FEDERAL AVIATION AGENCY
BUREAU OF FLIGHT STANDARDS
Washington 25, D. C.

June 8, 1961

CIVIL AIR REGULATIONS DRAFT RELEASE NO. 61-12

SUBJECT: First Federal Aviation Agency Airworthiness Review

The Bureau of Flight Standards of the Federal Aviation Agency has under consideration amendments of Parts 3, 4b, 5, 6, 7, 13, 14, 18, and 43 of the Civil Air Regulations. The reasons therefor are set forth in the explanatory statement of the attached proposal which was published today in the Federal Register as a notice of proposed rule making.

The Bureau of Flight Standards desires that all persons who will be affected by the requirements of this proposal be fully informed as to its effect upon them and is therefore circulating copies in order to afford interested persons ample opportunity to submit comments as they may desire.

Because of the large number of comments which we anticipate receiving in response to this draft release, we will be unable to acknowledge receipt of each reply. However, you may be assured that all comment will be given careful consideration.

It should be noted that comments must be submitted in duplicate to the Docket Section of the Federal Aviation Agency, and in order to insure consideration must be received on or before August 7, 1961.

Oscar Baker
Director
Bureau of Flight Standards

NOTICE OF PROPOSED RULE MAKING

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As published in the Federal Register
on June 8, 1961 (26 F.R. 5130)

FEDERAL AVIATION AGENCY

[14 CFR Parts 3, 4b, 5, 6, 7, 13, 14, 18, 43]

[Reg. Docket No. 107; Draft Release No. 61-12]

AIRWORTHINESS

Notice of Proposed Rule Making

Pursuant to the authority delegated to me by the Administrator (14 CFR 405.27), notice is hereby given that there is under consideration a proposal to amend Parts 3, 4b, 5, 6, 7, 13, 14, 18, and 43 of the Civil Air Regulations as hereinafter set forth.

Interested persons may participate in the making of the proposed rules by submitting such written data, views, or arguments as they may desire. Communications should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, Room B-316, 1711 New York Avenue NW., Washington 25, D.C. All communications received on or before August 7, 1961, will be considered by the Administrator before taking action upon the proposed rules. The proposals contained in this notice may be changed in the light of comments received. All comments submitted will be available, in the Docket Section, for examination by interested persons

when the prescribed date for return of comments has expired.

The proposed amendments to the airworthiness regulations attached hereto stem from studies conducted by the Bureau of Flight Standards during 1959 and 1960 in the course of reviewing the airworthiness regulations. A great number of the proposals resulted from the discussions which took place at the Airworthiness Conference held in Washington from March 7, through March 16, 1960, and several subsequent meetings.

The proposals herein pertain to amendments to Parts 3, 4b, 5, 6, 7, 13, 14, 18, and 43 of the Civil Air Regulations and to the adoption of a new Special Civil Air Regulation. The explanatory material accompanying the proposed regulations for each part briefly explains the proposed amendments.

All of the items in the Agenda for the Airworthiness Conference are not being proposed as amendments because consideration of all information available; i.e., the proponents' supporting discussion, the arguments presented at the Airworthiness Conference, and independent study and analysis by the Bureau, did not show sufficient justification for proposing such amendments.

Item 87, of the Airworthiness Conference Agenda, dealing with proposed amendments to Special Civil Air Regulation SR-422B, is being treated separately. Changes considered necessary to SR-422B will be published shortly as a separate notice of proposed rule making.

Some of the amendments being proposed herein were not on the agenda of the Airworthiness Conference. In most cases, these proposals merely correct minor errors or are of an editorial or clarifying nature.

These amendments are proposed under the authority of sections 313(a), 601-610 of the Federal Aviation Act of 1958, (72 Stat. 752, 775-780; 49 U.S.C. 1354(a), 1421-1430).

Issued in Washington, D.C., on June 2, 1961.

OSCAR BAKKE,
Director,
Bureau of Flight Standards.

APRIL 25, 1961.

Proposed rules—Part 3:

Several changes are being proposed to to the performance requirements. Section 3.82 provides for the flight test determination of the stalling speeds, V_{s_0} and V_{s_1}, except that when V_{s_1} is not obtainable it may be calculated. Since the purpose of this section is to determine the stall speeds by flight tests, it is being proposed that V_{s_1} be determined in the same manner as V_{s_0}, i.e., as a stall or as a minimum steady flight speed.

Part 3 does not provide engine inoperative en route climb performance for multiengine airplanes of 6,000 pounds or less. This information is necessary for the commercial operation of these airplanes and is useful to general operation. Therefore, a change to § 3.85 is proposed to require that this information be obtained during type certification of the airplane.

Part 3 requires that spin tests be conducted on airplanes of 4,000 pounds or less, including multiengined airplanes. On the basis that spin prevention will contribute more toward reducing stall-spin accidents than spin recovery, it is proposed that the engine-inoperative stall requirements of § 3.123 be revised to preclude inadvertent spins and that normal category multiengine spin tests be deleted. Furthermore, it is proposed that the current 4,000-pound limit of § 3.124(a) be deleted, and thus require one-turn spin tests on all normal category single engine airplanes. These tests are considered to be an investigation of the airplane's characteristics in a delayed stall rather than true spin tests and as such should be applicable to all single-engine airplanes. Section 3.124(c) does not clearly state the spin capability required of acrobatic category airplanes. It is therefore proposed to amend § 3.124(c) to clarify that acrobatic airplanes must be capable of six-turn spins. Furthermore, consistent with current practice, it is proposed to amend § 3.124(c) to incorporate the current policy material of §§ 3.124-1 and 3.124-2 concerning flap retraction during spin tests.

Several amendments are proposed to the strength requirements to make them appropriate for the speed, altitude, and maneuverability characteristics of small turbine-powered airplanes. These changes include a provision in § 3.184 that the design dive speed need not exceed Mach number 0.4 or any higher value chosen by the applicant. A similar provision would apply to the design cruising speed. Further study is being given to proposals on rational methods for determining design and operating limitation speed margins.

Two clarifying changes are also proposed for § 3.184. One indicates that the design speeds are stated in terms of equivalent airspeed RAS (already defined in § 3.1(d)), and in miles per hour unless other units are specified. The other would make it clear that a conservative value of the computed stalling speed be used in establishing the design maneuvering speed V_p.

To cover the effects of altitude on gust loads, it is proposed to amend § 3.187 by replacing the present nominal gust velocities and alleviating factor based on wing loading by the more rational mass parameter alleviating factor and derived gust velocities which reduce at altitudes above 20,000 feet altitude. This proposal is consistent with the treatment of the subject in current Part 4b. Amendments to §§ 3.188, 3.190, 3.217, 3.217-1, 3.220, and figure 3-1 are proposed to make them consistent with the proposed changes to § 3.187.

The maneuverability characteristics of the small high speed turbojet airplane now in operation are such that pilots tend to impose higher maneuvering loads than on slower piston engine airplanes. It is therefore proposed that § 3.186 be amended to require a limit positive maneuver load factor of 4.4 for normal category airplanes having a design dive speed Mach number greater than 0.4. However, as more experience is gained with various types of high-speed airplanes, it may be possible to develop a more rational criterion for the maneuver load factor.

It is proposed that the asterisk on point G and the corresponding note be deleted from figure 3-1. The note is incorrect because § 3.194 specifies a reversed airflow condition with peak load at the wing trailing edge and this is not a proper substitute for point G which is intended to cover maximum down loads on the front spar.

Several changes are proposed to cover the engine torque, gyroscopic, and unsymmetrical engine failure loads for turbine engine installations. In § 3.195 (b), it is proposed to require a factor of 1.25 on the mean torque to allow for turbine engine acceleration or power surges in maneuvering conditions. For turbopropeller airplanes, a new condition is proposed under § 3.195(a) to require an additional factor of 1.6 on the torque applied in level flight, to allow for increases in torque which can occur momentarily due to malfunctions such as a sudden increase in propeller blade angle.

Since the high rotational speed and angular momentum of turbine rotors can produce significant gyroscopic loads in pitching or yawing maneuvers, a new § 3.198 is proposed to cover these conditions. As an alternative to a rational determination of pitch and yaw velocities, acceptable arbitrary values are specified.

The existing yawing maneuver conditions in § 3.219 have generally been adequate to cover the yaw loads due to sudden failure of one engine on multiengine airplanes having reciprocating engines. However, studies show that a windmilling turbopropeller installation can produce up to 4 times the drag of a windmilling reciprocating engine. A new § 3.199 is therefore proposed, requiring multi-turbopropeller airplanes to be designed for the loads resulting from failure of one engine and specifying the types of engine failures, corresponding speed ranges, and other factors to be considered.

The present strength requirements for pressurized cabins state that where the cabin is separated into compartments by bulkheads or floors, the primary structure shall be designed for the effects of sudden release of pressure in any compartment having external doors or windows. Difficulties have arisen in applying these requirements because "primary structure" is not defined and the objectives are not stated clearly. It is, therefore, proposed to amend § 3.197(d) to state that, under conditions of sudden pressure release, the integrity of the structure carrying flight loads shall be maintained, but that damage to other portions of the airplane is acceptable provided reasonable precautions are taken to minimize the probability of serious injury to the occupants while in their seats.

The current requirements on fatigue evaluation of structures (§ 3.270) apply only to pressurized cabins. The increased use of high strength materials

and correspondingly higher operating stress levels in Part 3 airplanes has raised the question as to whether fatigue evaluation is needed for other portions of the structure, such as wings and tail surfaces. Except for one recent accident, service experience has not shown an increasing trend of catastrophic fatigue failures. However, to prevent such a trend from developing in future designs using new materials and methods of construction, changes are proposed to § 3.270 which would require a fatigue evaluation of critical portions of the flight structure, unless it is shown that the design is at least equivalent, from the fatigue standpoint, to a similar design which has had substantial satisfactory service history. This showing would be based on a comparison of factors affecting fatigue strength, such as material properties, operating stress levels, stress concentration factors, etc.

The present requirements on factors of safety and inspections for structural castings specify a special factor of 2.0 for visual inspection only, and a factor of 1.25 when radiographic inspection and strength tests of 3 sample castings are employed. Proposed changes to § 3.304 would provide a series of casting factors, and corresponding test and inspection requirements intended to reflect current methods and practices.

Section 3.357 currently prescribes that an auxiliary means of extending the landing gear be provided if other than manual power is used. This provision is unnecessary in the case of amphibious airplanes, since service experience has shown that such airplanes can be landed safely, on land or water, with the landing gear retracted. Therefore, it is proposed to amend this section so that it is no longer applicable to amphibian airplanes. It is also proposed to amend § 3.359 which currently provides that the aural warning device function continuously after the throttle is closed until the landing gear is down and locked. To remove the ambiguity which arises in the case of multiengine airplanes, it is proposed to have this section specify that the warning occur and continue after one or more throttles are closed. In this connection, it is proposed to delete material now contained in §§ 3.359–1, 3.359–2, and 3.359–3 and incorporate the acceptable means of compliance set forth therein in a note.

The increasing use of tinted windshields to reduce sun glare has raised questions as to the possible adverse effects on pilot vision during operations under poor lighting conditions. On the basis of automotive experience, it is proposed to amend § 3.383 to require that windshields and windows forward of the pilot's back have a luminous transmittance value of not less than 70 percent.

Sections 3.390(c) and 3.715 presently require an additional factor of safety of 1.33 on the loads for seat and safety belt attachments, and § 3.306 requires a factor of 1.15 for structural fittings (attachments). It is proposed to clarify §§ 3.390(c) and 3.715 by inserting a statement that the 1.33 factor may be applied in lieu of the 1.15 factor, not added to it. This is consistent with the general principle that only the highest factor intended for a similar purpose need be applied. However, if castings are used, the casting factor specified in § 3.304 would still apply, since this factor is intended for another purpose.

Section 3.432 restricts the routing of pressure cross feed fuel lines unless means are provided to permit flight personnel to shut off the supply of fuel to these lines, or unless any joints, fittings, or other possible sources of leakage installed in such lines are enclosed in a fuel- and fume-proof enclosure ventilated and drained to the exterior of the airplane. Experience has shown that pressure cross feed lines do not require provisions different from other pressure fuel lines. Accordingly, it is proposed to delete this section.

Section 3.581 requires that powerplant cooling provisions be capable of maintaining component and fluid temperatures at or below the maximum established limits under critical conditions of ground and flight operation. Since modern airplanes have minimum as well as maximum limits, it is proposed to amend § 3.581 to require that cooling provisions be capable of maintaining temperatures within limits. For the same reason it is proposed to delete the word "maximum" from § 3.582. Sections 3.586 and 3.587 establish cooling test procedures for single-engine and multiengine airplanes. Section 3.587 provides that the airplane be in the configuration specified in § 3.85, which covers climb performance, while § 3.586 is silent in this respect. Section 3.85, however, provides that the cowl flap setting, which is part of the airplane configuration, be that employed in the cooling test. To avoid ambiguity it is proposed to specify that the applicant select the cowl flap setting to be used in establishing cooling system capability.

Several revisions to the regulations concerning electrical systems and equipment are proposed involving §§ 3.681 through 3.693. These changes are proposed in recognition of the substantial growth in capacity, complexity, and significance to safety, of electrical systems on aircraft. In particular, a new section, § 3.682 dealing with electric power sources is proposed as well as revisions to §§ 3.688, 3.690, 3.691, and 3.693 concerned with master switch arrangement, protective devices, and electric cables respectively. In conjunction with these changes it is proposed to delete §§ 3.681 (b), 3.681–1, 3.681–2, 3.682–1, 3.688–1, 3.688–2, 3.690–1, 3.690–2, and 3.693–1, because the material contained in these sections is being proposed for inclusion, or already is included, in other sections.

Two changes are proposed to the lighting requirements. Figure 3–16 now specifies that position light intensity for angles 40° to 90° above or below the horizontal be at least 2 candles. Because this results in an irrational discontinuity when related to the other data in figure 3–16, it is proposed to amend figure 3–16 to require an intensity of .05 I for these angles.

The current anticollision light requirements in § 3.705 permit 0.03 steradians blockage in the rearward direction. In view of recent qualitative studies it has been determined that such a limitation might be unduly restrictive. Therefore, it is proposed to permit 0.5 steradians of obstruction without limitation as to direction.

The airspeed placards now required by Part 3 do not include operational speed information considered essential to the safe operation of the airplane. These speeds include the demonstrated crosswind velocity, recommended climb speed, best angle of climb speed, engine-inoperative climb speed, and approach speed. However, supplementary information regarding the airplane configuration, power, etc., is necessary to describe the conditions for which these speeds, except demonstrated crosswind, can be used. It is not considered practical to include all of this information on a cockpit placard. The detailed supplementary information should be included in a separate source provided it is readily available to the pilot. The Airplane Flight Manual procedures section is considered satisfactory for this purpose. Therefore, it is proposed that § 3.771 be amended to require that the demonstrated crosswind velocity be shown on a cockpit placard for all airplanes while the climb and approach speeds placard will be required only for airplanes of more than 6,000 pounds having an Airplane Flight Manual. For consistency with these changes, a corresponding amendment to § 3.779 is also proposed. Section 3.750 requires the establishment of operation limitations related to installed equipment but there are no provisions to inform the pilot of these limitations. Therefore, new §§ 3.772 and 3.778(h) are proposed to provide that the airplane crew be informed of the operation limitations established for the airplane; e.g., VFR day, IFR night, operation in icing conditions, etc.

Miscellaneous changes of an editorial or clarifying nature are proposed for §§ 3.1, 3.82, 3.86, 3.216–5, 3.216–6, 3.301, 3.301–1, 3.301–2, 3.573, 3.582, 3.714, 3.744, 3.745, 3.746, 3.747, 3.767, 3.779, 3.780, 3.780–1 and figure 3–12(b).

In consideration of the foregoing, it is proposed to amend Part 3 of the Civil Air Regulations (14 CFR Part 3, as amended) as follows:

1. By amending § 3.1(f) by deleting from the title the word *"Power"* and inserting in lieu thereof *"Powerplant"*, and by adding a new subparagraph (9) to read as follows:

§ 3.1 Definitions.

* * * * *

(f) *Powerplant installation.* * * *

(9) *Gas temperature.* Gas temperature for turbine engines is the temperature of the gas stream obtained as indicated in the approved engine specification.

2. By amending § 3.11(b) by adding at the end thereof a note to read as follows:

§ 3.11 Designation of applicable regulations.

* * * * *

(b) * * *

NOTE: The term "type certificate" as used in this paragraph does not include a "provisional" type certificate.

3. By amending § 3.82 by deleting from the introductory sentence of paragraph (a) the words "true indicated" and inserting in lieu thereof "calibrated", and by amending the introductory sentence of paragraph (b) to read as follows:

§ 3.82 Definition of stalling speeds.

* * * * *

(b) V_{s_1} denotes the calibrated stalling speed, if obtainable, or the minimum steady flight speed at which the airplane is controllable, in miles per hour, with:

4. By amending § 3.85a(b) by redesignating the present text of the section following the title as subparagraph (1); by redesignating the present subparagraphs (1), (2), (3), (4), and (5) as subdivisions (i), (ii), (iii), (iv), and (v), respectively, and by adding a new subparagraph (2) to read as follows:

§ 3.85a Climb requirements; airplanes of 6,000 lbs. or less.

* * * * *

(b) *Climb with inoperative engine.* * * *

(2) For all multiengine airplanes having a stalling speed equal to or less than 70 miles per hour, the steady rate of climb at 5,000 feet shall be determined with the critical engine inoperative and with:

(i) Remaining engines operating at not more than maximum continuous power,

(ii) Inoperative propeller in the minimum drag position.

(iii) Landing gear retracted,

(iv) Wing flaps in the most favorable position,

(v) Cowl flaps in the position used in cooling tests specified in §§ 3.581 through 3.596.

§ 3.86 [Amendment]

5. By amending § 3.86(a)(1) by deleting the words "true indicated" and inserting in lieu thereof "calibrated".

6. By amending § 3.123 to read as follows:

§ 3.123 One-engine-inoperative stalls.

(a) Multiengine airplanes shall have stall characteristics which preclude unintentional spin entry. These characteristics shall be demonstrated by performing the maneuvers prescribed in paragraph (b) of this section at the lowest practical altitude with:

(1) The critical engine inoperative and its propeller in the normal inoperative position;

(2) Flaps and landing gear retracted in one case and extended in the other case;

(3) The remaining engine(s) operating at full throttle, except that the power need not be greater than maximum continuous power.

(b) After a steady curvilinear flight condition has been established, and while maintaining a 15-degree bank towards in one case, and away in the other case, from the inoperative engine, the turn shall be steadily tightened with the elevator control until an uncontrollable downward pitching motion of the airplane indicates the stall.

(1) It shall be possible to produce and to correct roll by unreversed use of the lateral control until the airplane stalls.

(2) It shall be possible to effect immediate recovery to full flight control with wings level from the stalled condition by normal use of the controls, reducing power on the operating engine(s) if desired without the airplane exceeding a 60-degree bank angle. The loss of altitude, 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 shall be entered in the performance section of the Airplane Flight Manual for airplanes having a maximum certificated weight of more than 6,000 pounds, or shall be shown on a cockpit placard for airplanes having a maximum certificated weight of 6,000 pounds or less.

§ 3.124 [Amendment]

7. By amending § 3.124(a) by deleting the first sentence and inserting in lieu thereof "All single-engine airplanes shall recover from a one-turn spin in not more than one additional turn. The controls shall be applied in the manner normally used for recovery. For both the flaps retracted and flaps extended condtions, the respectively applicable limiting airspeed and positive limit maneuvering load factor shall not be exceeded. For the flaps extended condition, it shall be acceptable to retract the flaps during recovery."

