UNITED STATES OF AMERICA
CIVIL AERONAUTICS BOARD
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Civil Air Regulations Amendment 3-13
Effective: August 25, 1955
Adopted: July 20, 1955

AIRPLANE AIRWORTHINESS - NORMAL, UTILITY, AND ACROBATIC CATEGORIES

MISCELLANEOUS AMENDMENTS

This amendment contains a number of miscellaneous changes. Among the more important ones is a revision of the provisions applicable to the horizontal tail gust loads in § 3.217 for the purpose of attaining consistency with the airplane gust load criteria. This amendment prescribes consideration of tail gust loads at speed V_d in addition to those prescribed at V_f and V_c so as to cover all possible critical conditions prescribed in the airplane gust load criteria. Another important revision of the structural provisions entails deletion of the assumption in § 3.241 that the airplane is a rigid body in determining ground loads. This change is intended to assure conservatism in the determination of loads when the mass is irregularly distributed.

There is also a change involving the provisions of § 3.337 which require continued normal operation of trimming controls in the event of any failure in the primary flight control system. The Board believes that the presently effective requirements impose unnecessary penalties on small airplanes because, from the viewpoint of safety, this criterion should apply only to the longitudinal trim control for single-engine airplanes and to the longitudinal and directional trim controls for multi-engine airplanes. In view of the foregoing, this amendment relaxes the existing provisions accordingly.

Section 3.386 is being amended to require that all items of mass which might come loose and injure the occupants be restrained to withstand the loads prescribed for a minor crash landing. This requirement is consistent with the requirements applicable to the protection of occupants in transport category airplanes.

There is also a change which reduces the minimum fuel capacity from one gallon for each seven maximum continuous horsepower presently prescribed in § 3.440 to a capacity sufficient for one-half hour of operation at maximum continuous power. It is believed that this amendment establishes a fuel capacity which is the minimum necessary for safety taking into account local operations and typical traffic patterns.

Section 3.561 is being amended to eliminate the provisions which permit the use of a fuel-oil volume ratio of 30:1, in lieu of a rational analysis in determining the usable oil capacity. It has been indicated that this ratio is no longer applicable to modern engines and should be increased to 40:1. Since any ratio is subject to change with improved or new designs of engines, it is considered appropriate not to include any numerical ratios in this requirement, and to retain only the objective portion of the rule which involves a rational analysis.

Section 3.667 is being amended to require that the automatic pilot system be such as not to produce dangerous loads or flight path deviations when pilot corrective action is taken within a reasonable period of time. This amendment permits the use of a quick disengaging device in demonstrating recovery from simulated malfunctions.

There is included also a revision of § 3.769 (b) which requires a placard listing all approved acrobatic maneuvers for airplanes certificated in the Utility Category, and a new § 3.771 which requires a placard listing the maximum airspeed with landing gear extended and the minimum control speed with one engine inoperative. These changes are designed to assure availability of certain information important to safe flight.

In addition to the foregoing substantive changes, there are also a number of minor changes in §§ 3.74, 3.431, 3.441 and 3.715 most of which are made for clarification and consistency with other parts of the regulations.

Interested persons have been afforded an opportunity to participate 1/ in the making of this amendment, and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby amends Part 3 of the Civil Air Regulations (14 CFR Part 3, as amended) effective August 25, 1955:

1. By amending § 3.74 to read as follows:

3.74 Maximum weight. (a) The maximum weight shall not exceed any of the following:

(1) The weight selected by the applicant.

(2) The design weight for which the structure has been proven, except as provided in § 3.242 for multiengine airplanes.

(3) The maximum weight at which compliance with all of the applicable flight requirements has been demonstrated.

1/ 20 F.R. 369, January 15, 1955.

(b) The maximum weight shall not be less than the weights under the loading conditions prescribed in subparagraphs (1) and (2) of this paragraph assuming that the weight of the occupant in each of the seats is 170 pounds for the normal category and 190 pounds for the utility and acrobatic categories, unless placarded otherwise.

(1) All seats occupied, oil to full tank capacity, and at least a fuel supply for one-half hour operation at rated maximum continuous power.

(2) Fuel and oil to full tank capacities, and minimum crew.

2. By amending § 3.217 to read as follows:

3.217 Gust loads. The horizontal tail surfaces shall be designed for loads occurring in the conditions specified in paragraphs (a) and (b) of this section.

(a) Positive and negative gusts of 30 feet per second nominal intensity at speed V_c corresponding with the flight condition specified in § 3.187 (a) with flaps retracted.

