the following requirements:

(1) V_Y must be determined—

(i) For standard sea level conditions;

(ii) At maximum weight; and

(iii) With maximum continuous power on each engine.

(2) If at any altitude within the range for which certification is requested, V_{NE} is less than V_Y the steady rate of climb must be determined—

(i) At the climb speed selected by the applicant at or below V_{NE};

(ii) Within the range from 2,000 feet below the altitude at which V_{NE} is equal to V_Y up to the maximum altitude for which certification is requested;

(iii) For the weights and temperatures that correspond to the altitude range set forth in paragraph (b)(2)(ii) of this section and for which certification is requested; and

(iv) With maximum continuous power on each engine.

62. By revising § 27.67(c) to read as follows:

§ 27.67 Climb: one engine inoperative.

* * * * *

(c) Maximum continuous power on the other engines and (for helicopters for which certification for the use of 30-minute power is requested) at 30-minute power.

63. By revising § 27.75(a)(2)(ii) to read as follows:

§ 27.75 Landing.

(a) * * *

(2) * * *

(ii) For multiengine rotorcraft, one engine inoperative and with each operating engine within approved operating limitations; and

* * * * *

64. By revising § 27.143(b) and adding a new § 27.143(e) to read as follows:

§ 27.143 Controllability and maneuverability.

* * * * *

(b) The margin of cyclic control must allow satisfactory roll and pitch control at V_{NE} with—

(1) Critical weight;

(2) Critical center of gravity;

(3) Critical rotor r.p.m.; and

(4) Power off (except for helicopters demonstrating compliance with paragraph (e) of this section) and power on.

* * * * *

(e) For helicopters for which a V_{NE} (power-off) is established under § 27.1505 (c), compliance must be demonstrated with the following requirements with critical weight, critical center of gravity, and critical rotor r.p.m.:

(1) The helicopter must be safely slowed to V_{NE} (power-off), without exceptional pilot skill, after the last operating engine is made inoperative at power-on V_{NE}.

(2) At a speed of 1.1 V_{NE} (power-off), the margin of cyclic control must allow satisfactory roll and pitch control with power off.

65. By revising § 27.175(c) to read as follows:

§ 27.175 Demonstration of static longitudinal stability.

* * * * *

(c) *Autorotation.* Static longitudinal stability must be shown in autorotation at airspeeds from 0.5 times the speed for minimum rate of descent to V_{NE}, or to 1.1 V_{NE} (power-off) if V_{NE} (power-off) is established under § 27.1505(c), and with—

(1) Critical weight;

(2) Critical center of gravity;

(3) Power off;

(4) The landing gear—

(i) Retracted; and

(ii) Extended; and

(5) The rotorcraft trimmed at appropriate speeds found necessary by the Administrator to demonstrate stability throughout the prescribed speed range.

* * * * * *

66. By amending §§ 27.1043 (a)(1) and (d) by deleting the words "maximum anticipated air temperature" and inserting in their place the words "maximum ambient atmospheric temperature", and by revising the lead-in of § 27.1043(a) and revising § 27.1043(b) to read as follows:

§ 27.1043 Cooling tests.

(a) *General.* For the tests prescribed in § 27.1041(b), the following apply:

* * * * *

(b) *Maximum ambient atmospheric temperature.* A maximum ambient atmospheric temperature corresponding to sea level conditions of at least 100 degrees F must be established. The assumed temperature lapse rate is 3.6 degrees F per thousand feet of altitude above sea level until a temperature of −69.7 degrees F is reached, above which altitude the temperature is considered constant at −69.7 degrees F. However, for winterization installations, the applicant may select a maximum ambient atmospheric temperature corresponding to sea level conditions of less than 100 degrees F.

* * * * *

67. By adding a new § 27.1353(g) to read as follows:

§ 27.1353 Storage battery design and installation.

* * * * *

(g) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have—

(1) A system to control the charging rate of the battery automatically so as to prevent battery overheating;

(2) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or

(3) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

68. By revising § 27.1501 to read as follows:

§ 27.1501 General.