8. By amending § 3.124(c) by inserting in the introductory sentence between the words "spinning" and "and" the words "at least six turns"; by deleting from subparagraph (1) the clause "the airplane shall recover from a six-turn spin, or from any point in a six-turn spin," and inserting in lieu thereof "the airplane shall recover from any point in a spin not exceeding six turns with flaps retracted and one turn with flaps extended;" and by amending subparagraph (2) to read:

§ 3.124 Spinning.

* * * * *

(c) *Category A.* * * *

(2) For both the flaps retracted and flaps extended conditions, the respectively applicable limiting airspeed and positive limit maneuvering load factor shall not be exceeded. For the flaps extended condition, it shall be acceptable to retract the flaps during recovery, provided a placard is installed prohibiting intentional spins with flaps extended.

§§ 3.124–1, 3.124–2 [Deletions]

9. By deleting §§ 3.124–1 and 3.124–2.

§ 3.183 [Amendment]

10. By amending Figure 3–1 referred to in § 3.183 by deleting the number "30K" where it appears in two places and inserting in lieu thereof "50", by deleting the number "15K" where it appears in two places and inserting in lieu thereof "25", by deleting the asterisk where it appears in two places, and by deleting the related note.

§ 3.184 [Amendment]

11. By amending § 3.184 by inserting in the first sentence between the words "speeds" and "shall" the words "shall be equivalent air speeds (EAS) and"; by adding to each of the parenthetical expressions after the word "speed" the abbreviation ", m.p.h."; by adding at the end of the first sentence "or a Mach number chosen by the applicant for altitudes where V_d is limited by Mach number"; and by adding at the end of the second sentence the clause ": and further provided, that V_d need not exceed a value corresponding with Mach number 0.4 or any higher Mach number chosen by the applicant"; and by inserting in the definition of V_s between the words "on" and "the" the words "a conservative value of".

§ 3.186 [Amendment]

12. By amending § 3.186(a) by inserting between the word "that" and the letter "*n*" the words "for airplanes of this category having a design dive speed V_d not exceeding Mach number 0.4,"; and by adding following the number "2.5" the words "; for airplanes of this category having a design dive speed V_d exceeding Mach number 0.4, *n* shall be not less than 4.4."

13. By amending § 3.187 to read as follows:

§ 3.187 Gust envelope.

The airplane shall be assumed to encounter, while in level flight, symmetrical vertical gusts as prescribed in paragraphs (a) and (b) of this section. The prescribed gusts shall be derived gust velocities and the resulting loads shall be considered as limit loads. Gust load factors shall be assumed to vary linearly between V_c and V_d.

(a) Positive (up) and negative (down) gusts of 50 fps at altitude between sea level and 20,000 feet, with a linear reduction from 50 fps at 20,000 feet to 25 fps at 50,000 feet, at all speeds up to V_c.

(b) Positive and negative gusts of 25 fps at altitudes between sea level and 20,000 feet with a linear reduction from 25 fps at 20,000 feet to 12.5 fps at 50,000 feet, at V_d.

14. By amending § 3.188 to read as follows:

§ 3.188 Gust load factors.

In applying the requirements prescribed in § 3.187, the gust load factors shall be computed by the following formula:

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

where:

$K_g = \frac{0.38\,\mu_g}{5.3 + \mu_g}$ = gust alleviation factor;

$\mu_g = \frac{2(W/S)}{\rho C g m}$ = airplane mass ratio;

ρ = air density (slugs/cu. ft.);
C = mean geometric chord (ft.);
m = slope of lift curve (C_L per radian);
g = acceleration due to gravity (ft./sec.^{2});
U_{de} = derived gust velocity (fps) specified in § 3.187;
V = airplane speed (knots);
W/S = wing loading (psf).

§ 3.190 [Amendment]

15. By amending § 3.190(a)(2) by deleting the first sentence and inserting in lieu thereof the following: "Positive and negative gusts having the velocities prescribed in § 3.187(b), acting normal to the flight path with the airplane in level flight."

16. By amending § 3.195(a) by adding a new subparagraph (3) to read as follows:

§ 3.195 **Engine torque effects.**

* * * * *

(a) * * *

(3) For turbine propeller installations, in addition to the conditions prescribed in subparagraphs (1) and (2) of this paragraph, the limit torque corresponding with takeoff power and propeller speed multiplied by a factor of 1.6 shall be considered to act simultaneously with 1g level flight loads.

17. By amending § 3.195(b) by adding at the end thereof a new sentence to read as follows: "For turbine engines, the limit torque shall be obtained by multiplying the mean torque by a factor of 1.25."

18. By amending § 3.197(d) to read as follows:

§ 3.197 **Pressurized cabin loads.**

* * * * *

(d) Where a pressurized cabin is separated into two or more compartments by partitions, bulkheads, or floors, the structure supporting the prescribed flight and ground loads and other structure the failure of which could interfere with continued safe flight and landing of the airplane shall be designed to withstand the effects of sudden release of pressure in any compartment resulting from the failure of the largest external door, window, or windshield panel in such compartment. It shall be acceptable to take into account pressure relief provided by intercompartment venting. It can be assumed that parts of the airplane, other than the structure specified in this paragraph, may be damaged, in which case reasonable design precautions shall be taken to minimize the probability of serious injury to occupants of the airplane while in their seats.

NOTE: The aforementioned precautions might include, for example, designing internal doors so that they will remain attached to supporting structure even though forced open by differential pressure.

19. By adding a new § 3.198 to read as follows:

§ 3.198 **Turbine engine gyroscopic loads.**

For turbine engine installations, engine mounts and supporting structure shall be designed for the loads resulting from the conditions prescribed in either paragraph (a) or paragraph (b) of this section, taking into account gyroscopic effects with the engines operating at maximum continuous r.p.m.:

(a) The maneuvers prescribed in §§ 3.191(b) and 3.216.

(b) All combinations of the following:

(1) A yaw velocity of 3.5 radians per second,

(2) A pitch velocity of 1.0 radians per second,

(3) A normal load factor of 2.5,

(4) Maximum continuous thrust.

20. By adding a new § 3.199 to read as follows:

§ 3.199 **Unsymmetrical loads due to engine failure on multiengine turbine-propeller airplanes.**

Multiengine turbine-propeller airplanes shall be designed for the unsymmetrical loads resulting from the failure of the critical engine. The conditions prescribed in paragraphs (a) through (d) of this section shall apply in combination with a single malfunction of the propeller drag limiting system, if the airplane is provided with such a system, taking into account the probable pilot corrective action on the flight controls.

(a) Engine power failure due to fuel flow interruption or turbine blade burn off, whichever is critical, at all speeds between V_{mc} and V_d. The resulting loads shall be considered limit loads.

(b) Disconnection of the engine compressor from the turbine at all speeds between V_{mc} and V_c. The resulting loads shall be considered ultimate loads.

(c) The time history of the thrust decay and drag build-up occurring as a result of the prescribed engine failures shall be substantiated by test or other data applicable to the particular engine-propeller combination.

(d) The timing and magnitude of the probable pilot corrective action shall be conservatively estimated, considering the characteristics of the particular engine-propeller-airplane combination.

NOTE: It may be assumed that pilot corrective action will be initiated at the time maximum yaw velocity is attained, but not earlier than two seconds after the engine failure. The magnitude of the corrective action may be based on the control forces specified in § 3.212, except that lower forces may be assumed where it is shown by analysis or test that such forces will be sufficient to control the yaw and roll resulting from the prescribed engine failure conditions.

§ 3.216–5 [Amendment]

21. By amending § 3.216–5 by deleting from paragraph (a) the phrase "in § 3.216 (a), (b), and (c)" and inserting in lieu thereof "in § 3.216(c)"; and by deleting from paragraph (b) the phrase "in § 3.216(c)" and inserting in lieu thereof "in § 3.216".

§ 3.216–6 [Amendment]

22. By amending § 3.216–6 by deleting the equation

$$q_s=\frac{n\,(W/S)}{C_{L_{max}}}=\frac{(W/S)}{1.5}$$

and inserting in lieu thereof

$$q_s=\frac{n\,(W/S)}{C_{L_{max}}}=\frac{n\,(W/S)}{1.5}.$$

23. By amending § 3.217 by deleting from paragraph (a) the words "of 30 feet per second nominal intensity" and by amending paragraph (b) to read as follows:

§ 3.217 **Gust loads.**

* * * * *

(b) Positive and negative gusts having the velocity prescribed in § 3.187(b):

(1) At speed V_f, corresponding with the conditions specified in § 3.190(a)(2), with flaps extended.

(2) At speed V_d, corresponding with the conditions prescribed in § 3.187(b), with flaps retracted.

§ 3.217–1 [Amendment]

24. By amending § 3.217–1 by deleting from the first sentence the number "30" and inserting in lieu thereof "50".

§ 3.220 [Amendment]

25. By amending § 3.220 *Gust loads*, paragraph (a) by deleting the phrase "of 30 feet per second nominal intensity" and inserting in lieu thereof "having the velocity prescribed in § 3.187".

26. By amending § 3.220(b) to read as follows:

(b) In lieu of a rational analysis, it shall be acceptable to compute the gust loading by the following formula:

$$\bar{w}=\frac{K_g U_{de} V_m}{498}$$

where:

$\bar{w}$ = average limit pressure (psf).

$K_g=\frac{0.88\,\mu_g}{5.3+\mu_g}$

$\mu_g=\frac{2W}{\rho c_t g m S_v\left(\frac{K}{l_t}\right)^2}$

ρ = air density (slugs/cu. ft.).

c_t = mean geometric chord of vertical surface (ft.).

K = radius of gyration in yaw (ft.).

l_t = horizontal distance from airplane c.g. to lift center of vertical surface (ft.).

U_{de} = derived gust velocity (fps).

V = airplane speed (knots).

m = slope of lift curve of vertical surface (C_L per radian).

W = design weight (lbs.).

S_v = vertical surface area ($ft.^2$).

§ 3.244 [Amendment]

27. By amending Figure 3-12(b) referred to in § 3.244 as follows:

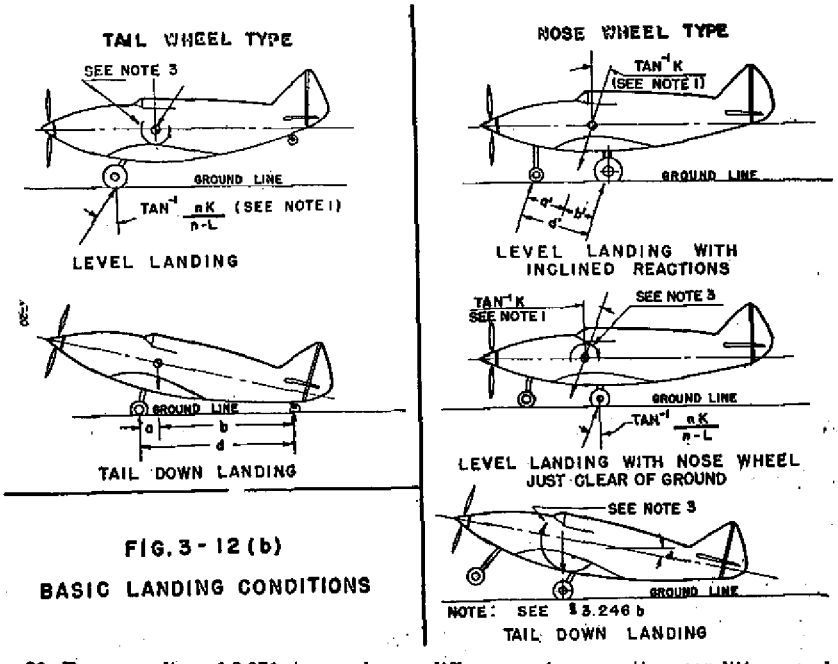

FIG. 3-12(b)

BASIC LANDING CONDITIONS

28. By amending § 3.270 to read as follows:

§ 3.270 General.

The provisions of either paragraph (a) or (b) of this section shall apply to pressurized cabins. They shall also apply to portions of the flight structure which are apt to be critical from the standpoint of structural fatigue, unless it is shown that the structural design from the fatigue standpoint is at least equivalent to a similar design which has had substantial satisfactory service history. Such showing shall cover all significant factors affecting fatigue strength, such as the properties of materials, operating stress levels, stress concentration factors, and fabrication methods.

(a) *Fatigue strength.* The structure shall be shown by analysis and/or tests to be capable of withstanding the repeated loads of variable magnitude expected in service. The provisions of subparagraphs (1) through (3) of this paragraph shall apply.

(1) Evaluation of fatigue shall involve the following:

(i) Typical loading spectrum expected in service;

(ii) Identification of principal structural elements and detail design points, the fatigue failure of which could cause catastrophic failure of the aircraft; and

(iii) An analysis and/or repeated load tests of principal structural elements and detail design points identified in subdivision (ii) of this subparagraph.

NOTE: Tests of principal structural elements usually include major fittings, samples of joints, spar cap strips, skin units, and other representative sections of the flight structure.

(2) It shall be acceptable to utilize the service history of airplanes of similar structural design, taking due account of differences in operating conditions and procedures.

(3) When circumstances require substantiation of the pressure cabin by fatigue tests, the cabin or representative portions of it shall be cycle-pressure tested, utilizing the normal operating pressure together with the effects of external aerodynamic pressure combined with the flight loads. It shall be acceptable to represent the effects of flight loads by an increased cabin pressure, or to omit the flight loads if they are shown to have no significant effect upon fatigue.

(b) *Fail-safe strength.* It shall be shown by analysis and tests that catastrophic failure or excessive deformation, which could preclude continued safe flight and landing of the airplane, are not probable after fatigue failure or obvious partial failure of a single structural element. After such failure, the structure shall be capable of withstanding 75 percent of the limit design loads. These loads are considered to be ultimate and shall be multiplied by a factor of 1.15 unless dynamic effects of failure under static load are otherwise taken into consideration.

29. By amending § 3.301 by deleting the last sentence and inserting in lieu thereof "Values contained in MIL-HDBK-5, ANC-17, ANC-18, and ANC-23, Part II shall be used unless shown to be inapplicable in a particular case", and by amending the note to read as follows:

§ 3.301 Material strength properties and design values.

* * * * *

NOTE: MIL-HDBK-5, "Strength of Metal Aircraft Elements"; ANC-17, "Plastics for Aircraft"; ANC-18, "Design of Wood Aircraft Structures"; and ANC-23, "Composite Construction for Flight Vehicles," are published by the Department of Defense and the Federal Aviation Agency and may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

§ 3.301-1 [Amendment]

30. By amending § 3.301-1(a) by deleting the first sentence and inserting in lieu thereof "With reference to Chapter 3 of MIL-HDBK-5, the allowable design property columns headed "B" represent design properties which will be equalled or exceeded by the properties possessed by approximately 90 percent of the material", and by deleting from subparagraph (1) the phrase "in ANC-5" and inserting in lieu thereof "in MIL-HDBK-5".

31. By amending § 3.301-2 to read as follows:

§ 3.301-2 Substitution of seam-welded for seamless steel tubing (FAA policies which apply to § 3.301).

Seam-welded tubing may be substituted for seamless steel tubing as follows:

(a) SAE 4130 welded tubing as per Specification MIL-T-6731 may be substituted for SAE 4130 seamless tubing conforming to Specification MIL-T-6736, and vice versa.

(b) SAE 1025 welded tubing as per Specification MIL-T-5066 may be substituted for SAE 1025 seamless tubing conforming to Specification MIL-T-5066, and vice versa.

(c) SAE 8630 welded tubing conforming to Specification MIL-T-6734 may be substituted for SAE 8630 seamless tubing conforming to Specification MIL-T-6732, and vice versa.

32. By amending § 3.304 to read as follows:

§ 3.304 Casting factors.

(a) For structural castings, the factor of safety prescribed in § 3.172 shall be multiplied by the casting factors specified in subparagraphs (1) and (2) of this paragraph. The prescribed tests and inspections shall be in addition to those necessary to establish foundry quality control. Castings shall be inspected in accordance with approved specifications.

(1) Each casting, the failure of which would preclude continued safe flight and landing of the airplane or which would result in serious injury to occupants, shall have a casting factor of at least 1.25 and shall receive 100 percent inspection by visual, radiographic, and magnetic particle or penetrant inspection methods. Where such castings have a casting factor less than 1.50, three sample castings shall be static tested. The test castings shall comply with the strength requirements of § 3.173 at an ultimate load corresponding with a casting factor of 1.25 and shall comply with the deformation requirements at a load equal to 1.15 times limit load.

NOTE: Examples of castings to which this subparagraph applies are: structural attachment fittings; parts of flight control systems; control surface hinges and balance weight attachments; seat, berth, safety belt, and fuel and oil tank supports and attachments; cabin pressure valves.

(2) For structural castings other than those specified in subparagraph (1) of this paragraph, the casting factor shall be not less than 1.25, and the required inspections shall be as follows:

Casting factor	Inspections
2.0 or greater	100 percent visual.
Less than 2.0 greater than 1.5.	100 percent visual, and magnetic particle or penetrant.
1.25 to 1.50	100 percent visual, magnetic particle or penetrant, and radiographic, except that it shall be acceptable to reduce the percentage of castings inspected radiographically when an approved sampling quality control procedure is established.

(b) Castings which are pressure tested as parts of a hydraulic or other fluid system shall not be required to comply with the provisions of this section unless such castings support airplane structural loads.

§ 3.357 [Amendment]

33. By amending § 3.357 by adding at the end thereof the phrase "on airplanes which are not amphibian."

34. By amending § 3.359 by deleting from the second sentence the phrase "after the throttle is closed" and inserting in lieu thereof "after one or more throttles are closed" and by adding a note to read as follows:

§ 3.359 Position indicator and warning device.

* * * * *

NOTE: An acceptable method for indicating to the pilot when the wheels are secured in the extreme positions is by means of lights, e.g., landplanes may display a green light when the wheels are down and locked, a red light to indicate an intermediate or unlocked wheel position, and "all lights out" when the wheels are up and locked. An acceptable method for sensing when the wheels are secured in the extreme positions is to locate the sensing devices so that they are operated by the landing gear locking latch. A throttle stop is not considered to be an acceptable alternative to an aural landing gear warning device.

§§ 3.359–1, 3.359–2, 3.359–3 [Deletions]

35. By deleting §§ 3.359–1, 3.359–2, and 3.359–3.

36. By amending § 3.383 by adding a new paragraph (d) to read as follows:

§ 3.383 Windshields, windows, and canopies.

* * * * *

(d) The windshield and side windows forward of the pilot's back, when he is seated in normal flight position, shall have a luminous transmittance value of not less than 70 percent.

NOTE: Tinted windshields may adversely affect vision under certain flight conditions.

§ 3.390 [Amendment]

37. By amending § 3.390(c) by adding at the end thereof a new sentence to read as follows: "Where the multiplying factor of 1.33 is used, the fitting factor prescribed in § 3.306 need not be applied."

§ 3.432 [Deletion]

38. By deleting § 3.432.

39. By amending § 3.573 to read as follows:

§ 3.573 Oil filters.

If the powerplant installation incorporates an oil filter (strainer), the filter shall be constructed and installed so that oil will continue to flow at the normal rate through the remainder of the system when the flow of oil through the filter element is completely blocked.

40. By amending § 3.581 to read as follows:

§ 3.581 General.

The powerplant cooling provisions shall be capable of maintaining the temperatures of all powerplant components and fluids within the established limits during ground and flight operation.

§ 3.582 [Amendment]

41. By amending § 3.582 by deleting from the third sentence the word "maximum"; and by deleting from the fourth sentence the words "octane number" and inserting in lieu thereof "grade".