NOTE: The average loadings of Figures 3-5 (a) and (b) and the distribution of Figure 3-9 may be used for the total tail loading in this condition.

(b) Positive and negative gusts of 15 feet per second nominal intensity at speed V_f corresponding with the flight condition specified in § 3.190 (b) with flaps extended and at speed V_d corresponding with the flight condition specified in § 3.187 (b) with flaps retracted.

(c) In determining the total load on the horizontal tail for the conditions specified in paragraphs (a) and (b) of this section, the initial balancing tail loads shall first be determined for steady unaccelerated flight at the pertinent design speeds V_f, V_c, and V_d. The incremental tail load resulting from the gust shall be added to the initial balancing tail load to obtain the total tail load.

NOTE: The incremental tail load due to the gust may be computed by the following formula:

$$\Delta^t = 0.1\ KUVS_t a_t \left(1 - \frac{36a_w}{R_w}\right)$$

where:

Δt = the limit gust load increment on the tail in pounds;
K = gust coefficient K in § 3.188;
U = nominal gust intensity in feet per second;
V = airplane speed in miles per hour;
S_t = tail surface area in square feet;
a_t = slope of lift curve of tail surface, C_L per degree, corrected for aspect ratio;
a_w = slope of lift curve of wing, C_L per degree; and
R_w = aspect ratio of the wing.

3. By amending § 3.241 by deleting the first sentence and inserting in lieu thereof the following: "The loads specified in the following conditions shall be considered as the external loads and the inertia forces which occur in an airplane structure."

4. By amending § 3.337 by deleting the fourth sentence and inserting in lieu thereof the following: "Longitudinal trimming devices for single-engine airplanes and longitudinal and directional trimming devices for multiengine airplanes shall be capable of continued normal operation notwithstanding the failure of any one connecting or transmitting element in the primary flight control system."

5. By amending § 3.386 by adding a new paragraph (d) to read as follows:

3.386 Protection. * * *

(d) The inertia forces specified for N, U, and A category airplanes in paragraph (a) of this section shall be applied to all items of mass which would be apt to injure the passengers or crew if such items became loose in the event of a minor crash landing, and the supporting structure shall be designed to restrain these items.

6. By amending § 3.431 by deleting the reference "§ 3.85 (b)" and inserting in lieu thereof the reference "§§ 3.85 (b) or 3.85a (b)".

7. By amending § 3.440 by deleting the sentence "The total usable capacity of the fuel tanks shall not be less than 1 gallon for each seven maximum continuous rated horsepower for which the airplane is certificated" and inserting in lieu thereof the following: "The total usable capacity of the fuel tanks shall be sufficient for not less than one-half hour operation at rated maximum continuous power (see § 3.74 (d))."

8. By amending § 3.441 (a) (3) by deleting the sentence "Subsequent tanks shall be production tested to at least 0.5 psi."

9. By amending § 3.561 by deleting the last sentence.

10. By amending § 3.667 (a) to read as follows:

3.667 Automatic pilot system. * * *

(a) The system shall be designed so that the automatic pilot can either:

(1) Be quickly and positively disengaged by the human pilot(s) to prevent it from interfering with his control of the airplane, or

(2) Be sufficiently overpowered by one human pilot to enable him to control the airplane.

11. By amending § 3.667 (d) to read as follows:

3.667 Automatic pilot system. * * *

(d) The automatic pilot system shall be designed so that, within the range of adjustment available to the human pilot, it cannot produce hazardous loads on the airplane or create hazardous deviations in the flight path under any conditions of flight appropriate to its use either during normal operation or in the event of malfunctioning, assuming that corrective action is initiated within a reasonable period of time.

12. By amending § 3.715 by deleting the words "specified in § 3.386 (a)" from the last sentence and inserting in lieu thereof the words "equal to those specified in § 3.386 (a) multiplied by a factor of 1.33".

13. By amending § 3.769 (b) to read as follows:

3.769 Approved flight maneuvers. * * *

(b) Category U. A placard shall be provided in clear view of the pilot stating: "Acrobatic maneuvers are limited to the following: - - - - - - - - - (List approved maneuvers)."

14. By adding a new § 3.771 to read as follows:

3.771 Airspeed placards. The following airspeed limitations shall be shown on placards in view of the pilot:

(a) Maximum speed with landing gear extended, if the airplane is equipped with retractable landing gear.

(b) Minimum control speed with one engine inoperative, for multiengine airplanes.

(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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