(a) Each operating limitation specified in §§ 27.1503 through 27.1525 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crewmembers as prescribed in §§ 27.1541 through 27.1589.

69. By revising § 27.1505(a) and adding a new § 27.1505(c) to read as follows:

§ 27.1505 Never-exceed speed.

(a) The never-exceed speed, V_{NE}, must be established so that it is—

(1) Not less than 40 knots (CAS); and

(2) Not more than the lesser of—

(i) 0.9 times the maximum forward speeds established under § 27.309; or

(ii) 0.9 times the maximum speed shown under §§ 27.251 and 27.629.

* * * * *

(c) For helicopters, a stabilized power-off V_{NE} denoted as V_{NE} (power-off) may be established at a speed less than V_{NE} established pursuant to paragraph (a) of this section, if the following conditions are met:

(1) V_{NE} (power-off) is not less than a speed midway between the power-on V_{NE} and the speed used in meeting the requirements of—

(i) § 27.65(b) for single engine helicopters; and

(ii) § 27.67 for multiengine helicopters.

(2) V_{NE} (power-off) is—

(i) A constant airspeed;

(ii) A constant amount less than power-on V_{NE}; or

(iii) A constant airspeed for a portion of the altitude range for which certification is requested, and a constant amount less than power-on V_{NE} for the remainder of the altitude range.

70. By adding a new § 27.1521(f) to read as follows:

§ 27.1521 Powerplant limitations.

* * * * *

(f) *Ambient temperature.* For turbine engines, 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 §§ 27.1041 through 27.1045 is shown.

71. By adding a new § 27.1527 to read as follows:

§ 27.1527 Maximum operating altitude.

The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

72. By redesignating §§ 27.1545(b) (2) and (3) as (b) (3) and (4), respectively, by revising § 27.1545(b)(1), and adding a new § 27.1545(b)(2), to read as follows:

§ 27.1545 Airspeed indicator.

* * * * *

(b) * * *

(1) A red radial line—

(i) For rotorcraft other than helicopters, at V_{NE}; and

(ii) For helicopters, at V_{NE} (power-on)

(2) A red, cross-hatched radial line at V_{NE} (power-off) for helicopters, if V_{NE} (power-off) is less than V_{NE} (power-on).

* * * * *

73. By deleting § 27.1581(c) and marking it "[Reserved]"; and by revising §§ 27.1581 (a) and (b) and by adding a new § 27.1581(d) to read as follows:

§ 27.1581 General.

(a) *Furnishing information.* A Rotorcraft Flight Manual must be furnished with each rotorcraft, and it must contain the following:

(1) Information required by §§ 27.1583 through 27.1589.

(2) Other information that is necessary for safe operation because of design, operating, or handling characteristics.

(b) *Approved information.* Each part of the manual listed in §§ 27.1583 through 27.1589, that is appropriate to the rotorcraft, must be furnished, verified, and approved, and must be segregated, identified, and clearly distinguished from each unapproved part of that manual.

(c) [Reserved]

(d) *Table of contents.* Each Rotorcraft Flight Manual must include a table of contents if the complexity of the manual indicates a need for it.

74. By revising § 27.1583(b) and adding a new § 27.1583(g) to read as follows:

§ 27.1583 Operating limitations.

* * * * *

(b) *Powerplant limitations.* The following information must be furnished:

(1) Limitations required by § 27.1521.

(2) Explanation of the limitations, when appropriate.

(3) Information necessary for marking the instruments required by §§ 27.1549 through 27.1553.

* * * * *

(g) *Altitude.* The altitude established under § 27.1527 and an explanation of the limiting factors must be furnished.

75. By adding new §§ 27.1585(c) and (d) to read as follows:

§ 27.1585 Operating procedures.

* * * * *

(c) For helicopters for which a VNE (power-off) is established under § 27.1505(c), information must be furnished to explain the VNE (power-off) and the procedures for reducing airspeed to not more than the VNE (power-off) following failure of all engines.

