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Civil Air Regulations Amendment 4b-11
Effective: October 1, 1959
Issued: August 24, 1959

REFERENCE

PART 4b—AIRPLANE AIRWORTHINESS; TRANSPORT CATEGORIES

Miscellaneous Amendments Resulting From the 1958 Annual Airworthiness Review

There are contained herein amendments as a result of the 1958 Annual Airworthiness Review.

The flight characteristics requirements are being amended to change the provisions relating to longitudinal trim and elevator control power. The currently effective regulations require sufficient elevator control power to fly the airplane at all speeds, powers, weights, and center of gravity positions for which the airplane is to be certificated. Transports of recent design are utilizing adjustable stabilizers and control power becomes a function of the stabilizer incidence setting. The amendments to §§ 4b.112 (c)(1), 4b.131(a), and 4b.151(a) are intended to make these provisions more appropriate for applications to adjustable stabilizers.

A number of changes to the structural provisions are being made. Section 4b.1 is being amended to include a definition of the term "zero fuel weight" which is frequently used in stating the structural limitations of an airplane. Amendments to §§ 4b.210(b)(2), 4b.213 (c), and figure 4b-2 are intended to eliminate possible inconsistencies in the relation between design speed V_A and point A on the maneuvering envelope, which resulted from previous amendments.

A proposal to reduce the required maneuvering load factor at the design dive speed V_D was considered during the annual airworthiness review but is not being adopted at this time. Although previous operating statistics show that the probability of attaining a 2.5 load factor is less at speeds greater than V_D than it is at lower speeds, there has been relatively little operating experience on turbine transports for which the cruising speed is closer to V_D. The proposal will be kept under study as operating statistics are obtained on turbine transports.

Section 4b.216(a) is being amended to specify engine torque loads appropriate for turbine engine installations. A new § 4b.217 is being added to specify strength criteria for speed control devices used in flight. Changes to §§ 4b.231, 4b.235, and 4b.236 provide more rational ground load requirements relating to coefficients of friction and deflated tire conditions.

A change to § 4b.421(a) requires structural test or analysis of the fuel tanks when subject to pressure developed under the most adverse condition of airplane roll and fuel load. On the basis of past experience, § 4b.421(c) is being revised to require nonmetallic tanks to be tested only for the vibration test of § 4b.421(b)(4), since this has been found to be the critical condition, except that compliance may be shown based on satisfactory operating experience with a similar tank in a similar installation.

With respect to design and construction, a number of changes are being made. On some high-speed airplanes, it is likely that control surface dampers will be necessary in order to show compliance with the flutter prevention requirements. Therefore, § 4b.308 is being revised to provide that it shall be possible to continue safe flight even though a single failure occurs in the flutter damper system. Section 4b.320 is being amended to include design safety criteria for power-operated control systems. This amendment is intended to insure continued safe flight and landing in the event certain failures occur in the control system and in the case of engine failure.

Section 4b.352 is being amended to specify which portion of the windshield is affected by the bird impact strength requirements and which portion is affected by the fragmentation requirements.

To provide appropriate emergency exit requirements for small transports, § 4b.362(c) is being amended to require at least one type IV exit on each side of the fuselage for a passenger capacity of up to 10 persons. A corresponding change is being made in the ditching exit requirements of § 4b.362(d).

In the powerplant installation requirements, § 4b.407 is being amended to extend the "fail-safe" concept to all types of thrust reversing systems intended for ground and/or inflight use. Sections 4b.410 and 4b.413 are being revised to simplify and clarify the statement of the fuel system and fuel flow requirements. Related changes to § 4b.430 clarify the definitions of main and emergency fuel pumps, delete the requirements that one pump for each engine must be engine driven, and eliminate the requirement for a bypass on fuel injection pumps for turbine engines.

Other amendments require cooling tests for turbine engine installations and means to indicate the functioning of the powerplant ice protection system.

A proposal to require the ability to regain full power or thrust within 20 seconds after engine malfunctioning occurs due to depletion of fuel in any tank was considered during the annual airworthiness review, but is not being adopted at this time. The objective of this proposal was to minimize the possibility of turbine engine flame-out during fuel tank switching. However, since there are several methods of accomplishing this objective, including systems designed to prevent such engine malfunctioning, further study is being given to this subject.

Other proposals being deferred for further study concern turbo-jet reverse thrust controls, the fire resistance of turbine engine installation diaphragms, and a means to indicate a clogged fuel filter condition (i.e., bypass operation) to the flight crew. The proposal on reverse thrust controls would have deleted the provision requiring a means to prevent inadvertent movement to a reverse thrust position, for systems which are approved for use in flight. Such systems are still in the development stage and additional evaluation is considered necessary to determine whether the previous proposal or some other change is appropriate. The proposal to permit fire-resistant in lieu of fire-proof diaphragms in certain turbine engine installations will be considered along with other changes in the powerplant fire protection requirements to make them suitable for isolated pod installations. The value of inflight indication of fuel filter clogging has been questioned in view of the fact that automatic filter bypass provisions cannot be controlled in flight and the military services are developing devices to indicate the occurrence of bypassing to maintenance personnel who can then service the filters.