§ 3.586 [Amendment]

42. By amending § 3.586 by deleting the last sentence including paragraphs (a) and (b) and inserting in lieu thereof the following: "The climb shall not be conducted at a speed greater than the best rate-of-climb speed with maximum continuous power unless the slope of the flight path at the speed chosen for the cooling test is equal to or greater than the minimum required angle of climb (see § 3.85(a)) and a cylinder head temperature indicator is provided as specified in § 3.675. The stabilizing and climb portions of the test shall be conducted with cowl flap settings selected by the applicant (see §§ 3.85 and 3.85a)."

43. By amending § 3.587(a) to read as follows:

§ 3.587 Cooling test procedure for multi-engine airplanes

(a) *Airplanes which meet the minimum one-engine-inoperative climb performance specified in* § 3.85(b). The engine cooling test for these airplanes shall be conducted with the airplane in the configuration specified in § 3.85(b), except that the operating engines shall be operated at maximum continuous power or at full throttle when above the critical altitude. The stabilizing and climb portions of the test shall be conducted with cowl flap settings selected by the applicant (see § 3.85). Temperatures of the operating engines shall be stabilized in flight with the engines operating at not less than 75 percent of the maximum continuous power rating. After stabilizing temperatures in flight, the climb shall be started 1,000 feet below the engine critical altitude (if this is impracticable, then at the lowest practicable altitude which the terrain will permit) or 1,000 feet below the altitude at which the single-engine-inoperative rate of climb is 0.02 $V_{s_0}^2$, whichever is the lower altitude, and shall be continued until at least 5 minutes after the highest temperature has been recorded. The climb shall be conducted at a speed not greater than the highest speed at which compliance with the climb requirement of § 3.85(b) can be shown, except that, if the speed used exceeds the speed for best rate of climb with one engine inoperative, a cylinder head temperature indicator shall be provided as specified in § 3.675.

§ 3.681 [Amendment]

44. By deleting § 3.681(b).

§ 3.681–1, 3.681–2 [Deletions]

45. By deleting §§ 3.681–1 and 3.681–2 and related footnotes.

46. By amending § 3.682 and the center heading preceding § 3.682 to read as follows:

ELECTRIC POWER SOURCES

§ 3.682 Electric power sources.

(a) Electric power sources, their transmission cables, and their associated control and protective devices, shall have sufficient capacity to furnish the required power at the proper voltage to all load circuits essential to the safe operation of the airplane.

(b) Compliance with paragraph (a) of this section shall be shown by means of an electrical load analysis, or by electrical measurements, which take into account all electrical loads applied to the electrical system, in probable combinations and for probable durations.

(c) At least one generator shall be installed if the electrical system supplies power to load circuits essential to the safe operation of the airplane.

(d) Electric power sources shall function properly when connected in combination or independently. The failure or malfunction of any electric power source shall not impair the ability of any remaining source to supply load circuits essential to the safe operation of the airplane.

(e) Electric power source controls shall be such as to permit independent operation of each source.

§ 3.682–1 [Deletion]

47. By deleting § 3.682–1.

48. By deleting the center heading "Generators" preceding § 3.685.

49. By amending § 3.688 to read as follows:

§ 3.688 Arrangement.

A master switch shall be provided to permit expeditious disconnection of all electric power sources from all load circuits. The point of disconnection shall be adjacent to the power sources.

§§ 3.688–1, 3.688–2 [Deletions]

50. By deleting §§ 3.688–1 and 3.688–2 and related footnotes.

§ 3.690 [Amendment]

51. By amending § 3.690 by adding at the end thereof two sentences and a note as follows: "Not more than one circuit, which is essential to safety in flight, shall be protected by a single protective device. All resettable type circuit protective devices shall be designed so that a manual operation is required to restore service after tripping and so that, when an overload or circuit fault exists, they will open the circuit irrespective of the position of the operating control.

NOTE: The aforementioned resettable type circuit protective devices are known commercially as "trip-free"; i.e., the tripping mechanism cannot be overridden by the operating control. Such circuit protective devices can be reset on an overload or circuit fault, but will trip subsequently in accordance with their current-time trip characteristic."

§§ 3.690–1, 3.690–2 [Deletions]

52. By deleting §§ 3.690–1 and 3.690–2 and related footnotes.

53. By amending § 3.691 to read as follows:

§ 3.691 Protective devices installation.

If the ability to reset a circuit breaker or to replace a fuse is essential to safety in flight, such circuit breaker or fuse shall be so located and identified that it can be readily reset or replaced in flight.

54. By amending § 3.693 to read as follows:

§ 3.693 Electric cables.

Electric connecting cables shall be of adequate capacity. Cables which would overheat in the event of circuit overload or fault shall be flame-resistant and shall not emit dangerous quantities of toxic fumes.

§ 3.693–1 [Deletion]

55. By deleting § 3.693–1 and related footnote.

§ 3.702 [Amendment]

56. By amending Figures 3–16 referred to in § 3.702 by deleting the phrase "At least 2 candles" in the intensity column and inserting in lieu thereof "0.05 *I*."

§ 3.705 [Amendment]

57. By amending § 3.705(a) by deleting the number ".03" and inserting in lieu thereof "0.5", and by deleting the phrase "within a solid angle equal to 0.15 steradians centered about the longitudinal axis in the rearward direction."

§ 3.714 [Amendment]

58. By amending § 3.714 by deleting from the first sentence the word "danger" and inserting in lieu thereof "the probability".

§ 3.715 [Amendment]

59. By amending § 3.715 by adding at the end thereof a new sentence to read as follows: "Where the multiplying factor of 1.33 is used, the fitting factor prescribed in § 3.306 need not be applied."

60. By amending § 3.744 to read as follows:

§ 3.744 Powerplant limitations.

The following powerplant limitations shall be established for the airplane. The limitations shall not exceed the corresponding limits established as part of the type certification of the engine and propeller installed in the airplane.

(a) *Takeoff operation.* (1) Maximum rotational speed (rpm);

(2) Maximum permissible manifold pressure (if applicable);

(3) Maximum permissible gas temperature;

(4) The time limit for use of the power or thrust which corresponds with the values established in subparagraphs (1) through (3) of this paragraph;

(5) When the time limit established in subparagraph (4) of this paragraph exceeds 2 minutes, the maximum permissible cylinder head, oil, and liquid coolant temperatures.

(b) *Maximum continuous operation.* (1) Maximum rotational speed (rpm);

(2) Maximum permissible manifold pressure (if applicable);

(3) Maximum permissible gas temperature;

(4) Maximum permissible cylinder head, oil, and liquid coolant temperatures.

(c) *Fuel grade or specification designation.* The minimum fuel grade required for reciprocating engines or the fuel designation for turbine engines, required for the operation of the engine within the limitations prescribed in paragraphs (a) and (b) of this section.

§§ 3.745, 3.746, 3.747 [Deletions]

61. By deleting §§ 3.745, 3.746, and 3.747.

§ 3.767 [Amendment]

62. By amending § 3.767(a) by deleting the words "octane number" and inserting in lieu thereof "grade or designation."

63. By amending § 3.771 to read as follows:

§ 3.771 Airspeed placards.

(a) *All airplanes.* An airspeed placard shall be provided, in clear view of the pilot and as close as practicable to the airspeed indicator. The placard shall list the following:

(1) Maximum speed for gear operation and extension (see § 3.356);

(2) Design maneuvering speed (V_p) (see § 3.184);

(3) Minimum control speed (V_{mc}) (see § 3.111);

(4) The demonstrated crosswind (see § 3.145).

(b) *Airplanes weighing more than 6,000 lbs.* The placard prescribed in paragraph (a) of this section shall also include:

(1) Recommended climb speed;

(2) Best angle-of-climb speed;

(3) Engine-inoperative-climb speed;

(4) Approach speed(s).

64. By adding a new § 3.772 to read as follows:

§ 3.772 Types of operation placard.

A placard shall be provided in clear view of the pilot which states the day and/or night meteorological conditions to which the operation of the airplane is limited by the equipment installed. (See §§ 3.750 and 3.778(h).)

65. By amending § 3.778 by adding a new paragraph (h) to read as follows:

§ 3.778 Operating limitations.

* * * * *

(h) *Types of operation.* The day and/or night meteorological conditions to which the operation of the airplane is limited shall be stated. (See §§ 3.750 and 3.772.) All installed equipment affecting the operations limitations of the airplane shall be listed and identified as to operational function.

§ 3.779 [Amendment]

66. By amending § 3.779 by adding at the end thereof a new sentence to read as follows: "In particular, procedures and pertinent information relating to the use of the airspeeds prescribed in § 3.771(b) shall be included."

67. By amending § 3.780(c) to read as follows:

§ 3.780 Performance information.

* * * * *

(c) The calculated approximate effect of variations in paragraph (a) (3), (4), and (5) of this section with altitudes from sea level to 8,000 feet and with temperatures at these altitudes from minus 60° F. below standard to plus 40° F. above standard shall be included.

§ 3.780–1 [Deletion]

68. By deleting § 3.780–1.

Proposed rules—Part 4b:

Several revisions to the flight requirements are proposed. A change is proposed to § 4b.112 which deals with stalling speeds to prescribe a lg, level flight, stall speed determination instead of the present stall speed requirements which result in unrealistic values. Consistent with this, a similar change is proposed to § 4b.160.

To supplement existing controllability requirements, it is proposed to expand § 4b.130 to provide pilot control force criteria in particular flight conditions during phases of unsteady flight and during transition from one flight condition to another. In addition, a change is proposed to § 4b.131 to define the maximum control force required to demonstrate longitudinal controllability.

A number of changes are proposed to the stability requirements. Because static longitudinal stability may become dependent upon the stick-fixed characteristics as well as the stick-free characteristics when artificial stick forces are used, it is proposed to revise the stability requirements of § 4b.150 through § 4b.155. If the elevator control forces are not the result of the elevator control surface hinge moments, it is proposed that it must be shown that an upward displacement of the elevator trailing edge is required to obtain and maintain speeds below the specified trim speed and a downward displacement of the elevator trailing edge is necessary to obtain and maintain speeds above the specified trim speed. It is also proposed to revise § 4b.151(c) which now requires any speed change to be perceptible to the pilot by a change in stick force. Because of difficulties in ascertaining a "perceptible" change in stick force, it is proposed to define the minimum stick force versus speed gradient as not less than one pound per six knots. Present § 4b.155 provides that the airplane be stable over the entire operating speed range under the most adverse trim condition. It is not considered necessary that stability be demonstrated over this wide range of speed without retrimming. Therefore, it is proposed to amend § 4b.155 to permit retrimming at V_A in the cruise stability tests.

In conjunction with these proposed changes, it is also proposed to delete

§§ 4b.150–1 and 4b.151–1, together with the discussion of policies relating thereto, as well as §§ 4b.152–1, 4b.153–1, 4b.154–1, and 4b.155–1 because this material does not reflect the changes proposed for the corresponding sections of the regulations and the information contained in these sections is already covered elsewhere.

Proposed amendments to the strength requirements include changes to the provisions on flap design speeds, pressure cabins, unsymmetrical loads due to engine failure, ground handling conditions, landing gear fatigue evaluation, and casting factors.

The present requirements on design flap speed V_F in § 4b.210(b)(1) were based on the concept of a single speed at which the pilot could place the flaps in any position from fully retracted to fully extended without reducing or increasing speed and without exceeding limit loads or without approaching a stalling condition. For this reason the requirements specify that V_F shall not be less than the greater of 1.4 V_{s_1} (flaps retracted) or 1.8 V_{s_0} (flaps in landing position). However, the development of more efficient flaps has resulted in the establishment of different operating speeds and flap positions for various stages of flight; e.g., initial approach, final approach, landing, and takeoff. The requirements have been amended to permit supplementary values of the flaps extended operating limit speed (§ 4b.714(c)), and to cover en route flap conditions (§ 4b.212(b)). Nevertheless, the single flap design speed concept has been retained in §§ 4b.210(b), 4b.212(a), 4b.221(a), and 4b.714(a).

Recent improvements in high lift flap design have raised the question of whether it is any longer necessary for the design speed for flaps in the landing position to be based on the stalling speed with flaps retracted. In view of the current operating practice of progressively reducing airspeed as flaps are extended during approach and landing, and of retracting flaps as airspeed increases during takeoff or balked landing, it appears more rational to base the design speed for each flap position on the operating and stalling speeds corresponding with the particular flap position. Therefore, it is proposed to amend § 4b.210(b)(1) to permit the selection of a flap design speed for each flap position established for the various stages of flight, with minimum values of 1.8 V_s for flaps in approach and landing positions, and 1.6 V_s for flaps in the takeoff position. Where an automatic flap positioning or load limiting device is employed, it would be permissible to use the speeds and flap positions programmed by the device. To insure that flap load limiting devices will not cause unwanted flap retraction or the inability to extend flaps when desired, it is proposed to amend § 4b.323(c) to require the ability to maintain the selected flap position at speeds up to 1.65 V_s for flaps in approach and landing positions, and 1.55 V_s for flaps in the takeoff position. Related changes are proposed for §§ 4b.1(d)(10), 4b.212(a), (b), and (c), 4b.221, and 4b.714 to make these requirements consistent with the proposed method for establishing flap design speeds.

The present strength requirements for pressurized cabins state that, where the cabin is separated into compartments by bulkheads or floors, the primary structure shall be designed for the effects of sudden release of pressure in any compartment having external doors or windows. Difficulties have arisen in applying these requirements because primary structure is not defined and the objectives are not stated clearly. It is, therefore, proposed to amend § 4b.216(c)(4) to state that, under conditions of sudden pressure release, the integrity of the structure carrying flight loads shall be maintained, but that damage to other portions of the airplane is acceptable provided reasonable precautions are taken to minimize the probability of serious injury to the occupants while in their seats.

Section 4b.216(d) presently contains a general requirement that the airplane be designed for the unsymmetrical loads resulting from failure of one engine; e.g., yaw loads due to windmilling drag of a turbopropeller engine. On the basis of experience gained in design evaluation, testing, and operation of turbopropeller airplanes, it is proposed to amend § 4b.216(d) to state the factors to be considered in determining these loads, including types of engine failure, corresponding airplane speeds, malfunctioning of propeller drag limiting systems, and pilot corrective action.

Section 4b.235 presently contains an inconsistency between the drag loads specified for the main landing gear in the braked roll condition (which may be based on the maximum obtainable brake torque), and the drag load specified for one main gear in the nose wheel yawing condition (which is based solely on a friction coefficient of 0.8). Proposed changes to § 4b.235 would apply the yawing loads resulting from the 0.8 coefficient to the nose gear and supporting structure only. A drag load corresponding with the basic braked roll condition would be applied to one main gear as an overall airplane design condition.

The fatigue evaluation requirements of § 4b.270 at present apply only to structure supporting flight loads. A number of cases of landing gear fatigue cracking or failure have been reported. Although these failures have not resulted in fatal accidents, the possibility of fire after landing gear failure is a potential hazard. It is, therefore, proposed to insert a new § 4b.271, requiring a fatigue evaluation of the landing gear structure, and, where such evaluation indicates a need, the establishment of inspection or other procedures to prevent catastrophic fatigue failure. Alternatively, it may be shown that catastrophic failure of the landing gear is not probable after fatigue failure or after obvious partial failure of a single structural element.

The present requirements on factors of safety and inspections for structural castings (§ 4b.307(a)) specify a special factor of 2.0 for visual inspection only, a factor of 1.25 for radiographic inspection only, and a factor of 1.25 when radiographic inspection and strength tests of 3 sample castings are employed. Proposed changes to § 4b.307(a) would provide a series of casting factors and corresponding test and inspection requirements intended to reflect more modern methods and practices.

A revision to § 4b.334(e) concerning landing gear position indicators and warning devices is proposed to insure warning in the event a landing is made with one or more throttles advanced. It is also proposed to add a note setting forth an acceptable means of compliance which would replace § 4b.334–2. To insure that essential equipment in wheel well areas is not damaged by loose tire treads or a bursting tire, a change is proposed which would require protection of such equipment.

Current regulations (§ 4b.352) do not specifically require fail safe (laminated or dual pane) windshields and windows on pressurized cabin airplanes; however, existing turbine transport airplanes incorporate this feature, which has prevented complete loss of cabin pressurization in a considerable number of partial windshield failure incidents. It is, therefore, proposed to amend § 4b.352(d) to require that windshield and window panels in pressurized cabins consist of at least two layers of material, each capable of carrying the maximum pressure load after failure of one layer. It would be acceptable to establish operating limitations requiring a reduction in pressure differential after failure occurs, provided a cabin pressure altitude of not more than 15,000 feet is maintained.

Sections 4b.357 and 4b.371(d) require that, when louvers or other ventilating devices are provided between cabin partitions, it shall be possible for the crew to stop the flow of air through such ventilating devices. Because this requirement does not accomplish its apparent objective which is covered elsewhere, it is proposed to delete § 4b.357 and § 4b.371(d).

Sections 4b.358(c)(2) and 4b.643 presently require an additional factor of safety of 1.33 on the loads for seat and safety belt attachments, and § 4b.307(c) requires a factor of 1.15 for structural fittings (attachments). It is proposed to clarify §§ 4b.358(c)(2) and 4b.643 by inserting a statement that, when the 1.33 factor is applied, the 1.15 factor need not be added to it. This is consistent with the general principle that only the highest factor intended for a similar purpose need be applied. However, if castings are used, the casting factor specified in § 4b.307(a) would still apply, since this factor is intended for another purpose.

Studies have indicated that the 20-inch upper aisle width currently specified in § 4b.362(h) may be reduced for relatively smaller transport airplanes without significantly affecting safe emergency evacuation. A reduction to 18 inches appears justifiable; and it is proposed to reduce the upper aisle width to 18 inches for airplanes having a passenger seating capacity of 10 or less. However, the advisability of reducing this dimension further to 16 inches is still under consideration. Comments and supporting evidence are invited not only on the advisability of the proposed reduction from

20 inches to 18 inches but also on the advisability of a further reduction to 16 inches.

Section 4b.385 requires that in areas of the airplane where flammable fluids or vapors might be liberated by leakage or other failure in fluid systems, design precautions shall be taken to safeguard against the ignition of such fluids or vapors due to the operation of other equipment. However, a further provision of this section obviates this requirement, if means are provided to control the fire. It is proposed to delete this second option inasmuch as it is considered that providing for the control of fire is not a suitable alternative for taking design precautions to prevent fire. It is also proposed to delete § 4b.412 dealing with pressure cross-feed fuel lines because the provisions of § 4b.385 as proposed herein cover the installation of flammable fluid-carrying systems, including pressure cross-feed lines.

Presently effective §§ 4b.413 and 4b.416 cover the demonstration of adequate fuel flow and the selection of unusable fuel supply. The demonstration is required to be conducted with unusable fuel supply together with the minimum quantity of fuel necessary for conducting the flow test. The flight conditions specified in § 4b.416, used in connection with the selection of unusable fuel supply, are unnecessary provided that flight tests are conducted to show compliance with the fuel flow requirements of § 4b.413(b). It is proposed, therefore, to delete from § 4b.413 the option that the demonstration may be conducted by a ground test. It is proposed, however, to retain the presently effective provision that it be acceptable to demonstrate compliance with the requirement for selection of unusable fuel supply in level flight by means of a ground test. Presently effective § 4b.415 also covers fuel flow rate, relative to transfer systems, and bases required flow rates on horsepower output. Since the changes proposed for § 4b.413 would eliminate the horsepower basis for establishing flow rate, it is proposed to delete § 4b.415.

Because of the change proposed for § 4b.416, material contained in other sections is no longer necessary. Therefore, it is proposed to delete §§ 4b.416–1, 4b.416–2, 4b.418(a), 4b.418–1, and 4b.-426–1. The deletion of § 4b.420(d) is also proposed to eliminate a conflict with the definition of unusable fuel supply in § 4b.416.