(d) For each rotorcraft showing compliance with § 27.1353 (g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

76. By striking the parenthetical expression "(if provided)" after "Manual" in the lead-in of § 27.1587(b); by striking the word "and" following the semicolon at the end of § 27.1587(b)(1); by striking the period at the end of § 27.1587 (b)(2)(ii) and inserting in its place a semicolon followed by the word "and"; and by revising § 27.1587(a) and adding a new § 27.1587(b)(3) to read as follows:

§ 27.1587 Performance information.

(a) The rotorcraft must be furnished with the following information, determined in accordance with §§ 27.51 through 27.79 and 27.143(c):

(1) Enough information to determine the limiting height-speed envelope.

(2) Information relative to—

(i) The hovering ceilings and the steady rates of climb and descent, as affected by any pertinent factors such as airspeed, temperature, and altitude;

(ii) The maximum safe wind for operation near the ground; and

(iii) For reciprocating engine-powered rotorcraft, the maximum atmospheric temperature at which compliance with the cooling provisions of §§ 27.1041 through 27.1045 is shown.

(b) * * *

(3) The horizontal takeoff distance determined in accordance with § 27.65(a)(2)(i).

PART 29—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY ROTORCRAFT

77. By amending § 29.29 by adding the word "and" at the end of paragraph (a)(2); by deleting paragraphs (a)(4) and (a)(5); and by revising paragraph (a)(3) to read as follows:

§ 29.29 Empty weight and corresponding center of gravity.

(a) * * *

(3) Full operating fluids, including—

(i) Oil;

(ii) Hydraulic fluid; and

(iii) Other fluids required for normal operation of rotorcraft systems, except water intended for injection in the engines.

* * * * *

78. By revising the lead-in of § 29.33 (b) and by adding a new § 29.33(e) to read as follows:

§ 29.33 Main rotor speed and pitch limits.

* * * * *

(b) *Normal main rotor high pitch limits (power-on).* For rotorcraft, except helicopters required to have a main rotor low speed warning under paragraph (e) of this section, it must be shown with power on and without exceeding approved engine maximum limitations, that main rotor speeds substantially less than the minimum approved main rotor speed will not occur under any sustained flight condition. This must be met by— * * *

* * * * *

(e) *Main rotor low speed warning for helicopters.* For each single engine helicopter, and each multiengine helicopter that does not have an approved device that automatically increases power on the operating engines when one engine fails, there must be a main rotor low speed warning which meets the following requirements:

(1) The warning must be furnished to the pilot in all flight conditions, including power-on and power-off flight, when the speed of a main rotor approaches a value that can jeopardize safe flight.

(2) The warning may be furnished either through the inherent aerodynamic qualities of the helicopter or by a device.

(3) The warning must be clear and distinct under all conditions, and must be clearly distinguishable from all other warnings. A visual device that requires the attention of the crew within the cockpit is not acceptable by itself.

(4) If a warning device is used, the device must automatically deactivate and reset when the low-speed condition is corrected. If the device has an audible warning, it must also be equipped with a means for the pilot to manually silence the audible warning before the low-speed condition is corrected.

79. By amending § 29.45 as follows:

1. By deleting paragraphs (a)(3) and (b)(3).

2. By deleting the semicolon and the word "and" at the end of paragraphs (a)(2) and (b)(2) and by adding periods in place thereof.

3. By adding the word "and" at the end of paragraphs (a)(1) and (b)(1).

4. By adding new paragraphs (c), (d), and (e) to read as follows:

§ 29.45 General.

* * * * *

(c) The available power 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.

(d) For reciprocating engine-powered rotorcraft, the performance, as affected by engine power, must be based on a relative humidity of 80 percent in a standard atmosphere.

(e) For turbine engine-powered rotorcraft, the performance, as affected by engine power, must be based on a relative humidity of—

(1) 80 percent, at and below standard temperature; and

(2) 34 percent, at and above standard temperature plus 50 degrees F.

Between these two temperatures, the relative humidity must vary linearly.

80. By changing the heading of § 29.65, by revising § 29.65(a) and by adding a new § 29.65(c) to read as follows:

§ 29.65 Climb: All engines operating.

