UNITED STATES OF AMERICA
CIVIL AERONAUTICS BOARD
WASHINGTON, D.C.

Civil Air Regulations Amendment 3-4
Effective: January 15, 1951
Adopted: December 7, 1950

SERVICE TESTS, PERFORMANCE, STALLS, SPINS, AND OTHER CHANGES

Amendments to this part are the result of studies and discussions undertaken during the 1950 airworthiness annual review, and include those items on which the Board believes action may properly be taken at this time. In general, most of the significant changes stem from the desire for simplification of the rules in this part with respect to the smaller airplanes, specifically those of 6,000 pounds maximum weight or less, which would be expected to be used mainly as personal airplanes.

The amendments include the deletion of the so-called "service test" requirement for airplanes of 6,000 pounds maximum weight or less, because experience seems to indicate that this rule imposes a burden upon the manufactures not commensurate with the safety gained. In addition, for airplanes in this weight range the take-off, climb, landing, and trim requirements have been modified.

The spin recovery requirements for airplanes of 4,000 pounds maximum weight or less have been changed to permit demonstration of recovery with use of normal controls, and more realistic requirements for stall handling characteristics are set forth for all airplanes. The latter are complemented by a requirement for stall warning indication.

Amendments are also included increasing the crash load factors for seat attachments and belt anchorages. These are intended to increase the survival possibilities in crashes where the cabin structure remains relatively intact, and they are consistent with the newly established standards for safety belts.

There are additional amendments of a relatively minor nature, based upon experience with the requirements of this part, designed to increase safety or to facilitate administration of the part. These include a revision of the position light system requirements to bring them up to date and to provide a greater degree of clarity and uniformity with similar provisions in other parts of the regulations.

It should be noted that this amendment does not limit the general applicability of Part 3 to any specific maximum weight of airplanes, for example 12,500 pounds. However, as was indicated in the notice of proposed rule making, serious consideration is being given to some type of limitation because this part originally was intended primarily for the smaller nontransport type airplanes and not for the larger and generally more complicated types. It is the Board's intention to determine at an early date the proper relationship between the various airworthiness categories and the various operational uses, and to impose by regulation suitable limitations on the introduction into passenger air carrier service of any new large-type airplanes.

Interested persons have been afforded an opportunity to participate 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 January 15, 1951:

1. By amending the title thereof to read as follows: Part 3-Airplane Airworthiness, Normal, Utility, and Acrobatic Categories.

2. By rescinding §§ 3.11 and 3.12.

3. By adding a new § 3.11 to read as follows:

3.11 Airworthiness, experimental, and production certificates. (For requirements with regard to these certificates, see Part 1 of the Civil Air Regulations.)

4. By amending § 3.19 to read as follows:

3.19 Flight tests.

(a) After proof of compliance with the structural requirements contained in this part, and upon completion of all necessary inspection and testing on the ground, and proof of conformity of the airplane with the type design, and upon receipt from the applicant of a report of flight tests conducted by him, there shall be conducted such official flight tests as the Administrator finds necessary to determine compliance with §§ 3.61 through 3.780.

(b) After the conclusion of the flight tests prescribed in paragraph (a) of this section such additional flight tests shall be conducted, on airplanes having a maximum certificated take-off weight of more than 6,000 pounds, as the Administrator finds necessary to ascertain whether there is reasonable assurance that the airplane, its components, and equipment are reliable and function properly. The extent of such additional flight tests shall depend upon the complexity of the airplane, the number and nature of new design features, and the record of previous tests and experience for the particular airplane model, its components, and equipment. If practicable, the flight tests performed for the purpose of ascertaining reliability and proper functioning shall be conducted on the same airplane which was used in flight tests to show compliance with §§ 3.61 through 3.780.

5. By adding a new § 3.80 to read as follows:

3.80 Alternate performance requirements. The provisions of §§ 3.84, 3.85, 3.86, and 3.112 (a)(2)(ii) shall not be applicable to airplanes having a maximum certificated take-off weight of 6,000 lbs. or less. In lieu thereof, such airplanes shall comply with the provisions of §§ 3.84a, 3.85a, 3.87, and 3.112(c).

6. By adding a new § 3.84a to read as follows:

3.84a Take-off requirements - airplanes of 6,000 lbs. or less. Airplanes having a maximum certificated take-off weight of 6,000 lbs. or less shall comply with the provisions of this section.