In addition to the matter of unusable fuel supply, another question has arisen relating to the flow requirements of § 4b.413. Section 4b.413(a) presently requires that the available fuel flow shall be not less than 125 percent of that needed to develop maximum engine horsepower or thrust. The 25 percent margin is not required to insure adequate fuel flow. Furthermore, a margin is unnecessary to offset system deterioration because such deterioration is precluded by proper maintenance, inspection, and overhaul. Accordingly, it is proposed to delete § 4b.413(a).

It is proposed to revise § 4b.436 dealing with fuel system drains by deleting redundant and contradictory requirements.

Presently effective §§ 4b.450 through 4b.455 deal with the powerplant cooling capability and specify tests to show that powerplant temperature limits can be maintained. With the exception of § 4b.455 these sections apply to reciprocating engines. It is proposed to clarify §§ 4b.450 through 4b.452 by making them generally applicable to turbine engine installations as well as reciprocating engine installations and by specifying test conditions in general terms which are based on the applicable airplane performance requirements. This clarification would make §§ 4b.453 and 4b.455 unnecessary. Accordingly, it is proposed to delete them.

Consistent with the proposed changes to the powerplant cooling requirements, it is proposed to delete §§ 4b.440(e), 4b.454–1, 4b.465, and 4b.465–1 inasmuch as the matter of oil cooling and carburetor air cooling is covered in the changes proposed to §§ 4b.450 through 4b.455.

Section 4b.488 requires a fireproof diaphragm to isolate the engine power section and all portions of the exhaust system from the engine accessory compartment, unless equivalent protection can be shown by other means. Fire extinguishing systems are required in all cases to be provided in the engine power section, in the engine accessory section, and in complete powerplant compartments. Since it is considered that fire extinguishing systems are equivalent to a diaphragm in providing protection, there is no reason for retaining the provisions of § 4b.488. Accordingly, it is proposed to delete this section. Consistent with this proposal, it is also proposed to make editorial changes in §§ 4b.484 and 4b.487.

Section 4b.604(q) requires a thrust indicator for each turbojet engine. Because such indicators have not been perfected and because the thrust output information which is desired can be otherwise obtained, it is proposed to revise this section to require instead an indicator which will permit the pilot to determine if the thrust of any engine has changed with respect to the other engines.

It is proposed to amend § 4b.622(b) by adding two provisions which relate to the proper functioning of the generating system with respect to load equipment. These provisions are a more precise statement of the requirement in currently effective § 4b.627 and permit deletion of that requirement.

To eliminate an unnecessarily restrictive provision requiring that certain electrical protective devices or their controls be accessible for resetting in flight, it is proposed to amend § 4b.624(d). It is also proposed to amend § 4b.627 by deleting the currently effective rule and adding several provisions to insure the validity of electrical system tests under simulated conditions in the laboratory. Deletion of the wording in the present section is proposed because: (1) Other sections require such tests as are necessary to show compliance with all airworthiness requirements, including those dealing with the electrical system; and (2) the need for the provision that the electrical system "functions properly and without electrical or thermal distress" has been eliminated by the proposed revision to § 4b.622(b).

Presently effective § 4b.652 deals with the reliability of engine driven accessories and § 4b.659 specifies that an airplane must be able to continue safe flight in the event of a failure of a high energy rotor. It is proposed to delete these two sections because their substance is covered by the provisions of § 4b.606 which is concerned with the reliability of all equipment, systems, and installations. A new § 4b.656 is proposed to insure valid hydraulic system laboratory tests.

A change is being proposed to figure 4b–19 dealing with position light intensities in order to remove an irrational discontinuity.

Operating records show an increasing number of cases of exceeding the airspeed operating limits on transport category airplanes, particularly on turbine-powered airplanes. Also, the present regulations lack definite criteria for the rational determination of speed margins. Among the probable causes of overspeed are the characteristics of turbine-powered airplanes which make it desirable to operate at the limit speed, the somewhat indefinite significance of the present normal operating limit speed, and the increasing preoccupation of pilots with air traffic and other duties which distract them from continuous monitoring of airspeed instruments. Therefore, a series of amendments to the airspeed operating limitation and related requirements are proposed. These proposals would replace the existing normal operating limit and never exceed speeds (§§ 4b.711 and 4b.712) by a single speed at the previous normal operating limit value. The new single limit would be designated as the "maximum operating limit speed," and would be defined in the Airplane Flight Manual (§ 4b.741) as a speed which shall not be deliberately exceeded in any regime of flight, except where a higher speed is authorized for flight test or pilot training operations. The proposals would provide a rational method (based on a 7.5 degree dive maneuver), as well as alternative arbitrary factors, for calculating the speed margin between the new limit speed and the demonstrated flight or structural dive speeds. To provide for atmospheric conditions and other operational factors not covered by the 7.5 degree dive criteria, the proposal includes a minimum speed margin of 0.05 Mach number beyond the operating limit speed. This is 0.04 M beyond the proposed aural warning speed, and is believed to be consistent with the minimum margin on existing airplanes.

A new § 4b.191, high-speed characteristics, is proposed to cover in general terms the flight tests for speed increase and recovery characteristics, and to establish a maximum speed V_{FC} for certain stability characteristics. The speed margin between design speeds V_C and V_D in § 4b.210 would be replaced by a cross reference to § 4b.711.

To minimize overspeeding due to pilot preoccupation, it is proposed to require, under § 4b.603(k), a bell sound warning device on turbine-powered airplanes and on other airplanes having a speed margin of less than 20 percent between limit and demonstrated speeds. To insure early warning and thus to make a major portion of the speed margin available for pilot reaction and recovery maneuvers, it is proposed to require that the warning occur whenever the speed exceeds the limit speed by more than 6 knots or 0.01 M.

The proposed changes in terminology in the airspeed limitations would require corresponding changes, including deletions and additions, in §§ 4b.1(d) (9), (15), and (16); 4b.132(e); 4b.141; 4b.142 (c); 4b.154–1(b); 4b.155; 4b.155–1(a) (2); 4b.156; 4b.157; 4b.157–1; 4b.158; 4b.191; 4b.210(b)(4); 4b.210(b)(5); 4b.603(a); 4b.603(k); 4b.612(a)(3); 4b.711; 4b.712; 4b.740–1; and 4b.741(a).

The changes being proposed to Part 4b relating to airspeed operating limitations would apply only to new type airplanes for which application for type certificate is filed on or after the effective date of the amended regulations, and would not affect the existing airplanes. It has been suggested that a pilot education program would effectively reduce the number and magnitude of overspeed incidents, and an NASA team has already visited a number of airlines for this purpose. However, recent operating records show improvement for only 2 types of airplanes. Also, proper pilot education is hampered by the indefinite and inconsistent definition of the normal operating limit speed in existing Airplane Flight Manuals. Pilots have emphasized the importance of an aural speed warning device in reducing the magnitude of inadvertent speed increases. A Special Civil Air Regulation is therefore proposed to require, for all turbine-powered airplanes, that the Airplane Flight Manuals be revised to incorporate the airspeed operating limitation terminology proposed for Part 4b, and that such airplanes be equipped with an aural speed warning device. For reciprocating engine airplanes, the proposal would merely require revision of the statement in the Airplane Flight Manual explaining the significance of the existing speed limitations. Since these proposals would be retroactive to existing airplanes, it is proposed to allow 6 months (after adoption) for the revision of manuals and one year for installation of warning devices. Air carriers would be required to inform pilots of the planned changes as quickly as possible.

Miscellaneous changes of an editorial or clarifying nature are being proposed for §§ 4b.1, 4b.11, 4b.155, 4b.160, 4b.221, 4b.306, 4b.306–1, 4b.435, 4b.447, 4b.612, 4b.642, 4b.645, 4b.718, and 4b.738.

In consideration of the foregoing, it is proposed to amend Part 4b of the Civil Air Regulations (14 CFR Part 4b, as amended) as follows:

1. By amending § 4b.1 by amending paragraphs (b)(2), (d)(9), (d)(10), (d)(15), and (d)(16) to read as follows:

§ 4b.1 Definitions.

* * * * *

(b) *General design.* * * *

(2) *Maximum ambient atmospheric temperature.* The maximum atmospheric temperature is the temperature selected by the applicant as the maximum operational limit.

* * * * *

(d) *Speeds.* * * *

(9) V_{DF}/M_{DF}: The demonstrated flight diving speed at which compliance is shown with the applicable flight requirements. (See §§ 4b.190 and 4b.191(a).)

(10) V_F: The design flap speeds for flight loading conditions. (See §4b.210 (b)(1).)

* * * * *

(15) V_{FC}/M_{FC}: *The maximum speed for* stability characteristics. (See § 4b.191 (b).)

(16) V_{MO}/M_{MO}: The maximum operating limit speed. (See § 4b.711.)

2. By amending § 4b.11(b) by adding at the end thereof a note to read as follows.

§ 4b.11 Designation of applicable regulations.

* * * * *

(b) * * *

NOTE: The term "type certificate" as used in this paragraph does not include a "provisional" type certificate.

§ 4b.112 [Amendment]

3. By amending § 4b.112(c) by deleting from the introductory paragraph the words "the minimum speeds obtained in" and inserting in lieu thereof "obtained in level flight at a normal acceleration of 1g during".

4. By amending § 4b.130 by adding new paragraphs (c) and (d) to read as follows:

§ 4b.130 Controllability; general.

* * * * *

(c) Compliance with the "strength of pilots" limits in paragraph (b) of this section need not be demonstrated by quantitative tests unless the condition is found to be marginal. In the latter case, they shall not exceed the following pilot control force limits:

	Pitch	Roll	Yaw
(1) For temporary application	75	60	180
(2) For prolonged application	10	5	20

Pitch and roll forces shall be measured as applied to the rim of the control wheel.

(d) For the purpose of complying with paragraphs (a), (b), and (c) of this section, the airplane shall be operated in accordance with approved operating procedure or conventional operating practice including being trimmed at the prior steady flight condition, except that in the case of takeoff the airplane shall be trimmed in accordance with approved operating procedures. Prolonged forces appropriate to all-engine cruise flight shall not be considered.

NOTE: The pilot control force necessary for rotation and lift-off during takeoff and the subsequent force necessary to maintain a constant V_2 speed beyond the 35-foot point are-cited as examples of temporary and prolonged pilot control forces, respectively.

§ 4b.131 [Amendment]

5. By amending § 4b.131(b) by deleting the first sentence and inserting in lieu thereof the following: "During each of the following controllability demonstrations a change in the trim control shall not be required. In addition, exertion of more than 50 pounds control force, representative of the maximum temporary force which can readily be applied by one hand, shall not be required."

§ 4b.132 [Amendment]

6. By amending § 4b.132(e) by deleting from the last sentence the symbol "V_{NE}" and inserting in lieu thereof "V_{FC}/M_{FC}."

§ 4b.141 [Amendment]

7. By amending § 4b.141 by deleting the words "V_{NO} or to M_{NO}, whichever is the lesser" and inserting in lieu thereof "V_{MO}/M_{MO}."

§ 4b.142 [Amendment]

8. By amending § 4b.142(c) by deleting the word "V_{NO} or to M_{NO}, whichever is the lesser" and inserting in lieu thereof "V_{MO}/M_{MO}".

9. By amending § 4b.150 to read as follows:

§ 4b.150 General.

The airplane shall be longitudinally, directionally, and laterally stable in accordance with §§ 4b.151 through 4b.158. Suitable stability shall be required in other conditions normally encountered in service if flight tests show such stability to be necessary for safe operation.

§ 4b.150–1 [Deletion]

10. By deleting § 4b.150–1.

11. By amending § 4b.151 by amending the introductory paragraph and paragraphs (a) and (c) to read as follows:

§ 4b.151 Static longitudinal stability.

In the conditions outlined in §§ 4b.152 through 4b.155, the characteristics of the elevator control forces including friction and the elevator control surface displacement shall comply with paragraphs (a) through (c) of this section.

(a) A pull shall be required to obtain and maintain speeds below the specified trim speed, and a push shall be required to obtain and maintain speeds above the specified trim speed, except that if the elevator control forces are not dependent upon the hinge moments of the elevator control surface it shall also be shown that an upward displacement of the elevator trailing edge is required to obtain and maintain speeds below the specified trim speed and a downward displacement of the elevator trailing edge is required to obtain and maintain speeds above the specified trim speed. These criteria shall apply to any speed which can be obtained, except that such speeds need not be greater than the appropriate operating limit speed or need

not be less than the minimum speed in steady unstalled flight.

* * * * *

(c) The stable slope of the stick force versus speed curve shall not be less than 0.5 pounds per 3 knots nor shall it exceed a value beyond which control of the airplane is difficult.

§ 4b.151–1 [Deletion]

12. By deleting § 4b.151–1.

13. By amending § 4b.152 to read as follows:

§ 4b.152 Stability during landing.

The stick force curve and, if required by § 4b.151(a), the elevator angle curve shall have stable slopes and the stick force shall not exceed 80 pounds at any speed between 1.1 V_{s_0} and 1.8 V_{s_0} with:

(a) Wing flaps in the landing position;

(b) The landing gear extended;

(c) Maximum landing weight;

(d) Power, or thrust, off on all engines;

(e) The airplane trimmed at 1.4 V_{s_0} with power or thrust off.

§ 4b.152–1 [Deletion]

14. By deleting § 4b.152–1.

15. By amending § 4b.153 to read as follows:

§ 4b.153 Stability during approach.

The stick force curve and, if required by § 4b.151(a), the elevator angle curve shall have stable slopes at all speeds between 1.1 V_{s_1} and 1.8 V_{s_1} with:

(a) Wing flaps in the approach position;

(b) Landing gear retracted;

(c) Maximum landing weight;

(d) The airplane trimmed at 1.4 V_{s_1} and with power sufficient to maintain level flight at this speed.

§ 4b.153–1 [Deletion]

16. By deleting § 4b.153–1.

17. By amending § 4b.154 to read as follows:

§ 4b.154 Stability during climb.

The stick force curve and, if required by § 4b.151(a), the elevator angle curve shall have stable slopes at all speeds between 85 and 115 percent of the speed at which the airplane is trimmed with:

(a) Wing flaps retracted;

(b) Landing gear retracted;

(c) Maximum takeoff weight;

(d) 75 percent of maximum continuous power for reciprocating engines; maximum power or thrust selected by the applicant as an operating limitation for use during climb (see § 4b.718) for turbine engines;

(e) The airplane trimmed at the best rate of climb speed except that the speed need not be less than 1.4 V_{s_1}.

§ 4b.154–1 [Deletion]

18. By deleting § 4b.154–1.

19. By amending § 4b.155 to read as follows:

§ 4b.155 Stability during cruising.

(a) *Landing gear retracted; high speed.* The stick force curve and, if required by § 4b.151(a), the elevator angle curve shall have stable slopes at all speeds between V_A and V_{FC}/M_{FC} and the stick force shall not exceed 50 pounds with:

(1) Wing flaps retracted;

(2) The most critical weight between maximum landing weight and maximum takeoff weight;

(3) 75 percent of maximum continuous power for reciprocating engines; maximum cruising power selected by the applicant as an operating limitation (see § 4b.718) for turbine engines, except that the power need not exceed that required at V_{MO}/M_{MO};

(4) The airplane trimmed for level flight with the power required in subparagraph (3) of this paragraph.

(b) *Landing gear retracted; low speed.* The stick force curve and, if required by § 4b.151(a), the elevator angle curve shall have stable slopes at all speeds between 1.4 V_{s_1} and V_A and the stick force shall not exceed 50 pounds with the wing flaps and weight as specified in paragraph (a) of this section and with:

(1) Power required for level flight at V_A;

(2) The airplane trimmed for level flight with the power required in subparagraph (1) of this paragraph.

(c) *Landing gear extended.* The stick force curve and, if required by § 4b.151 (a), the elevator angle curve shall have stable slopes at all speeds between 1.4 V_{s_1} and V_{LE} and the stick force shall not exceed 50 pounds with the wing flaps and the weight as specified in paragraph (a) of this section and with:

(1) Power required for level flight at V_{LE};

(2) The airplane trimmed for level flight with the power required in subparagraph (1) of this paragraph.

§ 4b.155–1 [Deletion]

20. By deleting § 4b.155–1.

§ 4b.156 [Amendment]

21. By amending § 4b.156 by inserting between the words "airplane" and "shall" the parenthetical expression "(e.g., V_{FE}, V_{LE}, or V_{FC}/M_{FC})".

§ 4b.157 [Amendment]

22. By amending § 4b.157 by inserting at the end of paragraph (a) and at the end of paragraph (b)(1), the words ", V_{FE}, V_{LE}, or V_{FC}/M_{FC}, whichever is appropriate".

§ 4b.157–1 [Amendment]

23. By amending § 4b.157–1 by deleting from paragraphs (e)(3)(ii), (e)(4), and (f)(2)(iii) the symbol "V_C" and inserting in lieu thereof "V_{MO}/M_{MO}".

§ 4b.158 [Amendment]

24. By amending § 4b.158 by inserting between the words "airplane" and "shall" the parenthetical expression "(e.g., V_{FE}, V_{LE}, or V_{FC}/M_{FC})".

§ 4b.160 [Amendment]

25. By amending § 4b.160(c)(1) by deleting the phrase "With trim controls adjusted for straight flight at a speed of 1.4 V_{s_1}" and inserting in lieu thereof "With the airplane trimmed for straight flight at the speed prescribed in § 4b.112(c)(1)".

26. By amending § 4b.160(e) to read as follows:

§ 4b.160 Stalling; symmetrical power.

* * * * *

(e) Straight flight stalls shall be entered with wings level. The roll occurring between the stall and the completion of the recovery shall not exceed approximately 20 degrees.

27. By adding a new § 4b.191 to read as follows:

§ 4b.191 High-speed characteristics.

(a) *Speed increase and recovery characteristics.* (1) Operating conditions or characteristics likely to cause inadvertent speed increases, including upsets in pitch and roll, shall be simulated with the airplane initially trimmed at any likely cruise speed up to V_{MO}/M_{MO}. Allowing for pilot reaction time after effective inherent or artificial speed warning occurs (see § 4b.603(k)), it shall be demonstrated that the airplane can be recovered to a normal attitude and its speed reduced to V_{MO}/M_{MO} without requiring exceptional strength or skill on the part of the pilot, without exceeding V_D/M_D, V_{DF}/M_{DF}, or the structural limitations, and without producing buffeting which would cause structural damage.

NOTE: Examples of operating conditions or characteristics likely to cause speed increases are: gust upsets, inadvertent control movements, low stick force gradient in relation to control friction, passenger movement, leveling off from climb, and descent from Mach to airspeed limit altitudes.

(2) At all speeds up to V_{DF}/M_{DF}, there shall be no reversal of control effect. Any reversal of elevator control force or tendency of the airplane to pitch, roll, or yaw, including short period oscillations, shall be mild and readily controllable using normal piloting technique.

(b) *Maximum speed for stability characteristics, V_{FC}/M_{FC}.* V_{FC}/M_{FC} shall be the maximum speed at which the requirements of §§ 4b.132(e), 4b.155(a), 4b.156, 4b.157(a), 4b.157(b), and 4b.158 are required to be met with flaps and landing gear retracted. It shall not be less than a speed halfway between V_{MO}/M_{MO} and V_{DF}/M_{DF}, except that in the altitude range where Mach number is the limiting factor, M_{FC} need not exceed the Mach number at which effective speed warning occurs.

28. By amending § 4b.210(b)(1) to read as follows:

§ 4b.210 General.