(a) The steady rate of climb must be determined for each Category B rotorcraft—

(1) With maximum continuous power on each engine;

(2) With the landing gear retracted;

(3) For the weights, altitudes, and temperatures for which certification is requested; and

(4) At V_Y for standard sea level conditions at maximum weight and at speeds selected by the applicant at or below VNE for other conditions.

* * * * *

(c) For Category A helicopters, if VNE at any altitude within the range for which certification is requested is less than V_Y at sea level standard conditions, with maximum weight and maximum continuous power, the steady rate of climb must be determined—

(1) At the climb speed selected by the applicant at or below VNE;

(2) Within the range from 2,000 feet below the altitude at which VNE is equal to V_Y up to the maximum altitude for which certification is requested;

(3) For the weights and temperatures that correspond to the altitude range set forth in paragraph (c)(2) of this section and for which certification is requested;

(4) With maximum continuous power on each engine; and

(5) With the landing gear retracted.

81. By revising § 29.143(b) and adding a new § 29.143(e) to read as follows:

§ 29.143 Controllability and maneuverability.

* * * * *

(b) The margin of cyclic control must allow satisfactory roll and pitch control at VNE with—

(1) Critical weight;

(2) Critical center of gravity;

(3) Critical rotor r.p.m.; and

(4) Power off (except for helicopters demonstrating compliance with paragraph (e) of this section) and power on.

* * * * *

(e) For helicopters for which a VNE (power-off) is established under § 29.1505(c), compliance must be demonstrated with the following requirements with critical weight, critical center of gravity, and critical rotor r.p.m.:

(1) The helicopter must be safely slowed to VNE (power-off), without ex-

ceptional pilot skill, after the last operating engine is made inoperative at power-on VNE.

(2) At a speed of 1.1 VNE (power-off), the margin of cyclic control must allow satisfactory roll and pitch control with power off.

82. By revising § 29.175(c) to read as follows:

§ 29.175 Demonstration of static longitudinal stability.

* * * * *

(c) *Autorotation.* Static longitudinal stability must be shown in autorotation at airspeeds from 0.5 times the speed for minimum rate of descent to VNE, or to 1.1 VNE (power-off) if VNE (power-off) is established under § 29.1505(c), and with—

(1) Critical weight;
(2) Critical center of gravity;
(3) Power off;
(4) The landing gear——
(i) Retracted; and
(ii) Extended; and
and (ii) extended; and
(5) The rotorcraft trimmed at appropriate speeds found necessary by the Administrator to demonstrate stability throughout the prescribed speed range.

* * * * *

83. By amending §§ 29.1043(a)(1) and (d) by deleting the words "maximum anticipated air temperature" and inserting in their place the words "maximum ambient atmospheric temperature" and by revising § 29.1043(b) to read as follows:

§ 29.1043 Cooling tests.

* * * * *

(b) *Maximum ambient atmospheric temperature.* A maximum ambient atmospheric temperature corresponding to sea level conditions of at least 100 degrees F must be established. The assumed temperature lapse rate is 3.6 degrees F per thousand feet of altitude above sea level until a temperature of −69.7 degrees F is reached, above which altitude the temperature is considered constant at −69.7 degrees F. However, for winterization installations, the applicant may select a maximum ambient atmospheric temperature corresponding to sea level conditions of less than 100 degrees F.

* * * * *

84. By adding a new § 29.1353(c)(6) to read as follows:

§ 29.1353 Electrical equipment and installation.

* * * * *

(c) * * *

(6) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have—

(i) A system to control the charging rate of the battery automatically so as to prevent battery overheating;

(ii) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or

(iii) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

85. By revising § 29.1501 to read as follows:

§ 29.1501 General.

(a) Each operating limitation specified in §§ 29.1503 through 29.1525 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crewmembers as prescribed in §§ 29.1541 through 29.1589.

86. By revising § 29.1505(a) and adding a new §29.1505(c) to read as follows:

§ 29.1505 Never-exceed speed.