Section 4b.603 is being amended to incorporate current terminology for flight and navigational instruments. However, a proposal which would require all critical air-speed limitations that vary with altitude to be displayed on the appropriate instrument is being deferred for further study. Where a number of such limitations exist, that proposal might be impractical or lead to confusion or undesirable differences in displaying air-speed limitations to pilots. At present, V_{NE} is the only variable limit required to be indicated. A machmeter is being required for airplanes having compressibility limitations which are not otherwise indicated to the pilot in accordance with § 4b.732.

Section 4b.612 is being revised to clarify the power failure indicating means required for certain instruments. Section 4b.625 is being amended to cover new types of storage batteries as well as the conventional lead-acid types. A new § 4b.628 establishes criteria intended to minimize the hazards of lightning strikes on portions of the airplane which are insulated from the main airframe.

Another new § 4b.647 requires all new type transport category airplanes to be provided with individual flotation means for each occupant even though the airplane is not certificated for ditching. The requirement that life preservers shall be reversible is being deleted from § 4b.645(d), since it is expected that design features and instructions to insure correct donning will be covered in the appropriate Technical Standard Order. Since chunks of ice falling from aircraft have caused hazards to persons and property on the ground, a new § 4b.660 requires that fluid drains be designed to prevent the formation of ice on the airplane. A placard showing the air-speed limitations for various flap settings is being required because these limitations are no longer shown on the air-speed indicator.

Interested persons have been afforded an opportunity to participate in the making of this amendment (24 F.R. 128), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, Part 4b of the Civil Air Regulations (14 CFR Part 4b, as amended) is hereby amended as follows, effective October 1, 1959:

1. By amending § 4b.1(b)(4) by deleting the phrase "by the U.S. National Advisory Committee for Aeronautics" and inserting in lieu thereof "by the National Aeronautics and Space Administration (formerly the National Advisory Committee for Aeronautics)".

2. By amending § 4b.1(c) by redesignating subparagraph (8) as subparagraph (9) and inserting a new subparagraph (8) to read as follows:

§ 4b.1 Definitions.

* * * * *

(c) *Weights.* * * *

(8) *Zero fuel weight.* The zero fuel weight is the design maximum weight of the airplane with no disposable fuel and oil.

3. By amending § 4b.112(c)(1) to read as follows:

§ 4b.112 Stalling speeds.

* * * * *

(c) * * *

(1) From a speed sufficiently above the stalling speed to assure steady conditions, the elevator control shall be applied at a rate such that the airplane speed reduction does not exceed one mile per hour per second. This maneuver shall be performed with the airplane trimmed at a speed of $1.4V_{s_1}$, except that airplanes utilizing adjustable stabilizers may be trimmed at a speed selected by the applicant but not less than $1.2V_{s_1}$, nor greater than $1.4V_{s_1}$.

4. By amending § 4b.131(a) to read as follows:

§ 4b.131 Longitudinal control.

(a) It shall be possible at all speeds between the trim speed prescribed in § 4b.112(c)(1) and V_{s_1} to pitch the nose downward so that a prompt recovery to this selected trim speed can be made with the following combination of airplane configurations:

(1) The airplane trimmed at the trim speed prescribed in § 4b.112(c)(1),

(2) The landing gear extended,

(3) The wing flaps in a retracted, and in an extended position,

(4) Power off, and maximum continuous power on all engines.

§ 4b.151 [Amendment]

5. By amending § 4b.151(a) by inserting in the last sentence after the words "control force" the phrase "and within the limits of elevator control power".

6. By amending § 4b.210(b)(2) to read as follows:

§ 4b.210 General.

* * * * *

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

(2) *Design maneuvering speed, V_A.* The design maneuvering speed, V_A, shall be equal to $V_{s_1}\sqrt{n}$ where n is the limit positive maneuvering load factor at V_C (see § 4b.211(a)) and V_{s_1} is the stalling speed with flaps retracted. Both V_C and V_S shall be evaluated at the design weight and altitude under consideration. V_A need not be greater than V_C or the speed at which the positive $C_{N_{max}}$ curve intersects the positive maneuver load factor line, whichever is the lesser. (See figure 4b–2.)

7. By amending § 4b.210(c) by deleting the heading and the first sentence and inserting in lieu thereof the following, respectively:

(c) *Design fuel and oil loads.* The disposable load combinations shall include all fuel and oil loads in the range from zero fuel and oil to the maximum fuel and oil load selected by the applicant. * * *

8. By amending § 4b.210(c)(1) by inserting between the words "fuel" and "at" the phrase "and oil in the wing".

9. By amending § 4b.213(c) to read as follows:

§ 4b.213 Symmetrical flight conditions.