* * * * *

(b) *Design air speeds.* * * *

(1) *Design flap speeds, V_F.* The design flap speed for each flap position established in accordance with § 4b.323(a) shall be sufficiently greater than the operating speed recommended for the corresponding stage of flight (including balked landings) to allow for probable variations in control of airspeed and for transition from one flap position to another. V_F shall be not less than:

(i) 1.6 V_s with flaps in takeoff position;

(ii) 1.8 V_s with flaps in approach position;

(iii) 1.8 V_s with flaps in landing position;

where V_s shall be the stalling speed for the corresponding flap position and associated maximum weight. Where an automatic flap positioning or load limiting device is employed, it shall be permissible to use the speeds and corresponding flap positions programmed or permitted by the device. (See § 4b.323(c).)

29. By amending § 4b.210(b)(4) by adding at the end thereof the parenthetical reference "(See § 4b.711.)"

30. By amending § 4b.210(b)(5) to read as follows:

§ 4b.210 General.

* * * * *

(b) *Design air speeds.* * * *

(5) *Design dive speed, V_D.* The design dive speed chosen by the applicant shall be used in determining the maximum operating limit speed for the airplane in accordance with § 4b.711.

31. By amending § 4b.212(a) by deleting the introductory paragraph and inserting in lieu thereof the following: "When flaps are intended for use during takeoff, approach, or landing, the airplane shall be assumed to be subjected to symmetrical maneuvers and gusts within the range determined by the following conditions, at the design flap speeds established for these stages of flight in accordance with § 4b.210(b)(1) and with the flaps in the corresponding positions."

32. By amending § 4b.212(b) by deleting from the introductory paragraph the words "V_{FE} speed established in accordance with § 4b.714(c)" and inserting in lieu thereof "the flap design speed chosen for this condition."

33. By amending § 4b.212 by deleting paragraph (d) and amending paragraph (c) to read as follows:

§ 4b.212 Effect of high lift devices.

* * * * *

(c) The airplane shall be designed for the conditions prescribed in paragraph (a) of this section, except that the airplane load factor need not exceed 1.0, taking into account the following effects as separate conditions:

(1) Propeller slipstream corresponding with maximum continuous power at the design flap speeds V_F, and with takeoff power at not less than 1.4 times the stalling speed for the particular flap position and associated maximum weight.

(2) A head-on gust of 25 feet per second velocity (EAS).

§ 4b.216 [Amendment]

34. By amending § 4b.216 by amending paragraphs (c)(4) and (d) to read as follows:

§ 4b.216 Supplementary flight conditions.

* * * * *

(c) *Pressurized cabin loads.* * * *

(4) Where a pressurized cabin is separated into two or more compartments by partitions, bulkheads, or floors, the structure supporting the prescribed flight and ground loads and other structure the failure of which could interfere with continued safe flight and landing of the airplane shall be designed to withstand the effects of sudden release of pressure in any compartment resulting from the failure of the largest external door, window, or windshield panel in such compartment. It shall be acceptable to take into account pressure relief provided by intercompartment venting. It can be assumed that parts of the airplane, other than the structure specified in this paragraph, may be damaged, in which case reasonable design precautions shall be taken to minimize the probability of serious injury to occupants of the airplane while in their seats.

NOTE: The aforementioned precautions might include, for example, designing internal doors so that they will remain attached to supporting structure even though forced open by differential pressure.

(d) *Unsymmetrical loads due to engine failure.* The airplane shall be designed for the unsymmetrical loads resulting from the failure of the critical engine. Turbopropeller airplanes shall be designed for the conditions prescribed in subparagraphs (1) through (4) of this paragraph in combination with a single malfunction of the propeller drag limiting system (see § 4b.408), taking into account the probable pilot corrective action on the flight controls.

(1) At all speeds between V_{MC} and V_D, the loads resulting from engine power failure due to fuel flow interruption or turbine blade burn-off, whichever is critical, shall be considered as limit loads.

(2) At all speeds between V_{MC} and V_C, the loads resulting from the disconnection of the engine compressor from the turbine shall be considered as ultimate loads.

(3) The time history of the thrust decay and drag build-up occurring as a result of the prescribed engine failures shall be substantiated by test or other data applicable to the particular engine-propeller combination.

(4) The timing and magnitude of the probable pilot corrective action shall be conservatively estimated, considering the characteristics of the particular engine-propeller-airplane combination.

NOTE: It may be assumed that pilot corrective action will be initiated at the time maximum yawing velocity is attained, but not earlier than two seconds after the engine failure. The magnitude of the corrective action may be based on the control forces specified in § 4b.220(a)(1), except that lower forces may be assumed where it is shown by analysis or test that such forces will be sufficient to control the yaw and roll resulting from the prescribed engine failure conditions.

35. By amending § 4b.221 to read as follows:

§ 4b.221 Wing flaps.

Wing flaps and their supporting structure and operating mechanism shall be designed for the critical loads resulting from the conditions prescribed in § 4b.212, taking into account the loads occurring during transition from one flap position and airspeed to another.

§ 4b.235 [Amendment]

36. By amending § 4b.235 by deleting from the last sentence of the introductory paragraph the phrase "of paragraph (b)(1) and (2)" and inserting in lieu thereof "paragraphs (b)(1) and (2), and (e)(3)".

37. By amending § 4b.235(e)(2) by adding at the beginning thereof a new sentence to read as follows: "It shall be acceptable to apply the conditions of this subparagraph to the design of only the nose gear, its attaching structure, and the fuselage structure."

38. By amending § 4b.235 by adding a new paragraph (e)(3) to read as follows:

(3) This subparagraph shall apply to the landing gear and airplane structure. The loading conditions shall be those prescribed in subparagraph (2) of this paragraph, except that the forward acting load at the center of gravity need not exceed the maximum drag reaction on one main gear determined in accordance with the introductory paragraph and paragraph (b)(2) of this section.

§ 4b.270 [Amendment]

39. By amending the title of § 4b.270 to read *"Fatigue evaluation of flight structure."*

40. By adding a new § 4b.271 to read as follows:

§ 4b.271 Fatigue evaluation of landing gear.

The strength, detail design, and fabrication of those portions of the landing gear and its attachment fittings in which fatigue may be critical shall be evaluated in accordance with the provisions of either paragraph (a) or (b) of this section.

(a) The fatigue strength of the structure shall be evaluated and, where indicated by such evaluation, inspection or other procedures shall be established to prevent catastrophic fatigue failure. The evaluation shall include the loading spectrum expected in service and the identification and analysis or repeated load testing of the principal structural elements and detail design points where catastrophic fatigue failure could occur. It shall be acceptable to utilize the service history of airplanes of similar structural design, taking due account of differences in operating conditions and procedures.

(b) It shall be shown by analysis or tests that catastrophic failure is not probable after fatigue failure or obvious partial failure of a single principal structural element. After such failure the remaining structure shall be capable of withstanding static loads corresponding with 80 percent of the limit loads resulting from the conditions prescribed in § 4b.230. These static loads shall be considered ultimate loads.

41. By amending § 4b.306(c) and the note to read as follows:

§ 4b.306 Material strength properties and design values.

* * * * *

(c) MIL-HDBK-5, ANC-17, ANC-18, and ANC-23 (Part II) values shall be used unless shown to be inapplicable in a particular case.

NOTE: MIL-HDBK-5, "Strength of Metal Aircraft Elements"; ANC-17, "Plastics for Aircraft"; ANC-18, "Design of Wood Aircraft Structures"; and ANC-23, "Composite Construction for Flight Vehicles," are published by the Department of Defense and the Federal Aviation Agency. They may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

§ 4b.306-1 [Amendment]

42. By amending § 4b.306-1 by deleting from paragraph (a) the expression "ANC-5" and inserting in lieu thereof "MIL-HDBK-5"; by deleting from paragraph (c) and the footnote the words "The ANC-5 Bulletin" wherever they appear and inserting in lieu thereof "MIL-HDBK-5"; and by deleting from footnote 8 the phrase "to § 3.111 'Design Mechanical Properties'" and inserting in lieu thereof "to § 3.1.1 'Material Properties'".

43. By amending § 4b.307(a) to read as follows:

§ 4b.307 Special factors.

* * * * *

(a) *Casting factors.* (1) For structural castings, the factor of safety prescribed in § 4b.200(a) shall be multiplied by the casting factors specified in subdivisions (i) and (ii) of this subparagraph. The prescribed tests and inspections shall be in addition to those necessary to establish foundry quality control. Castings shall be inspected in accordance with approved specifications.

(i) Each casting, the failure of which would preclude continued safe flight and landing of the airplane or which would result in serious injury to occupants, shall have a casting factor not less than 1.25 and shall receive 100 percent inspection by visual, radiographic, and magnetic particle or penetrant inspection methods. Where such castings have a casting factor less than 1.50, three sample castings shall be static tested. The test castings shall comply with the strength requirements of § 4b.201 at an ultimate load corresponding with a casting factor of 1.25 and shall comply with the deformation requirements at a load equal to 1.15 times limit load.

NOTE: Examples of castings to which this subdivision applies are: structural attachment fittings; parts of flight control systems; control surface hinges and balance weight attachments; seat, berth, safety belt, and fuel and oil tank supports and attachments; cabin pressure valves.

(ii) For structural castings other than those specified in subdivision (i) of this subparagraph, the casting factor shall be not less than 1.25, and the required inspections shall be as follows:

Casting factor	Inspections
2.0 or greater	100 percent visual.
Less than 2.0 greater than 1.5.	100 percent visual, and magnetic particle or penetrant.
1.25 to 1.50	100 percent visual, magnetic particle or penetrant, and radiographic, except that it shall be acceptable to reduce the percentage of castings inspected radiographically when an approved sampling quality control procedure is established.

(2) Castings which are pressure tested as parts of a hydraulic or other fluid system need not comply with the provisions of this section unless such castings support airplane structural loads.

(3) A casting factor need not be employed with respect to the bearing surface of a part if the bearing factor used (see paragraph (b) of this section) is greater than the casting factor.

§ 4b.323 [Amendment]

44. By amending § 4b.323(c) by adding at the end thereof a new sentence to read as follows: "Flap load limiting devices shall be designed to permit attaining and maintaining the selected flap position at all speeds up to 1.55 V_s for takeoff flap positions and 1.65 V_s for approach and landing flap positions, V_s being the stalling speed for the corresponding flap position and associated maximum weight".

§ 4b.334 [Amendment]

45. By amending § 4b.334(e)(2) by deleting the word "all" and inserting in lieu thereof "one or more".

§ 4b.334 [Amendment]

46. By amending § 4b.334 by adding a note at the end of paragraph (e)(1); and by adding a new paragraph (g) to read as follows:

(e) *Position indicator and warning device.* (1) * * *

NOTE: An acceptable method for indicating to the pilot when the landing gear is secured in the extended and in the retracted positions is by means of lights. For example, landplanes may display a green light when the landing gear is down and locked; a red light to indicate an intermediate or unlocked landing gear position; and "all lights out" when the landing gear is up and locked. An acceptable method for sensing when the landing gear is secured in the extreme positions is to locate the sensing devices so that they are operated by the landing gear locking latch.

* * * * *

(g) *Protection of equipment in wheel wells.* Equipment essential to safe operation of the airplane, when located in wheel wells, shall be protected against the damaging effects of loose tire treads or of a bursting tire.

§ 4b.352 [Amendment]

47. By amending § 4b.352(d) by adding at the end thereof, after the parenthetical expression, two new sentences to read as follows: "Windshield and window panels shall consist of at least two layers of load-carrying material (e.g., laminated construction or separate inner and outer panes) and shall be shown by test or analysis to be capable of withstanding the maximum cabin pressure differential loads combined with critical aerodynamic pressure and temperature effects, after failure of one layer of the load-carrying material. It shall be acceptable to assume that after such failure occurs the cabin pressure differential will be reduced in accordance with appropriate operating limitations enabling continued safe flight of the airplane with a cabin pressure altitude of not more than 15,000 feet. (See § 4b.374(b).)"

§ 4b.357 [Deletion]

48. By deleting § 4b.357.

§ 4b.358 [Amendment]

49. By amending § 4b.358(c)(2) by adding at the end thereof a new sentence to read as follows: "Where the multiplying factor of 1.33 is used, the fitting factor prescribed in § 4b.307(c) need not be applied."

50. By amending § 4b.362(h) to read as follows:

§ 4b.362 Emergency evacuation.

* * * * *

(h) *Width of main aisle.* The main passenger aisle width at any point between seats shall not be less than the values in the following table:

Passenger seating capacity	Minimum main passenger aisle width	
	Less than 25 inches from floor	25 inches and more from floor
	Inches	*Inches*
10 or less	12	15
11 to 19	12	20
20 or more	15	20

§ 4b.371 [Deletion]

51. By deleting § 4b.371(d).

52. By amending § 4b.385 to read as follows:

§ 4b.385 Flammable fluid fire protection.

Provisions shall be incorporated to prevent the ignition of fluid which might be liberated by leakage or failure of flammable fluid systems.

§ 4b.412 [Deletion]

53. By deleting § 4b.412.

54. By amending § 4b.413 to read as follows:

§ 4b.413 Fuel flow demonstration.

(a) The ability of the fuel system to provide not less than 100 percent of the fuel flow required by the engines shall be demonstrated when the airplane is operated at attitudes and altitudes representing the most adverse conditions from the standpoint of fuel feed.

(b) During the demonstration prescribed in paragraph (a) of this section, the provisions of subparagraphs (1) through (4) of this paragraph shall apply:

(1) Fuel shall be delivered to the engine at a pressure within the limits specified in the engine type certificate.

(2) The quantity of fuel in the tank being considered shall not exceed the sum of the amount established as the unusable fuel supply for that tank, as determined in accordance with the provisions of § 4b.416, and whatever minimum quantity of fuel it may be necessary to add for the purpose of conducting the flow test.

(3) Such main pumps shall be used as are necessary for each operating condition and airplane attitude for which the demonstration is made. For each main pump so used, the demonstration shall be repeated, substituting, if required, the appropriate emergency pump for the main pump. (See § 4b.430(b).)

(4) If a fuel flowmeter is provided, operation of the meter shall be blocked

during the flow test prescribed in this section and the fuel shall flow through the meter or its bypass.

§ 4b.415 [Deletion]

55. By deleting § 4b.415.

56. By amending § 4b.416 to read as follows:

§ 4b.416 Determination of unusable fuel supply and fuel system operation on low fuel.

(a) The unusable fuel supply shall be selected by the applicant. The unusable fuel supply for each tank used for takeoff and landing shall be established as not less than the quantity at which the first evidence of malfunctioning occurs under the most adverse condition from the standpoint of fuel feed during the takeoff and landing. The unusable fuel supply for all tanks other than those used for takeoff and landing shall be established as not less than the quantity at which the first evidence of malfunctioning occurs during level flight. A ground test of the level flight condition shall be acceptable.

(b) If an engine can be supplied with fuel from more than one tank, it shall be possible to regain the full fuel pressure of that engine in not more than 20 seconds after switching to any fuel tank when engine malfunctioning becomes apparent due to the depletion of the fuel supply in any tank from which the engine can be fed. Compliance with this provision shall be demonstrated in level flight.

§§ 4b.416–1, 4b.416–2 [Deletions]

57. By deleting §§ 4b.416–1 and 4b.416–2.

58. By amending § 4b.418 to read as follows:

§ 4b.418 Flow between interconnected tanks.

If it is possible to pump fuel from one tank to another in flight, the design of the fuel tank vents and the fuel transfer system shall be such that no structural damage to tanks will occur in the event of overfilling.

§ 4b.418–1 [Deletion]

59. By deleting § 4b.418–1.

§ 4b.420 [Deletion]

60. By deleting § 4b.420(d).

§ 4b.426 [Deletion]

61. By deleting § 4b.426–1.

62. By amending § 4b.435(d) to read as follows:

§ 4b.435 Fuel strainer or filter.

* * * * *

(d) Provision shall be made to maintain automatically the fuel flow when ice-clogging of the filter occurs, unless means are incorporated in the fuel system to prevent the accumulation of ice particles on the filter.

63. By amending § 4b.436 to read as follows:

§ 4b.436 Fuel system drains.

Drainage of the system shall be accomplished by fuel strainer drains and other drains as provided in § 4b.424. The drains shall discharge clear of all portions of the airplane and shall incorporate means for positive locking of the drain in the closed position, either manually or automatically.

§ 4b.440 [Deletion]

64. By deleting § 4b.440(c).

§ 4b.440–1 [Deletion]

65. By deleting § 4b.440–1.

66. By amending § 4b.447 to read as follows:

§ 4b.447 Oil filters.

If the powerplant installation incorporates an oil filter (strainer), the filter shall be constructed and installed so that oil will continue to flow at the normal rate through the remainder of the system when the flow of oil through the filter element is completely blocked.

67. By amending § 4b.450 to read as follows:

§ 4b.450 General.

The powerplant cooling provisions shall be capable of maintaining the temperatures of powerplant components and engine fluids within the temperature limits established for such components and fluids, under all surface (ground or water) and flight operating conditions. (For cooling system instruments see §§ 4b.604 and 4b.734.)

§ 4b.450–1 [Deletion]

68. By deleting § 4b.450–1.

69. By amending § 4b.451 to read as follows:

§ 4b.451 Cooling tests.

(a) *General.* Compliance with the provisions of § 4b.450 shall be demonstrated by test under critical surface (ground or water) and flight operating conditions. If the tests are conducted under conditions which deviate from the maximum ambient atmospheric temperature (see paragraph (b) of this section), the recorded powerplant temperatures shall be corrected in accordance with the provisions of paragraphs (c) and (d) of this section. The corrected temperatures determined in this manner shall not exceed the established limits. In the case of reciprocating engines, the fuel used during the cooling tests shall be of the minimum grade approved for the engines involved, and the mixture settings shall be those normally used in the flight stages for which the cooling tests are conducted. The test procedures shall be as outlined in §§ 4b.452 and 4b.454.

(b) *Maximum ambient atmospheric temperature.* A maximum ambient atmospheric temperature corresponding with sea level conditions shall be established by the applicant as a limitation on the operation of the airplane (see § 4b.718). The temperature lapse rate shall be 3.6° F. per thousand feet of altitude above sea level until a temperature of −69.7° F. is reached above which altitude the temperature shall be constant at −69.7° F.

(c) *Correction factor.* Temperatures of all powerplant components and engine fluids, except cylinder barrels, for which temperature limits have been established, shall be corrected by adding the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum component or fluid temperature recorded during the cooling test, unless a more rational correction is shown to be applicable.

(d) *Correction factor for cylinder barrel temperatures.* Cylinder barrel temperatures shall be corrected by adding 0.7 of the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum cylinder barrel temperature recorded during the cooling test, unless a more rational correction is shown to be applicable.

70. By amending § 4b.452 to read as follows:

§ 4b.452 Cooling test procedures.

(a) *General.* Compliance with the provisions of § 4b.450 shall be established for the takeoff, climb, en route, and landing stages of flight which correspond with the applicable performance regulations. The cooling tests shall be conducted with the airplane in the configuration and operating under the conditions which are critical relative to cooling during each stage of flight.

(b) *Temperature stabilization.* For all stages of flight, temperatures shall be stabilized under conditions from which entry is made into the stage of flight for which a test is conducted, except when the entry condition normally is not one during which component and engine fluid temperatures would stabilize. In such case, operation through the full entry condition shall be conducted prior to entry into the stage of flight for which the test is conducted in order to allow temperatures to attain their natural level at the time of entry. In particular, the takeoff cooling test shall be preceded by a period during which the powerplant component and engine fluid temperatures are stabilized with the engines at ground idle.

(c) *Duration of test.* Cooling tests for each stage of flight shall be continued until one of the following conditions is fulfilled:

(1) Component and engine fluid temperatures stabilize;

(2) The stage of flight is completed; or

(3) An operating limitation is reached.