(a) The never-exceed speed, VNE, must be established so that it is—

(1) Not less than 40 knots (CAS); and
(2) Not more than the lesser of—
(i) 0.9 times the maximum forward speeds established under § 29.309; or
(ii) 0.9 times the maximum speed shown under §§ 29.251 and 29.629.

* * * * *

(c) For helicopters, a stabilized power-off VNE denoted as VNE (power-off) may be established at a speed less than VNE established pursuant to paragraph (a) of this section, if the following conditions are met:

(1) VNE (power-off) is not less than a speed midway between the power-on VNE and the speed used in meeting the requirements of—
(i) § 29.67(a)(3) for Category A helicopters;
(ii) § 29.65(a) for Category B helicopters, except multi-engine helicopters meeting the requirements of § 29.67(b); and
(iii) § 29.67(b) for multi-engine Category B helicopters meeting the requirements of § 29.67(b).

(2) VNE (power-off) is—
(i) A constant airspeed;
(ii) A constant amount less than power-on VNE; or
(iii) A constant airspeed for a portion of the altitude range for which certification is requested, and a constant amount less than power-on VNE for the remainder of the altitude range.

87. By revising § 29.1521(e) to read as follows:

§ 29.1521 Powerplant limitations.

* * * * *

(e) *Ambient temperature.* 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 §§ 29.1041 through 29.1049 is shown.

* * * * *

88. By adding a new § 29.1527 following § 29.1525 to read as follows:

§ 29.1527 Maximum operating altitude.

The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

89. By redesignating §§ 29.1545(b)(2) and (3) as (b)(3) and (4), respectively, by revising § 29.1545(b)(1), and adding a new § 29.1545(b)(2), to read as follows:

§ 29.1545 Airspeed indicator.

* * * * *

(b) * * *

(1) A red radial line—
(i) For rotorcraft other than helicopters, at VNE; and
(ii) For helicopters, at VNE; (power-on).

(2) A red, cross-hatched radial line at VNE (power-off) for helicopters, if VNE (power-off) is less than VNE (power-on).

* * * * *

90. By deleting § 29.1581(c) and marking it "[Reserved]", and by revising §§ 29.1581 (a) and (b) and adding a new § 29.1581(d) to read as follows:

§ 29.1581 General.

(a) *Furnishing information.* A Rotorcraft Flight Manual must be furnished with each rotorcraft, and it must contain the following:

(1) Information required by §§ 29.1583 through 29.1589.

(2) Other information that is necessary for safe operation because of design, operating, or handling characteristics.

(b) *Approved information.* Each part of the manual listed in §§29.1583 through 29.1589 that is appropriate to the rotorcraft, must be furnished, verified, and approved, and must be segregated, identified, and clearly distinguished from each unapproved part of that manual.

(c) [Reserved]

(d) *Table of contents.* Each Rotorcraft Flight Manual must include a table of contents if the complexity of the manual indicates a need for it.

91. By revising § 29.1583(b) and by adding a new § 29.1583(h) to read as follows:

§ 29.1583 Operating limitations.

* * * * *

(b) *Powerplant limitations.* The following information must be furnished:

(1) Limitations required by § 29.1521.

(2) Explanation of the limitations, when appropriate.

(3) Information necessary for marking the instruments required by §§ 29.1549 through 29.1553.

* * * * *

(h) *Altitude.* The altitude established under § 29.1527 and an explanation of the limiting factors must be furnished.

92. By adding new §§ 29.1585 (c) and (d) to read as follows:

§ 29.1585 Operating procedures.

* * * * *

(c) For helicopters for which a V_{NE} (power-off) is established under § 29.1505(c), information must be furnished to explain the V_{NE} (power-off) and the procedures for reducing airspeed to not more than the V_{NE} (power-off) following failure of all engines.

(d) For each rotorcraft showing compliance with § 29.1353 (c)(6)(ii) or (c)(6)(iii), the operating procedures for disconnecting the battery from its charging source must be furnished.

PART 91—GENERAL OPERATING AND FLIGHT RULES

93. By revising § 91.31(b) and adding a new § 91.31(e) to read as follows:

§ 91.31 Civil aircraft operating limitations and marking requirements.