* * * * *

(c) *Maneuvering pitching conditions.* The following conditions involving pitching acceleration shall be investigated (see figure 4b–2):

(1) *Maximum elevator displacement at speed V_A.* The airplane shall be assumed to be flying in steady level flight (point A_1 on figure 4b–2) and the pitching control suddenly moved to obtain extreme positive pitching (nose up) except as limited by pilot effort in accordance with § 4b.220(a).

(2) *Checked maneuver at speeds between V_A and V_D.* The airplane shall be assumed to be subjected to a checked maneuver from steady level flight (points A_1 to D_1 on figure 4b–2) and from the positive load factor (points A_2 to D_2 on figure 4b–2) as follows:

(i) A positive pitching acceleration (nose up), equal to at least the following value, shall be assumed to be attained concurrently with the airplane load factor of unity (points A_1 to D_1 on figure 4b–2) unless it is shown that lesser values could not be exceeded:

$$\frac{39}{V}n\,(n-1.5)\ \text{(radians/sec.}^2\text{)}$$

where n is the positive load factor (see § 4b.211(a)(1)), at the speed under consideration, and V is the airplane equivalent speed, knots.

(ii) A negative pitching acceleration (nose down) equal to at least the following value shall be assumed to be attained concurrently with the airplane positive maneuvering load factor (points A_2 to D_2 on figure 4b–2) unless it is shown that lesser values could not be exceeded:

$$-\frac{26}{V}n\,(n-1.5)\ \text{(radians/sec.}^2\text{)}$$

where n is the positive load factor (see § 4b.211(a)(1)), at the speed under consideration, and V is the airplane equivalent speed, knots.

(3) *Specified control displacement.* In lieu of subparagraph (2) of this paragraph, a checked maneuver based on a rational pitching control motion vs. time

5. By amending § 4b.13 by adding new paragraph (c) to read as follows:

4b.13 Type certificate. * * *

(c) The applicable provisions of this part recorded by the Administrator in accordance with § 4b.12 shall be considered as incorporated in the type certificate as though set forth in full.

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

4b.19 Changes in type design. (For requirements with regard to changes in type design and the designation of applicable regulations therefor, see § 4b.11 (d) and (e), and Part 1 of this subchapter.)

7. By amending § 4b.350 by adding the following general paragraph preceding paragraph (a):

4b.350 Pilot compartment; general. All references to flight crew in §§ 4b.350 through 4b.353 shall mean the minimum flight crew established in accordance with § 4b.720.

8. By amending § 4b.350 (a) to read as follows:

4b.350 Pilot compartment; general. * * *

(a) The arrangement of the pilot compartment and its appurtenances shall provide safety and assurance that the flight crew will be able to perform all of their duties and operate the controls in the correct manner without unreasonable concentration and fatigue.

9. By amending § 4b.350 (b) by deleting the word "pilot" and inserting in lieu thereof the words "flight crew".

10. By amending § 4b.351 (a) (2) by deleting the words "pilots' vision" and inserting in lieu thereof the words "the flight crew's normal duties".

11. By amending § 4b.353 (c) by deleting in two instances the word "pilots'" and inserting in lieu thereof the words "flight crew's".

12. By amending § 4b.362 (e) (7) by adding the word "approved" at the beginning of the phrase "means shall be provided to assist the occupants in descending to the ground".

13. By adding a new § 4b.407 to read as follows:

4b.407 Propeller reversing system. The propeller reversing system, if installed, shall be such that no single failure or malfunctioning of the system during normal or emergency operation will result in unwanted travel of the propeller blades to a position substantially below the normal flight low-pitch stop. Failure of structural elements need not be considered if occurrence of such failure is expected to be extremely remote.

14. By amending § 4b.604 (m) by deleting the words "engine cylinder displacement" and inserting in lieu thereof the words "cylinder displacement of the engine".

15. By amending § 4b.606 (c) by adding a new subparagraph (4) to read as follows:

4b.606 Equipment, systems, and installations. * * *

(c) Power supply. * * *

(4) In determining the probable operating combinations and durations of essential loads for the partial power failure conditions prescribed in subparagraphs (2) and (3) of this paragraph, it shall be permissible to assume that the power loads are reduced in accordance with a monitoring procedure which is consistent with safety in the types of operations authorized. If a particular load is not required to maintain controlled flight it need not be considered for the two-engine-inoperative condition on airplanes with four or more engines as prescribed in subparagraph (3) of this paragraph.

(Sec. 205 (a) 52 Stat. 984; 49 U.S.C. 425 (a). Interpret or apply secs. 601, 603, 52 Stat. 1007, 1009, as amended; 49 U.S.C. 551, 553)

By the Civil Aeronautics Board:

/s/ M. C. Mulligan

M. C. Mulligan
Secretary

(SEAL)

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