NOTE: In the case of reciprocating engines, it may be assumed for cooling test purposes that the takeoff stage of flight is complete when the airplane has attained an altitude of 1,500 feet above the takeoff surface or a point in the takeoff where the transition from the takeoff to the en route configuration is completed and a speed is reached at which compliance with § 4b.120(c) is shown, whichever point is at a higher altitude.

§ 4b.452–1 [Deletion]

71. By deleting § 4b.452–1.

§§ 4b.453, 4b.453–1 [Deletions]

72. By deleting §§ 4b.453 and 4b.453–1.

§ 4b.454–1 [Deletion]

73. By deleting § 4b.454–1.

§ 4b.455 [Deletion]

74. By deleting § 4b.455.

§§ 4b.465, 4b.465–1 [Deletions]

75. By deleting §§ 4b.465 and 4b.465–1.

§ 4b.484 [Amendment]

76. By amending § 4b.484(a)(1) by deleting from the third sentence the words "complying with the provisions of § 4b.488".

§ 4b.487 [Amendment]

77. By amending § 4b.487(c) by deleting from the first sentence the words "complying with § 4b.488" and inserting in lieu thereof "to isolate the engine power section from the engine accessory section."

§ 4b.488 [Deletion]

78. By deleting § 4b.488.

§ 4b.603 [Amendment]

79. By amending § 4b.603(a) by deleting the symbol "V_{NE}" and inserting in lieu thereof "V_{MO}/M_{MO}".

80. By amending § 4b.603 by adding a new paragraph (k) to read as follows:

(k) Speed warning device for all turbine-powered airplanes and for all other airplanes for which V_{MO}/M_{MO} is greater than 0.8 V_{DF}/M_{DF} or 0.8 V_D/M_D. The device shall provide effective bell sound warning to the pilots whenever the speed exceeds V_{MO} plus 6 knots or $M_{MO}+0.01$. These speeds shall be considered as the upper limit of the production tolerance permitted for the warning device.

81. By amending § 4b.604(q) to read as follows:

§ 4b.604 Powerplant instruments.

* * * * *

(q) An indicator for each turbojet engine to indicate a change in thrust, resulting from any deficiency in the engine, relative to the thrust being obtained by the remaining engines.

§ 4b.612 [Amendment]

82. By amending § 4b.612(a)(3) by deleting the symbol "V_{NO}" and inserting in lieu thereof "V_{MO}".

83. By amending § 4b.612(f) to read as follows:

(f) *Duplicate instrument systems.* If duplicate flight instruments are required by the operating parts of the Civil Air Regulations (see note under § 4b.610), the provisions of subparagraphs (1) through (4) of this paragraph shall apply.

(1) The operating system for flight instruments used by the first pilot, which are required to be duplicated at other flight crew stations, shall be completely independent of the operating system provided for other flight crew stations.

(2) Only the required flight instruments and duplicates of required instruments provided for use of the first pilot shall be connected to the operating system provided for the first pilot.

(3) When other than required instruments and duplicates are connected to other than the first pilot's operating systems, provision shall be made to disconnect or isolate in flight such other instruments.

(4) Two complete static air pressure operating systems shall be provided for the required instruments at the first pilot's station. Means for transferring an instrument from one system to another shall be provided. The control used shall be of a positive positioning type marked to indicate clearly which system is being used.

84. By amending § 4b.622(b) to read as follows:

§ 4b.622 Generating system.

* * * * *

(b) The generating system shall be so designed that:

(1) The power sources function properly when independent and when connected in combination;

(2) The failure or malfunctioning of any power source cannot create a hazard or impair the ability of the remaining sources to supply essential loads;

(3) The system voltage, frequency, and waveform (as applicable) at the terminals of all essential load equipment can be maintained within the limits for which the equipment is designed during any probable operating condition;

(4) System transients initiated by switching, fault clearing, or other causes, do not render essential loads inoperative, and do not introduce smoke or fire hazard.

85. By amending § 4b.624(d) to read as follows:

§ 4b.624 Electrical protection.

* * * * *

(d) If the ability to reset a circuit breaker or to replace a fuse is essential to safety in flight, such circuit breaker or fuse shall be so located and identified that it can be readily reset or replaced in flight.

86. By amending § 4b.627 to read as follows:

§ 4b.627 Electrical system tests.

When laboratory tests of the electrical system are conducted they shall be performed on a mock-up utilizing the same generating equipment complement as in the aircraft. The equipment shall simulate the electrical characteristics of the distribution wiring and connected loads to the extent necessary for valid test results. Laboratory generator drives shall simulate the actual prime movers on the airplane with respect to their reaction to generator loading, including loading due to faults. When the conditions of flight cannot adequately be simulated in the laboratory or by ground tests on the prototype airplane, flight tests shall be conducted.

87. By amending Figure 4b–19 referred to in § 4b.634 by deleting the phrase "At least 2 candles" in the intensity column and inserting in lieu thereof "0.05 *I*".

§ 4b.642 [Amendment]

88. By amending § 4b.642(a) by deleting the word "danger" and inserting in lieu thereof "probability".

§ 4b.643 [Amendment]

89. By amending § 4b.643 by adding at the end thereof a new sentence to read as follows: "Where the multiplying factor of 1.33 is used, the fitting factor prescribed in § 4b.307(c) need not be applied."

§ 4b.645 [Amendment]

90. By amending § 4b.645 by deleting from the introductory paragraph the phrase "through (d)" and inserting in lieu thereof "through (e)".

§ 4b.652 [Deletion]

91. By deleting § 4b.652.

92. By adding new § 4b.656 to read as follows:

§ 4b.656 Hydraulic system tests.

When laboratory tests of the hydraulic system are conducted, they shall be performed on a mock-up utilizing production equipment identical to that which is to be installed in the airplane. Hydraulic system characteristics shall be simulated to the extent necessary for valid test results.

NOTE: Hydraulic system characteristics are influenced by such factors as the relative location of hydraulic equipment, line diameter, and line length.

§ 4b.659 [Deletion]

93. By deleting § 4b.659.

94. By amending § 4b.711 to read as follows:

§ 4b.711 Maximum operating limit speed V_{MO}/M_{MO}.

The maximum operating limit speed is a speed which shall not be deliberately exceeded in any regime of flight (climb, cruise, or descent), except where a higher speed is authorized for flight test or pilot training operations. This operating limitation, denoted by the symbols V_{MO}/M_{MO} (airspeed or Mach number, whichever is critical at a particular altitude), shall be established to be not greater than the design cruising speed V_C and sufficiently below V_D/M_D or V_{DF}/M_{DF} to make it highly improbable that the latter speeds will be inadvertently exceeded in operations. The speed margin between V_{MO}/M_{MO} and V_D/M_D or V_{DF}/M_{DF} shall be determined in accordance with either paragraph (a) or (b) of this section, but shall not be less than the margin found necessary in flight tests in accordance with § 4b.191. (Also see § 4b.603(k) concerning speed warning means.)

(a) The minimum margin shall be the greater of the values determined in accordance with subparagraphs (1) and (2) of this paragraph.

(1) From an initial condition of stabilized flight at V_{MO}/M_{MO}, the airplane shall be assumed to be upset, flown for 20 seconds along a flight path 7.5 degrees below the initial path and pulled up at a load factor of 1.5 (.5g acceleration increment). It shall be acceptable to calculate the speed increase occurring in this maneuver, provided reliable or conservative aerodynamic data are used. Power, as specified in § 4b.155(a), shall be assumed until the pullup is initiated, at which time power reduction and the

use of pilot controlled drag devices may be assumed.

(2) The margin shall be sufficient to provide for atmospheric variations, such as horizontal gusts, penetration of jet stream or cold front, and for instrument errors and airframe production variations. It shall be acceptable to consider these factors on a probability basis, but the margin at altitudes where M_{MO} is limited by compressibility effects shall not be less than 0.05M.

(b) V_{MO}/M_{MO} shall not be greater than 0.8 V_D/M_D or 0.8 V_{DF}/M_{DF}.

§ 4b.712 [Deletion]

95. By deleting § 4b.712.

96. By amending § 4b.714 to read as follows:

§ 4b.714 Flap extended speeds, V_{FE}.

Flap extended speeds, V_{FE}, shall be established not to exceed the design flap speeds V_F chosen in accordance with §§ 4b.210(b)(1) and 4b.212(c)(1) for the corresponding flap positions and engine powers.

97. By amending § 4b.718(c) to read as follows:

§ 4b.718 Powerplant limitations.

* * * * *

(c) *Fuel grade or specification designation.* The minimum fuel grade for reciprocating engines or the fuel designation for turbine engines, required for the operation of the engine within the limitations prescribed in paragraphs (a) and (b) of this section.

98. By amending § 4b.718 by adding a new paragraph (d) to read as follows:

§ 4b.718 Powerplant limitations.

* * * * *

(d) The maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 4b.450 through 4b.452 is established.

§ 4b.738 [Amendment]

99. By amending § 4b.738(b)(1) by deleting the words "octane number" and inserting in lieu thereof "grade or designation".

100. By amending § 4b.740–1 by deleting paragraph (b)(4)(ii) and by amending paragraphs (b)(4)(i), (vii), and (viii) to read as follows:

§ 4b.740–1 Preparation of Airplane Flight Manuals for aircraft certificated in the transport category (FAA policies which apply to § 4b.740).

* * * * *

(b) *Operating limitations.* * * *

(4) *Speed limitations.* * * *

(i) *Maximum operating limit speed, V_{MO}/M_{MO}.* In accordance with § 4b.741(a)(1), the manual should include a statement that the maximum operating limit speed shall not be deliberately exceeded in any regime of flight (climb, cruise, or descent), except where a higher speed is authorized for flight test or pilot training operations.

* * * * *

(vii) *Compressibility effects.* Where a speed limitation (e.g., M_{MO} is based on compressibility effects, the manual should include information concerning warning symptoms, probable behavior of the airplane, and recovery procedures.

(viii) *Airspeed and Mach indicator markings and placards.* An explanation of the markings, limit hands, placards, etc., required by § 4b.732, should be included.

101. By amending § 4b.741(a)(1) to read as follows:

§ 4b.741 Operating limitations.

(a) *Airspeed limitations.* (1) The maximum operating limit speed V_{MO}/M_{MO} (see § 4b.711), together with a statement that this speed limit shall not be deliberately exceeded in any regime of flight (climb, cruise, or descent), except where a higher speed is authorized for flight test or pilot training operations.

§ 4b.741 [Amendment]

102. By deleting § 4b.741(a)(2).

103. By adopting a Special Civil Air Regulation to read as follows:

AIRSPEED OPERATING LIMITATIONS FOR TRANSPORT CATEGORY AIRPLANES

Contrary provisions of the Civil Air Regulations notwithstanding, the following requirements shall be applicable to transport category airplanes certificated under the provisions of Part 4b in effect prior to [effective date of proposed amendments to Part 4b]:

1. *Turbine-powered airplanes.* (a) On or before March 1, 1962:

(1) The airspeed operating limitations in the Airplane Flight Manual shall be revised by deleting the term "Normal operating limit speed" and the corresponding symbols "V_{NO}/M_{NO}", together with statements explaining the significance of this term, and inserting in lieu thereof the term "Maximum operating limit speed", the corresponding symbols "V_{MO}/M_{MO}", and the following statement explaining the significance of the new term:

"The maximum operating limit speed shall not be deliberately exceeded in any regime of flight (climb, cruise, or descent), except where a higher speed is specifically authorized for flight test or pilot training operations, or in approved emergency procedures."

(2) Airspeed placards and instrument markings shall be consistent with subparagraph (1) of this paragraph. Where color markings are used on airspeed or Mach indicators, the red radial line shall be at V_{MO}/M_{MO}. Where a maximum allowable airspeed indicator is used, the limit hand shall indicate V_{MO}/M_{MO}.

(b) On or before September 1, 1962, each airplane shall be equipped with a speed warning device which shall provide effective bell sound warning to the pilots whenever the speed exceeds V_{MO} plus 6 knots or $M_{MO}+0.01$. These speeds shall be considered as the upper limit of the production tolerance permitted for the warning device.

2. *Reciprocating engine-powered airplanes.* On or before December 1, 1961, the airspeed operating limitations in the Airplane Flight Manual shall be revised as necessary to state that the normal operating limit speed, or the maximum structural cruising speed (whichever term is used in the particular manual) shall not be deliberately exceeded in any regime of flight (climb, cruise, or descent), except where a higher speed is specifically authorized for flight test or pilot training operations, or in approved emergency procedures.

3. *Pilot indoctrination.* Air carriers shall take action as soon as practicable to insure that all their pilots are informed of the changes to the airspeed operating limitations prescribed in sections 1(a) and (2) of this regulation as applicable.

Proposed rules—Part 5:

The current regulations apply only to fixed-wing gliders. Because of recent developments, it is being proposed to include such references in Part 5 as are necessary to make this part also applicable to rotary-wing gliders. In addition, a clarifying change is proposed to § 5.11 to indicate that the term type certificate does not include a provisional type certificate.

In consideration of the foregoing, it is proposed to amend Part 5 of the Civil Air Regulations (14 CFR Part 5, as amended) as follows:

§ 5.10 [Amendment]

1. By amending § 5.10 by inserting between the words "Part 3" and "of" the words "or Part 6", and by inserting between the words "finds" and "appropriate" the words "are applicable to the type design and are".

2. By amending § 5.11(b) by adding at the end thereof a note to read as follows:

§ 5.11 Designation of applicable regulations.

* * * * *

(b) * * *

NOTE: The term "type certificate" as used in this paragraph does not include a "provisional" type certificate.

§ 5.13 [Amendment]

3. By amending § 5.13(b) by deleting the parenthetical expression "(see § 3.737 of this subchapter)" and inserting in lieu thereof "(see § 3.737 or § 6.700 of this chapter, as appropriate)".

Proposed rules—Part 6:

Two changes are proposed which affect control systems. Section 6.225 now requires manual control systems to comply with the provisions of that section. Because the word manual has erroneously been construed to limit the applicability of this section, it is proposed to amend § 6.225 to make certain that it applies to all control systems. The other change stems from the fact that Part 6 does not now cover the design of dual primary flight control systems. To insure that future dual control systems will be designed to withstand more than single pilot effort, it is proposed to add a new § 6.226.

Several changes to the structural provisions relating to parts subjected to alternating stresses, casting factors, and hull and float design are proposed. The current regulations require fatigue evaluation of the rotor structure but not of the essential fuselage and rotor pylon structure. Service experience has shown a need for fatigue evaluation of these other structural parts. Therefore, it is proposed to amend § 6.231 to require such an evaluation of fuselage and rotor pylon structure, the failure of which would threaten the structural integrity of the rotorcraft. The present requirements on factors of safety and inspections for structural castings specify a special factor of 2.0 for visual inspection only, and a factor of 1.25 when radiographic inspection and strength tests of 3 sample castings are employed. Proposed changes to § 6.307 would provide a series of casting

factors and corresponding test and inspection requirements intended to reflect current methods and practices. Part 6 does not now prescribe minimum standards for the design of hull-type or amphibian rotorcraft. Since rotorcraft of this type are being manufactured, it is proposed to add a new § 6.343 setting forth minimum standards for hull and float design.

The regulations covering Part 6 fuel systems are not in the same form and do not use terminology similar to that used in other airworthiness parts. To eliminate this inconsistency, it is proposed to add new § § 6.418 and 6.419 and to amend § § 6.420, 6.421, and 6.424. In addition, other changes are being proposed.

Section 6.420 presently requires that, insofar as practicable, the entire fuel supply can be utilized under certain conditions. Such a requirement is unnecessary, even when practicable, because a rotorcraft will continue to be airworthy so long as usable fuel can be used regardless of the quantity of unusable fuel. Therefore, it is proposed to delete this provision in favor of the objective requirement proposed in § 6.418 which would cover fuel system construction and arrangement to insure a satisfactory fuel flow.

Currently effective § 6.421 defines unusable fuel supply as that quantity at which the first evidence of malfunctioning occurs. This definition is unnecessarily restrictive since a rotorcraft is no less airworthy if an unusable fuel supply is selected as a quantity which is in excess of that which would produce a malfunction. Therefore, it is proposed to redefine unusable fuel supply as being not less than the quantity at which the first evidence of malfunctioning occurs.

Three changes of an editorial nature are proposed. It is proposed to transfer the requirements for a low fuel quantity warning indicator (§ 6.420(a)), and a means to indicate when the emergency fuel system is in operation (§ 6.424), to § 6.604 which lists required items of equipment. In addition, the powerplant operating limitation dealing with fuel is brought up to date by including reference to turbine engine fuel in § 6.714.

Presently effective Part 6 contains no requirement pertaining to the bypass of engine oil around a filter element when the element becomes clogged. Although installation of a filter is not required, it is necessary to provide for the bypass of a clogged filter, if a filter is installed, to insure continued normal functioning of the rest of the oil system. Accordingly, it is proposed to add a new § 6.447 to provide for bypass capability, consistent with the same requirement now appearing in all the other airworthiness parts.

Revisions to the regulations concerning electrical systems and equipment are proposed involving §§ 6.617 through 6.627. These changes are proposed in recognition of the substantial growth in capacity, complexity, and significance to safety of electrical systems on rotorcraft. In particular, a new section, § 6.618 dealing with electric power sources is being proposed as well as revisions to §§ 6.623, 6.626, and 6.627 concerned with master switch arrangement, protective devices, and electric cables, respectively. In conjunction with these changes, it is proposed to delete §§ 6.623-1, 6.625-1, 6.625-2, and 6.627-1 because the material contained in these sections is being proposed for inclusion, or already is included, in other sections.

Two changes are proposed to the lighting requirements. Figure 6-2 now specifies that position light intensity for angles 40° to 90° above or below the horizontal be at least 2 candles. Because this results in an irrational discontinuity when related to the other data in figure 6-2, it is proposed to amend figure 6-2 to require an intensity of 0.05 I for these angles.

The current anticollision light requirements in § 6.637(a) permit 0.03 steradians blockage in the rearward direction. In view of recent qualitative studies it has been determined that such a limitation might be unduly restrictive. Therefore, it is proposed to permit .5 steradians of obstruction.

Part 6 currently does not require the tail rotor to be marked. Because there have been a number of accidents attributable to persons walking into tail rotors, it is proposed that § 6.738(f) be added requiring tail rotors to be marked conspicuously.

Miscellaneous changes of an editorial or clarifying nature are proposed for §§ 6.11, 6.203, 6.237, 6.306, 6.605, and 6.642.

In consideration of the foregoing, it is proposed to amend Part 6 of the Civil Air Regulation (14 CFR Part 6, as amended) as follows:

1. By amending § 6.11(b) by adding at the end thereof a note to read as follows:

§ 6.11 Designation of applicable regulations.

* * * * *

(b) * * *

NOTE: The term "type certificate" as used in this paragraph does not include a "provisional" type certificate.

§ 6.203 [Amendment]

2. By amending § 6.203(d) by deleting the reference "(See §§ 6.221 and 6.250)" and inserting in lieu thereof "(See §§ 6.221, 6.250, and 6.251)".

§ 6.225 [Amendment]

3. By amending § 6.225 by deleting from the introductory paragraph the word "Manual" and inserting in lieu thereof "All".

4. By adding a new § 6.226 to read as follows:

§ 6.226 Dual primary flight control systems.

If a dual primary flight control system is provided, the system shall be designed for conditions when the pilots operate the controls in opposition and in conjunction. Individual pilot loads equal to 75 percent of those obtained in accordance with § 6.225 shall be applicable.