* * * * *

(b) No person may operate a U.S. registered civil aircraft—

(1) For which an Airplane or Rotorcraft Flight Manual is required by § 21.5 unless there is available in the aircraft a current approved Airplane or Rotorcraft Flight Manual or the manual provided for in § 121.141(b); and

(2) For which an Airplane or Rotorcraft Flight Manual is not required by § 21.5, unless there is available in the aircraft a current approved Airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

* * * * *

(e) The Airplane or Rotorcraft Flight Manual, or manual material, markings and placards required by paragraph (b) of this section must contain each operating limitation prescribed for that aircraft by the Administrator, including the following:

(1) Powerplant (e.g., r.p.m., manifold pressure, gas temperature, etc.).

(2) Airspeeds (e.g., normal operating speed, flaps extended speed, etc.).

(3) Aircraft weight, center of gravity, and weight distribution, including the composition of the useful load in those combinations and ranges intended to ensure that the weight and center of gravity position will remain within approved limits (e.g., combinations and ranges of crew, oil, fuel, and baggage).

(4) Minimum flight crew.

(5) Kinds of operation.

(6) Maximum operating altitude.

(7) Maneuvering flight load factors.

(8) Rotor speed (for rotorcraft).

(9) Limiting height-speed envelope (for rotorcraft).

PART 121—CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

94. By revising § 121.141(b) to read as follows:

§ 121.141 Airplane or rotorcraft flight manual.

* * * * *

(b) In each transport-category aircraft, the certificate holder shall carry either the manual required by § 121.133, if it contains the information required for the applicable flight manual and this information is clearly identified as flight manual requirements, or an approved Airplane or Rotorcraft Flight Manual. If the certificate holder elects to carry the manual required by § 121.133, he may revise the operating procedures sections and modify the presentation of performance data from the applicable flight manual if the revised operating procedures and modified performance data presentation are—

(1) Approved by the Administrator; and

(2) Clearly identified as airplane or rotorcraft flight manual requirements.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).)

NOTE.—The Federal Aviation Administration has determined that this document does not contain a major proposal requiring preparation of an Economic Impact Statement under Executive Order 11821, as amended by Executive Order 11949, and OMB Circular A-107.

Issued in Washington, D.C., on January 9, 1978.

LANGHORNE BOND,
Administrator.

[FR Doc.78-1034 Filed 1-13-78;8:45 am]

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[1505-01]

Title 14—Aeronautics and Space

CHAPTER I—FEDERAL AVIATION ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

[Dockets Nos. 14684 and 14324; Amendment Nos. 1-29, 21-46, 23-21, 25-42, 27-14, 29-15, 91-145, and 121-138]

AIRWORTHINESS REVIEW PROGRAM

Amendment No. 6: Flight Amendments

Correction

In FR Doc. 78-1034 appearing at page 2302 in the issue for Monday, January 16, 1978, in the heading the last Amendment No. appearing in brackets read "* * * 121-1381". It should have read "* * * 121-138" as set forth in the heading above.

[1505-01]

[Docket Nos. 14684 and 14324; Amendment Nos 1-29, 21-46, 23-21, 25-42, 27-14, 29-15, 91-145, and 121-1381]

AIRWORTHINESS REVIEW PROGRAM

Amendment No. 6: Flight Amendments

Correction

In FR Doc. 78-1034 appearing at page 2302 in the issue for Monday, January 16, 1978, make the following corrections:

(1) On page 2303, in the middle column, in the second full paragraph, between the third and fourth lines, insert: "be possible to show that the effect of".

(2) On page 2309, in the middle column, in the first full paragraph, the 34th line should read: "quires that V_{MC_G} must be determined to".

(3) On page 2323, in the third column, in amendatory paragraph 55, in the fifth line, the reference to "§ 25.1595" should read "§ 25.1585".

(4) On page 2325, in the the third column, in § 27.1545(b)(1)(ii), insert a period after "(power on)".

(5) On page 2327, in the third column, in § 29.1545(b)(1)(ii), delete the semicolon after "V_{NE}".