§ 6.237 [Amendment]

5. By amending § 6.237(a) by amending the definition of W_T to read as follows:

$W = W_T$ for tailwheel units (lbs.) equal to whichever of the following is critical:

(1) The static weight on the tailwheel with the rotorcraft resting on all wheels; or

(2) The vertical component of the ground reaction which would occur at the tailwheel assuming the mass of the rotorcraft acting at the center of gravity and exerting a force of 1g downward with the rotorcraft in the maximum nose-up attitude considered in the nose-up landing conditions. (See § 6.246 (b) and (c).)

§ 6.251 [Amendment]

6. By amending § 6.251 by deleting from the introductory paragraph the phrase "through (d)" and inserting in lieu thereof "through (e)"; and by deleting from paragraph (d) the phrase "in § 6.250 (d) and (f)" and inserting in lieu thereof "in § 6.250 (e) and (f).".

7. By amending § 6.251 by adding a new paragraph (e) to read as follows:

§ 6.251 Fuselage, landing gear, and rotor pylon structure.

* * * * *

(e) Parts of the basic structure which are directly subjected to alternating stresses, the sudden failure of which would threaten the structural integrity of the rotocraft, shall be designed to withstand the repeated loading conditions likely to occur within the established service life for such parts. The stresses of critical parts shall be determined in flight in all attitudes appropriate to the type of rotocraft throughout the ranges of limitations prescribed in § 6.204. The service life of such parts shall be established by the applicant on the basis of fatigue tests or other acceptable methods.

8. By amending § 6.306(c) and the note to read as follows:

§ 6.306 Material strength properties and design values.

* * * * *

(c) MIL-HDBK-5, ANC-17, ANC-18, and ANC-23 (Part II) values shall be used unless shown to be inapplicable in a particular case.

NOTE: MIL-HDBK-5, "Strength of Metal Aircraft Elements"; ANC-17, "Plastics for Aircraft"; ANC-18, "Design of Wood Aircraft Structure"; and ANC-23, "Composite Construction for Flight Vehicles," are published by the Department of Defense and the Federal Aviation Agency and may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

9. By amending § 6.307(b) to read as follows:

§ 6.307 Special factors.

* * * * *

(b) *Casting factors.* (1) For structural castings, the factor of safety prescribed in § 6.200(b) shall be multiplied by the casting factors specified in subdivisions (i) and (ii) of this subparagraph. The prescribed tests and inspections shall be in addition to those necessary to establish foundry quality control. Castings shall be inspected in accordance with approved specifications,

(i) Each casting, the failure of which would preclude continued safe flight and landing of the rotorcraft or result in serious injury to occupants, shall have a casting factor of at least 1.25 and shall receive 100 percent inspection by visual, radiographic, and magnetic particle or penetrant inspection methods. Where such castings have a casting factor less than 1.50, three sample castings shall be static tested. The test castings shall comply with the strength requirements of § 6.201 at an ultimate load corresponding with a casting factor of 1.25 and shall comply with the deformation requirements at a load equal to 1.15 times limit load.

NOTE: Examples of castings to which this subdivision applies are: structural attachment fittings; parts of flight control systems; control surface hinges and balance weight attachments; seat, berth, safety belt, and fuel and oil tank supports and attachments; cabin pressure valves.

(ii) For structural castings other than those specified in subdivision (i) of this subparagraph, the casting factor shall be not less than 1.25, and the required inspections shall be as follows:

Casting factor	Inspections
2.0 or greater	100 percent visual.
Less than 2.0 greater than 1.5.	100 percent visual, and magnetic particle or penetrant.
1.25 to 1.50	100 percent visual, magnetic particle or penetrant, and radiographic, except that it shall be acceptable to reduce the percentage of castings inspected radiographically when an approved sampling quality control procedure is established.

(2) Castings which are pressure tested as parts of a hydraulic or other fluid system shall not be required to comply with the provisions of this section unless such castings support airplane structural loads.

(3) A casting factor need not be employed with respect to the bearing surface of a part if the bearing factor used (see paragraph (c) of this section) is greater than the casting factor.

10. By amending the center heading preceding § 6.340 to read as follows: "*Hulls and Floats*".

11. By adding new § 6.343 to read as follows:

§ 6.343 Boat hulls.

The hull and auxiliary floats of sea or amphibian type rotorcraft shall be divided into watertight compartments so that, with any single compartment flooded, the buoyancy of the hull and auxiliary floats (and wheel tires, if used) will provide a sufficient margin of positive stability to minimize capsizing.

12. By adding between the center heading "Fuel System" and § 6.420 a new § 6.418 to read as follows:

§ 6.418 General.

(a) The fuel system shall be constructed and arranged in such a manner as to insure a flow of fuel at a rate and pressure which have been established for proper engine functioning under all likely operating conditions, including all maneuvers for which the rotorcraft is intended. (For fuel system instruments see § 6.604.)

(b) The fuel system shall be arranged so that no one fuel pump can draw fuel from more than one tank at a time unless means are provided to prevent introducing air into the system.

§ 6.419 [Redesignation]

13. By amending § 6.420 by redesignating paragraph (b) as § 6.419, by amending the remainder of the section to read as follows, and by deleting the associated note:

§ 6.420 Fuel flow demonstration.

(a) The ability of the fuel system to provide not less than 100 percent of the fuel flow required by the engines shall be demonstrated when the rotorcraft is operated at attitudes and altitudes representing the most adverse conditions from the standpoint of fuel feed.

(b) During the demonstration prescribed in paragraph (a) of this section, the provisions of subparagraphs (1) through (3) of this paragraph shall apply:

(1) Fuel shall be delivered to the engine at a pressure within the limits specified in the engine type certificate.

(2) The quantity of fuel in the tank being considered shall not exceed the sum of the amount established as the unusable fuel supply for that tank, as determined in accordance with the provisions of § 6.421 and the low fuel quantity as defined by § 6.604(1).

(3) Such main pumps shall be used as are necessary for each operating condition and rotorcraft attitude for which the demonstration is made. For each main pump so used, the demonstration shall be repeated, substituting, if required, the appropriate emergency pump for the main pump. (See § 6.424.)

14. By amending § 6.421 to read as follows:

§ 6.421 Determination of unusable fuel supply and fuel system operation on low fuel.

(a) The unusable fuel supply shall be selected by the applicant. The unusable fuel supply for each tank used for takeoff and landing shall be established as not less than the quantity at which the first evidence of malfunctioning occurs under the most adverse conditions from the standpoint of fuel feed during takeoff and landing. The unusable fuel supply for all tanks, other than those used for takeoff and landing, shall be established as not less than the quantity at which the first evidence of malfunctioning occurs during level flight. A ground test of the level flight condition shall be acceptable.

(b) If an engine can be supplied with fuel from more than one tank, the fuel system shall feed promptly when the fuel supply becomes low in one tank and another tank is turned on.

15. By amending § 6.424 to read as follows:

§ 6.424 Fuel pumps.

(a) *Main pumps.* (1) Any fuel pump which is required for proper engine operation or to meet the fuel system requirements of this subpart, except for the provisions of paragraph (b) of this section, shall be considered a main pump.

(2) Provision shall be made to permit the bypass of all positive displacement fuel pumps except fuel injection pumps approved as part of the engine.

NOTE: The phrase "fuel injection pump" means a pump which supplies the proper flow and pressure conditions for fuel injection when such injection is not accomplished in a carburetor. Fuel injection is a special form of carburation: the charging of air or gas with volatile carbon compounds. It is either an intermittent charging of air by discrete metered quantities of fuel such as occurs in a Diesel cylinder or it is a continuous charging of air by fuel, the fuel flow being proportioned to the airflow through the engine. Examples of continuous injection are injections into the supercharger section of a reciprocating engine or into the combustion chambers of a turbine engine.

(b) *Emergency pumps.* (1) Pumps shall be provided to permit supplying all engines with fuel immediately after the failure of any one main fuel pump except fuel injection pumps approved as part of the engine. The emergency pump shall be actuated automatically or operated continuously so that sufficient fuel pressure will be maintained to prevent engine stoppage.

16. By adding a new § 6.447 to read as follows:

§ 6.447 Oil filters.

If the powerplant installation incorporates an oil filter (strainer), the filter shall be constructed and installed so that oil will continue to flow at the normal rate through the remainder of the system when the flow of oil through the filter element is completely blocked.

17. By amending § 6.604 by adding new paragraphs (l) and (m) to read as follows:

§ 6.604 Powerplant instruments.

* * * * *

(l) A warning device to indicate low fuel in each tank if an engine can be supplied with fuel from more than one tank. The fuel in any tank shall be considered to be low if a five-minute usable fuel supply remains when the rotorcraft is in the most adverse condition, from the standpoint of fuel feed from the tank, whether or not that condition can be sustained for five minutes.

(m) Means to indicate to the pilot when emergency pumps are in operation.

§ 6.605 [Amendment]

18. By amending § 6.605(d) by deleting the reference "6.620 through 6.622" and inserting in lieu thereof "6.618 through 6.621".

19. By adding, between the center heading "Electrical Systems and Equipment" and § 6.620, new §§ 6.617 and 6.618 to read as follows:

§ 6.617 Installation.

Electrical systems in rotorcraft shall be free from hazards in themselves, in their method of operation, and in their effects on other parts of the rotorcraft. Electrical equipment shall be of a type and design adequate for the use in-

tended. Electrical systems shall be installed in such a manner that they are protected from fuel, oil, water, other detrimental substances, and mechanical damage.

§ 6.618 Electric power sources.

(a) Electric power sources, their transmission cables, and their associated control and protective devices, shall have sufficient capacity to furnish the required power at the proper voltage to all load circuits which are essential to the safe operation of the rotorcraft.

(b) Compliance with paragraph (a) of this section shall be shown by means of an electrical load analysis, or by electrical measurements, which take into account all electrical loads applied to the electrical system, in probable combinations and for probable durations.

(c) At least one generator shall be installed if the electrical system supplies power to load circuits which are essential to the safe operation of the rotorcraft.

(d) Electric power sources shall function properly when connected in combination or independently. The failure or malfunction of any electric power source shall not impair the ability of any remaining source to supply load circuits which are essential to the safe operation of the rotorcraft.

(e) Electric power source controls shall be such as to permit independent operation of each source.

20. By amending § 6.620 to read as follows:

§ 6.620 Generator.

Generators shall be capable of delivering their continuous rated power.

§ 6.619 [Redesignation]

21. By redesignating § 6.621 as § 6.619 and by adding a new § 6.621 to read as follows:

§ 6.621 Generator controls.

(a) Generator voltage control equipment shall be capable of dependably regulating the generator output within rated limits.

(b) A generator reverse current cutout shall be incorporated and designed to disconnect the generator from the battery and other generators when the generator is developing a voltage of such value that current sufficient to cause malfunctioning can flow into the generator.

22. By amending § 6.622 to read as follows:

§ 6.622 Electric power system instruments.

Means shall be provided to indicate to appropriate crewmembers those electric power system quantities which are essential for the safe operation of the system. For direct current systems, an ammeter which can be switched into each generator feeder shall be acceptable. When only one generator is installed, it shall be acceptable to locate the ammeter in the battery feeder.

23. By amending § 6.623 to read as follows:

§ 6.623 Master switch arrangement.

A master switch arrangement shall be provided to permit expeditious disconnection of all electric power sources from all load circuits. The point of disconnection shall be adjacent to the power sources.

§ 6.623–1 [Deletion]

24. By deleting § 6.623–1.

25. By amending § 6.625 to read as follows:

§ 6.625 Fuses or circuit breakers.

Protective devices (fuses or circuit breakers) shall be installed in the circuits to all electrical equipment, except that such items need not be installed in the main circuits of starter motors or in other circuits where no hazard is presented by their omission. Not more than one circuit, which is essential to safety in flight, shall be protected by a single protective device. All resettable type circuit protective devices shall be designed so that a manual operation is required to restore service after tripping and so that, when an overload or circuit fault exists, they will open the circuit irrespective of the position of the operating control.

NOTE: The aforementioned resettable type circuit protective devices are known commercially as "trip-free"; i.e., the tripping mechanism cannot be overridden by the operating control. Such circuit protective devices can be reset on an overload or circuit fault, but will trip subsequently in accordance with their current-time trip characteristic.

§§ 6.625–1, 6.625–2 [Deletions]

26. By deleting §§ 6.625–1 and 6.625–2 and related footnotes.

27. By amending § 6.626 to read as follows:

§ 6.626 Protective devices installation.

If the ability to reset a circuit breaker or to replace a fuse is essential to safety in flight, such circuit breaker or fuse shall be so located and identified that it can be readily reset or replaced in flight. If fuses are used, one spare of each rating or 50 percent spare fuses of each rating, whichever is the greater, shall be provided.

28. By amending § 6.627 to read as follows:

§ 6.627 Electric cables.

Electric connecting cables shall be of adequate capacity. Cables which would overheat in the event of circuit overload or fault shall be flame-resistant and shall not emit dangerous quantities of toxic fumes.

§ 6.627–1 [Deletion]

29. By deleting § 6.627–1 and related footnotes.

§ 6.634 [Amendment]

30. By amending Figure 6–2 referred to in § 6.634 by deleting the phrase "At least 2 candles" in the intensity column and inserting in lieu thereof ".05 *I*".

§ 6.637 [Amendment]

31. By amending § 6.637(a) by deleting the number ".03" and inserting in lieu thereof "0.5".

§ 6.642 [Amendment]

32. By amending § 6.642(a) by deleting the word "danger" and inserting in lieu thereof "probability".

33. By amending § 6.714(c) to read as follows:

§ 6.714 Powerplant limitations.

* * * * *

(c) *Fuel grade or specification designation.* The minimum fuel grade required for reciprocating engines or the fuel designation for turbine engines, required for the operation of the engine within the limitations prescribed in paragraphs (a) and (b) of this section.

§ 6.738 [Amendment]

34. By amending § 6.738(b)(1) by deleting the words "octane number" and inserting in lieu thereof "grade or designation".

35. By amending § 6.738 by adding a new paragraph (f) to read as follows:

(f) *Tail rotor.* The tail rotor shall be marked so that the rotor disc will be conspicuous under all normal ground conditions.

Proposed rules—Part 7:

Two changes are proposed which affect control systems. Section 7.225 now requires manual control systems to comply with the provisions of that section. Because the word manual has erroneously been construed to limit the applicability of this section, it is proposed to amend § 7.225 to make certain that it applies to all control systems. The other change is of an editorial nature, making § 7.226 consistent with the proposed change to Part 6 covering the design of dual flight control systems.

The present requirements on factors of safety and inspection for structural castings specify a special factor of 2.0 for visual inspection only, and a factor of 1.25 when sample castings are subjected to radiographic inspection and strength tests. Changes proposed to § 7.307 would provide a series of casting factors and corresponding test and inspection requirements intended to reflect current methods and practices.

A revision to the note under § 7.332 dealing with shock absorption tests is proposed because it does not reflect the ground loading conditions for tail wheel type landing gear. Another proposal is made to add a new § 7.342 in order to provide minimum standards for hull and float type rotorcraft. In conjunction with this change it is also proposed to revise the heading preceding § 7.340.

Studies have indicated that the 20-inch upper aisle width currently specified in § 7.357(g) may be reduced for relatively smaller transport rotorcraft without significantly affecting safe emergency evacuation. A reduction to 18 inches appears justifiable; and it is proposed to reduce the upper aisle width to 18 inches for rotorcraft having a passenger seating capacity of 10 or less. However, the advisability of reducing this dimension further to 16 inches is still under consideration. Comments and supporting evidence are invited not only on the advisability of the proposed reduction from 20 inches to 18 inches but also on the

advisability of a further reduction to 16 inches.

Section 7.385 requires that, in areas of the rotorcraft where flammable fluids or vapors might be liberated by leakage or other failure in fluid systems, design precautions be taken to safeguard against the ignition of such fluids or vapors due to the operation of other equipment. However, a further provision of this section obviates this requirement, if means are provided to control the fire. It is proposed to delete this second option inasmuch as it is considered that providing for the control of fire is not a suitable alternative for taking design precautions to prevent fire. It is also being proposed to delete § 7.412 dealing with pressure crossfeed fuel lines because the provisions of § 7.385 as proposed herein cover the installation of flammable fluid-carrying systems, including pressure crossfeed lines.

Section 7.405(e) currently requires each gearbox used in the rotor drive system of a category A helicopter to be bench tested for 150 hours. This test is in addition to a 200-hour endurance test required by other provisions of this part. Because the 200-hour endurance test is adequate to show the structural and functional capacity of the gearbox as an element of the whole helicopter, the additional test now required by § 7.405(e) is not necessary. Therefore, it is proposed to delete the paragraph.

Presently effective §§ 7.413 and 7.416 cover the demonstration of adequate fuel flow and the selection of unusable fuel supply. The demonstration is required to be conducted with unusable fuel supply together with the minimum quantity of fuel necessary for conducting the flow test. The unusable fuel supply is defined as the quantity at which the first evidence of malfunction occurs. This definition is unnecessarily restrictive and is not essential to safety since the rotorcraft is no less airworthy if unusable fuel supply is selected as a quantity which is in excess of that which would produce a malfunction. Accordingly, it is proposed to revise the definition of unusable fuel supply to make it not less than the quantity at which the first evidence of malfunction occurs, the same as in other airworthiness parts. Furthermore, Part 7 employs the concept of "low fuel" and requires warning to the pilot when low fuel quantity has been reached. Therefore, it is proposed to amend § 7.413 to require that the demonstration of fuel flow capability be conducted with unusable fuel supply plus the low fuel quantity. In making this change, the form of § 7.413 is rearranged to make it consistent with that of corresponding § 4b.413 in Part 4b. This change would eliminate the provision that the entire fuel supply be capable of being utilized under certain conditions, "insofar as practicable." Such a requirement is unnecessary even when practicable because a rotorcraft will continue to be airworthy so long as usable fuel can be used regardless of the quantity of unusable fuel.

In addition to the matter of unusable fuel supply, another question has arisen relating to the flow requirements of § 7.413. Section 7.413(c) presently requires that the available fuel flow shall be 150 percent of actual fuel consumption for gravity systems, 0.9 pounds per takeoff horsepower per hour for pump systems, or 125 percent of actual takeoff fuel consumption for pump systems. These margins are not required to insure adequate fuel flow. Furthermore, a margin is unnecessary to offset system deterioration because such deterioration is precluded by proper maintenance, inspection, and overhaul. Accordingly, it is proposed to delete § 7.413(c).

The presently effective provisions of §§ 7.414 and 7.430 deal with fuel pumps and fuel flow. In consideration of the changes proposed for § 7.413, these flow provisions become unnecessarily repetitive. It is proposed, therefore, to delete § 7.414 and combine all fuel pump requirements in § 7.430 in a form consistent with other airworthiness parts.

Presently effective § 7.415 also covers fuel flow rate, relative to transfer systems, and bases required flow rates on horsepower output. Since the changes proposed for § 7.413 would eliminate the horsepower basis for establishing flow rate, it is proposed to delete § 7.415.

Presently effective § 7.436 merely repeats the requirement of § 7.604(f) for a low fuel warning device. Therefore, it is proposed to delete § 7.438 and to transfer the definition of low fuel from the associated note to § 7.604(f).

Section 7.488 requires a fireproof diaphragm to isolate the engine power section and all portions of the exhaust system from the engine accessory compartment, unless equivalent protection can be shown by other means. Fire extinguishing systems are required to be provided in the engine power section, in the engine accessory section, and in complete powerplant compartments. Since it is considered that fire extinguishing systems are equivalent to a diaphragm in providing protection, there is no reason for retaining the provisions of § 7.488. Accordingly, it is being proposed to delete this section. Consistent with this proposal, it is also proposed to include editorial changes to § 7.487.

Section 7.604(m) currently requires an oil temperature warning device for all rotor drive gearboxes. Because it is doubtful that such devices would further safety in the case of small, noncritical gearboxes of simple design, it is proposed to amend § 7.604(m) to require oil temperature warning devices only for each main rotor drive gearbox including those gearboxes essential to rotor phasing.

Several changes are proposed to the electric system requirements. It is proposed to amend § 7.622(b) by adding two provisions which relate to the proper functioning of the generating system with respect to load equipment. It is also proposed to amend § 7.624(d) in order to eliminate an unnecessarily restrictive provision requiring that certain electrical protective devices or their controls be accessible for resetting in flight. In addition, a proposal is included to add a new § 7.627 which is intended to insure the validity of electrical system tests under simulated conditions in the laboratory.

Two changes are proposed to the lighting requirements. Figure 7–2 now specifies that position light intensity for angles 40° to 90° above or below the horizontal be at least 2 candles. Because this results in an irrational discontinuity when related to the other data in figure 7–2, it is proposed to amend figure 7–2 to require an intensity of 0.05 I for these angles.

The current anticollision light requirements in § 7.637(a) permit 0.03 steradians blockage in the rearward direction. In view of recent qualitative studies it has been determined that such a limitation might be unduly restrictive. Therefore, it is proposed to permit 0.5 steradians of obstruction.

A new § 7.653 is proposed to insure valid hydraulic system laboratory tests.

Part 7 currently does not require the tail rotor to be marked. Because there have been a number of accidents attributable to persons walking into tail rotors, it is proposed that § 7.738(f) be added requiring tail rotors to be marked conspicuously.

Miscellaneous changes of an editorial or clarifying nature are being proposed for §§ 7.11, 7.306, 7.447, 7.612, 7.634, 7.642, 7.714, and 7.738.

In consideration of the foregoing, it is proposed to amend Part 7 of the Civil Air Regulations (14 CFR Part 7, as amended) as follows:

1. By amending § 7.11(b) by adding at the end thereof a note to read as follows:

§ 7.11 Designation of applicable regulations.

* * * * *

(b) * * *

NOTE: The term "type certificate" as used in this paragraph does not include a "provisional" type certificate.

§ 7.225 [Amendment]

2. By amending § 7.225(a) by deleting the words "Manually operated" and inserting in lieu thereof "All".

3. By amending § 7.226 to read as follows:

§ 7.226 Dual primary flight control systems.

If a dual primary flight control system is provided, the system shall be designed for conditions when the pilots operate the controls in opposition or in conjunction. Individual pilot loads equal to 75 percent of those obtained in accordance with § 7.225 shall be applicable.

4. By amending § 7.306(c) and the note to read as follows:

§ 7.306 Material strength properties and design values.

* * * * *

(c) MIL–HDBK–5, ANC–17, ANC–18, and ANC–23, (Part II) values shall be used unless shown to be inapplicable in a particular case.

NOTE: MIL–HDBK–5, "Strength of Metal Aircraft Elements"; ANC–17, "Plastics for Aircraft"; ANC–18, "Design of Wood Aircraft Structures"; ANC–23, "Composite Construction for Flight Vehicles," are published by

the Department of Defense and the Federal Aviation Agency and may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

5. By amending § 7.307(b) to read as follows:

§ 7.307 Special factors.

* * * * *

(b) *Casting factors.* (1) For structural castings, the factor of safety prescribed in § 7.200(b) shall be multiplied by the casting factors specified in subdivisions (i) and (ii) of this subparagraph. The prescribed tests and inspections shall be in addition to those necessary to establish foundry quality control. Castings shall be inspected in accordance with approved specifications.

(i) Each casting, the failure of which would preclude continued safe flight and landing of the rotorcraft or which would result in serious injury to occupants, shall have a casting factor of at least 1.25 and shall receive 100 percent inspection by visual, radiographic, and magnetic particle or penetrant inspection methods. Where such castings have a casting factor less than 1.50, three sample castings shall be static tested. The test castings shall comply with the strength requirements of § 7.201 at an ultimate load corresponding with a casting factor of 1.25 and shall comply with the deformation requirements at a load equal to 1.15 times limit load.

NOTE: Examples of castings to which this subdivision applies: structural attachment fittings; parts of flight control systems; control surface hinges and balance weight attachments; seat, berth, safety belt, and fuel and oil tank supports and attachments; cabin pressure valves.

(ii) For structural castings other than those specified in subdivision (i) of this subparagraph, the casting factor shall be not less than 1.25, and the required inspections shall be as follows:

Casting factor	Inspections
2.0 or greater	100 percent visual.
Less than 2.0 greater than 1.5.	100 percent visual, and magnetic particle or penetrant.
1.25 to 1.50	100 percent visual, magnetic particle or penetrant, and radiographic, except that it shall be acceptable to reduce the percentage of castings inspected radiographically when an approved sampling quality control procedure is established.

(2) Castings which are pressure tested as parts of a hydraulic or other fluid system shall not be required to comply with the provisions of this section unless such castings support airplane structural loads.

(3) A casting factor need not be employed with respect to the bearing surface of a part if the bearing factor used (see paragraph (c) of this section) is greater than the casting factor.

§ 7.332 [Amendment]

6. By amending § 7.332(a) by inserting a new definition in the note between the definitions of "$W=W_N$" and "h" to read as follows:

$W=W_T$ for tailwheel units (lbs.) equal to whichever of the following is critical:

(1) The static weight on the tailwheel with the rotorcraft resting on all wheels; or

(2) The vertical component of the ground reaction which would occur at the tailwheel assuming the mass of the rotorcraft acting at the center of gravity and exerting a force of 1g downward with the rotorcraft in the maximum nose-up attitude considered in the nose-up landing conditions. (See § 7.246 (b) and (c).)

7. By amending the center heading preceding § 7.340 to read as follows: "Hulls and Floats".

8. By adding new § 7.342 to read as follows:

§ 7.342 Boat hulls.

The hull and auxiliary floats of sea or amphibian type rotorcraft shall be divided into watertight compartments so that, with any single compartment flooded, the buoyancy of the hull and auxiliary floats (and wheel tires, if used) will provide a sufficient margin of positive stability to minimize capsizing.

9. By amending § 7.357(g) to read as follows:

§ 7.357 Emergency evacuation.

* * * * *

(g) *Width of main aisle.* The main passenger aisle width at any point between seats shall not be less than the values in the following table.

Passenger seating capacity	Minimum main passenger aisle width	
	Less than 25 inches from floor	25 inches and more from floor
	Inches	*Inches*
10 or less	12	18
11 to 19	12	20
20 or more	15	20

10. By amending § 7.385 to read as follows:

§ 7.385 Flammable fluid fire protection.

Provisions shall be incorporated to prevent the ignition of fluid which might be liberated by leakage or failure of flammable fluid systems.

§ 7.405 [Deletion]

11. By deleting § 7.405(e).

§ 7.412 [Deletion]

12. By deleting § 7.412.

13. By amending § 7.413 to read as follows:

§ 7.413 Fuel flow demonstration.

(a) The ability of the fuel system to provide not less than 100 percent of the fuel flow required by the engines shall be demonstrated when the rotorcraft is operated at attitudes and altitudes representing the most adverse conditions from the standpoint of fuel feed.

(b) During the demonstration prescribed in paragraph (a) of this section, the provisions of subparagraphs (1) through (4) of this paragraph shall apply:

(1) Fuel shall be delivered to the engine at a pressure within the limits specified in the engine type certificate.

(2) The quantity of fuel in the tank being considered shall not exceed the sum of the amount established as the unusable fuel supply for that tank, as determined in accordance with the provisions of § 7.416, and the low fuel quantity as defined by § 7.604(f).

(3) Such main pumps shall be used as are necessary for each operating condition and rotorcraft attitude for which the demonstration is made. For each main pump so used, the demonstration shall be repeated, substituting, if required, the appropriate emergency pump for the main pump (see § 7.430(b)).

(4) If a fuel flowmeter is provided, operation of the meter shall be blocked during the flow test prescribed in this section and the fuel shall flow through the meter or its bypass.

§§ 7.414, 7.415 [Deletions]

14. By deleting §§ 7.414 and 7.415.

15. By amending § 7.416 to read as follows:

§ 7.416 Determination of unusable fuel supply and fuel system operation on low fuel.

(a) The unusable fuel supply shall be selected by the applicant. The unusable fuel supply for each tank used for takeoff and landing shall be established as not less than the quantity at which the first evidence of malfunctioning occurs under the most adverse conditions from the standpoint of fuel feed during takeoff and landing. The unusable fuel supply for all tanks, other than those used for takeoff and landing, shall be established as not less than the quantity at which the first evidence of malfunctioning occurs during level flight. A ground test of the level flight condition shall be acceptable.

(b) If an engine can be supplied with fuel from more than one tank, the fuel system shall feed promptly when the fuel supply becomes low in one tank and another tank is turned on.

16. By amending § 7.430 to read as follows:

§ 7.430 Fuel pumps.

(a) *Main pumps.* (1) Any fuel pump which is required for proper engine operation or to meet the fuel system requirements of this subpart, except for the provisions of paragraph (b) of this section, shall be considered a main pump.

(2) Provision shall be made to permit the bypass of all positive displacement fuel pumps except fuel injection pumps approved as part of the engine.

NOTE: The phrase "fuel injection pump" means a pump which supplies the proper flow and pressure conditions for fuel injection when such injection is not accomplished in a carburetor. Fuel injection is a special form of carburetion: the charging of air or gas with volatile carbon compounds. It is either an intermittent charging of air by discrete metered quantities of fuel such as occurs in a Diesel cylinder or it is a continuous charging of air by fuel, the fuel flow being proportioned to the airflow through the engine. Examples of continuous injection are injections into the supercharger section of a reciprocating engine or into the combustion chambers of a turbine engine.

(b) *Emergency pumps.* (1) Pumps shall be provided to permit supplying all engines with fuel immediately after the failure of any one main fuel pump except fuel injection pumps approved as part of the engine.

§ 7.438 [Deletion]

17. By deleting § 7.438 including the associated note.

18. By amending § 7.447 to read as follows:

§ 7.447 Oil filters.

If the powerplant installation incorporates an oil filter (strainer), the filter shall be constructed and installed so that oil will continue to flow at the normal rate through the remainder of the system when the flow of oil through the filter element is completely blocked.

§ 7.487 [Amendment]

19. By amending § 7.487(c) by deleting from the first sentence the words "complying with § 7.488" and inserting in lieu thereof "to isolate the engine power section from the engine accessory section".

§ 7.488 [Deletion]

20. By deleting § 7.488.

21. By amending § 7.604 by amending paragraphs (f) and (m) to read as follows:

§ 7.604 Powerplant instruments.

* * * * *

(f) A warning device to indicate low fuel in each tank if an engine can be supplied with fuel from more than one tank. The fuel in any tank shall be considered to be low if a five-minute usable fuel supply remains when the rotorcraft is in the most adverse condition, from the standpoint of fuel feed from that tank, whether or not that condition can be sustained for five minutes.

* * * * *

(m) Oil temperature warning device to indicate when the oil temperature exceeds a safe value in each main rotor drive gearbox, including those gearboxes essential to rotor phasing, having an oil system independent of the engine oil system.

§ 7.612 [Amendment]

22. By amending § 7.612 by deleting from the first sentence of paragraph (a)(3) and from the second sentence of paragraph (a)(4) the word "including" and inserting in lieu thereof "excluding".

23. By amending § 7.612(f) to read as follows:

* * * * *

(f) *Duplicate instrument systems.* If duplicate flight instruments are required by the operating parts of the Civil Air Regulations (see note under §7.610), the provisions of subparagraphs (1) through (4) of this paragraph shall apply:

(1) The operating system for flight instruments used by the first pilot, which are required to be duplicated at other flight crew stations, shall be completely independent of the operating system provided for other flight crew stations.

(2) Only the required flight instruments and duplicates of required instruments provided for use of the first pilot shall be connected to the operating system provided for the first pilot.

(3) When other than required instruments and duplicates are connected to other than the first pilot's operating system, provision shall be made to disconnect or isolate in flight such other instruments.

(4) Two complete static air pressure operating systems shall be provided for the required instruments at the first pilot's station. Means for transferring an instrument from one system to another shall be provided. The control used shall be of a positive positioning type marked to indicate clearly which system is being used.

24. By amending § 7.622(b) to read as follows:

§ 7.622 Generating system.

* * * * *

(b) The generating system shall be so designed that:

(1) The power sources function properly when independent and when connected in combination;

(2) The failure or malfunctioning of any power source cannot create a hazard or impair the ability of the remaining sources to supply essential loads;

(3) The system voltage, frequency, and waveform (as applicable), at the terminals of all essential load equipment can be maintained within the limits for which the equipment is designed, during any probable operating condition;

(4) System transients initiated by switching, fault clearing, or other causes, do not render essential loads inoperative, and do not introduce a smoke or fire hazard.

25. By amending § 7.624(d) to read as follows:

§ 7.624 Electrical protection.

* * * * *

(d) If the ability to reset a circuit breaker or to replace a fuse is essential to safety in flight, such circuit breaker or fuse shall be so located and identified that it can be readily reset or replaced in flight.

26. By adding a new § 7.627 to read as follows:

§ 7.627 Electrical system tests.

When laboratory tests of the electrical system are conducted, they shall be performed on a mock-up utilizing the same generating equipment complement as in the rotorcraft. The equipment shall simulate the electrical characteristics of the distribution wiring and connected loads to the extent necessary for valid test results. Laboratory generator drives shall simulate the actual prime movers on the rotorcraft with respect to their reaction to generator loading, including loading due to faults. When the conditions of flight cannot adequately be simulated in the laboratory or by ground tests on the prototype rotorcraft, flight tests shall be conducted.

§ 7.634 [Amendment]

27. By amending § 7.634(a) by deleting the phrase "of paragraphs (b) and (c)" and inserting in lieu thereof "of paragraph (b)".

28. By amending Figure 7-2 by deleting the phrase "At least 2 candles" in the intensity column and inserting in lieu thereof "0.05 *I*".

§ 7.637 [Amendment]

29. By amending § 7.637(a) by deleting the number ".03" and inserting in lieu thereof "0.5".

§ 7.642 [Amendment]

30. By amending § 7.642(a) by deleting the word "danger" and inserting in lieu thereof "probability".

§ 7.655 [Redesignation]

31. By redesignating § 7.653 as § 7.655 and by adding a new § 7.653 to read as follows:

§ 7.653 Hydraulic system tests.

When laboratory tests of the hydraulic system are conducted they shall be performed on a mock-up utilizing production equipment identical to that which is to be installed in the rotorcraft. Hydraulic system characteristics shall be simulated to the extent necessary for valid test results.

NOTE: Hydraulic system characteristics are influenced by such factors as the relative location of hydraulic equipment, line diameter and line length.

32. By amending § 7.714(c) to read as follows:

§ 7.714 Powerplant limitations.

* * * * *

(c) *Fuel grade or specification designation.* The minimum fuel grade for reciprocating engines or the fuel designation for turbine engines, required for the operation of the engine within the limitations prescribed in paragraphs (a) and (b) of this section.

§ 7.738 [Amendment]

33. By amending § 7.738(b)(1) by deleting the words "octane number" and inserting in lieu thereof "grade or designation".

34. By amending § 7.738 by adding a new paragraph (f) to read as follows:

(f) *Tail rotor.* The tail rotor shall be marked so that the rotor disc will be conspicuous under all normal ground conditions.

Proposed rules—Part 13:

Presently effective § 13.260 requires, among other things, that thrust reversers be subjected to reversal tests and that after each reversal, the reverser be operated at full reverse thrust for a period of one minute. A period of operation this long is unnecessary for reversers intended for use only as a braking means on the ground since the usual period of reverse thrust in operation has been shown to be between 20 and 30 seconds. Accordingly, it is proposed to amend the provision by reducing the reverse thrust test time for such reversers from one minute per cycle to 30 seconds per cycle.

Concurrently, the provisions of § 13.260 (b), dealing specifically with reversers intended for use in flight, would be amended to retain the requirement for a one-minute reversal operation.

In consideration of the foregoing, it is proposed to amend Part 13 of the Civil Air Regulations (14 CFR Part 13, as amended) as follows:

1. By amending § 13.260(a) by deleting from the last sentence the words "one minute" and inserting in lieu thereof "30 seconds".

2. By amending § 13.260(b) to read as follows:

§ 13.260 Thrust reversers.

* * * * *

(b) If the reverser is intended for use in flight, the provisions of paragraph (a) of this section shall apply, except that, after each reversal, the reverser shall be operated at full reverse thrust for a period of one minute. In addition, such other tests shall be conducted as are found necessary to insure safe and reliable operation of the device in flight.

Proposed rules—Part 14:

Presently effective § 14.154 covers the functional testing of propellers. Paragraph (d) of this section requires 200 complete cycles of operation from the lowest normal pitch to the maximum reverse pitch. This paragraph further provides that at the end of each cycle the propeller be operated in reverse pitch for a period of one minute at the reverse pitch maximum rotational speed and power. This testing in one minute periods is unnecessary because the propeller is adequately endurance tested in accordance with the provisions of § 14.153. Accordingly, it is proposed to dispense with the additional testing by deleting the last sentence of § 14.154(d).

In consideration of the foregoing, it is proposed to amend Part 14 of the Civil Air Regulations (14 CFR Part 14, as amended) as follows:

§ 14.154 [Amendment]

By amending § 14.154(d) by deleting the last sentence.

Proposed rules—Part 18:

A change to § 18.13 is being proposed in conjunction with changes to Part 43 to provide a means for maintaining the currency of documents which show aircraft operating limitations whenever repairs or alterations are made which affect the limitations.

In consideration of the foregoing, it is proposed to amend Part 18 of the Civil Air Regulations (14 CFR Part 18, as amended) as follows:

1. By amending § 18.13 to read as follows:

§ 18.13 Aircraft operating limitations.

When a repair or an alteration results in any change in the aircraft operating limitations or in the data contained in the approved aircraft flight manual, the aircraft shall not be approved for return to service unless such operating limitations or data are appropriately revised and carried or displayed in accordance with the requirements of § 43.10 of Part 43 of this chapter.

§ 18.13–1 [Deletion]

2. By deleting § 18.13–1.

Proposed rules—Part 43:

Sections 43.10 and 43.10–1 require that aircraft operating limitations be available in all aircraft, except foreign aircraft, operated in the United States, or that there be an approved Aircraft Flight Manual. The current requirements do not insure in all cases that pilots and operators will have information regarding aircraft weight and center of gravity. Lack of this information could result in inadvertent overloading. Therefore, it is proposed to amend § 43.10 to provide that such information be available. In conjunction with this, it is proposed to delete § 43.10–1 since the proposal would incorporate in § 43.10 the substance of the provisions of § 43.10–1.

In consideration of the foregoing, it is proposed to amend Part 43 of the Civil Air Regulations (14 CFR Part 43, as amended) as follows:

1. By amending § 43.10(d) to read as follows:

§ 43.10 Aircraft requirements.

* * * * *

(d) No aircraft, except foreign aircraft, shall be operated unless the operating limitations prescribed for the particular aircraft are set forth in a current approved Aircraft Flight Manual, on placards, listings, instrument markings, or in any combination thereof. The flight manual, placards, listings, or markings shall be legible and accessible to the pilot at his station, and shall include limitations on the following items, as applicable:

(1) Speed (e.g., normal operating speed, flaps extended speed);

(2) Powerplant (e.g., rpm, manifold pressure, gas temperature);

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

(4) Minimum flight crew;

(5) Types of operation;

(6) Maximum operating altitude;

(7) Maneuvering flight load factors;

(8) Rotor speed (for rotorcraft);

(9) Limiting height-speed envelope (for rotorcraft); and,

(10) Any other limitations prescribed when the aircraft is certificated.

§ 43.10–1 [Deletion]

2. By deleting § 43.10–1 and footnotes 1 and 2 related thereto.

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