(a) The elevator control for tail wheel type airplanes shall be sufficient to maintain at a speed equal to or V_{s1} 0.8 V airplane attitude which will permit holding the airplane on the runway until a safe take-off speed is attained.

(b) The elevator control for nose wheel type airplanes shall be sufficient to raise the nose wheel clear of the take-off surface at a speed equal to 0.85 V.

(c) The characteristics prescribed in paragraphs (a) and (b) of this section shall be demonstrated with:

(1) Take-off power,

(2) Most unfavorable weight,

(3) Most unfavorable c.g. position.

(d) It shall be demonstrated that the airplane will take off safely without requiring an exceptional degree of piloting skill.

7. By adding a new § 3.85a to read as follows:

3.85a Climb requirements - airplane of 6,000 lbs. or less. Airplanes having a maximum certificated take-off weight of 6,000 lbs. or less shall comply with the requirements of this section.

(a) Climb - take-off climb condition. The steady rate of climb as sea level shall not be less than V_{s1} to 300 feet per minute, whichever is the greater, with:

(1) Take-off power,

(2) Landing gear extended,

(3) Wing flaps in take-off position,

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

(b) Climb with inoperative engine. All multiengine airplanes having a stalling speed greater than 70 miles per hour shall have a steady rate of climb of at least 0.02 V_{so}^2 feet per minute at an altitude of 5,000 feet with the critical engine inoperative and:

(1) The remaining engines operating at not more than maximum continuous power,

(2) The inoperative propeller in the minimum drag position,

(3) Landing gear retracted,

(4) Wing flaps in the most favorable position,

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

(c) Climb - balked landing condition. The steady rate of climb at sea level shall not be less than 0.5 V_{so}^2 or 200 feet per minute, whichever is the greater, with:

(1) Take-off power,

(2) Landing gear extended,

(3) Wing flaps in the landing position. If rapid retraction is possible with safety, without loss of altitude and without requiring sudden changes of angle of attack or exceptional skill on the part of the pilot, wing flaps may be retracted.

8. By adding a new § 3.87 to read as follows:

3.87 Landing requirements - airplanes of 6,000 lbs. or less. For an airplane having a maximum certificated take-off weight of 6,000 lbs. or less it shall be demonstrated that the airplane can be safely landed and brought to a stop without requiring an exceptional degree of piloting skill, and without excessive vertical acceleration, tendency to bounce, nose over, ground loop, porpoise, or water loop.

9. By adding a new § 3.112 (c) to read as follows:

3.112 Requirements * * *

(c) For aircraft having a maximum certificated take-off weight of 6,000 lbs. or less, the value specified in subdivision (a) (2) (ii) of this section shall be 1.5 V_{s1}, if the stalling speed V_{s1} is not obtainable in the particular configuration, 1.5 times the minimum steady flight speed at which the airplane is controllable.

10. By amending § 3.120 to read as follows:

3.120 Stalling demonstration

(a) Stalls shall be demonstrated under two conditions:

(1) With power off, and

(2) With the power setting not less than that required to show compliance with the provisions of paragraph (a) of § 3.85 or with those of § 3.85a, whichever are appropriate.

(b) In either condition required by paragraph (a) of this section it shall be possible, with flaps and landing gear in any position, with center of gravity in the position least favorable for recovery, and with appropriate airplane weights, to show compliance with the applicable requirements of paragraphs (c) through (f) of this section.

(c) For airplanes having independently controlled rolling and directional controls, it shall be possible to produce and to correct roll by unreversed use of the rolling control and to produce and correct yaw by unreversed use of the directional control up until the time the airplane pitches in the maneuver prescribed in paragraph (g) of this section.

(d) For two-control airplanes having either interconnected lateral and directional controls or for airplanes having only one of these controls, it shall be possible to produce and to correct roll by unreversed use of the rolling control without producing excessive yaw up until the time the airplane pitches in the maneuver prescribed in paragraph (g) of this section.

(e) During the recovery portion of the stall maneuver the pitch shall not exceed a value of 30° below level, and the airplane shall not develop uncontrollable rolling or yawing characteristics before the recovery is achieved. The altitude lost in the stall maneuver shall be entered in the airplane flight manual.

(f) A clear and distinctive stall warning shall precede the stalling of the airplane, with the flaps and landing gear in any position, both in straight and turning flight. The stall warning shall begin at a speed exceeding that of stalling by not less than 5 but not more than 10 miles per hour and shall continue until the stall occurs.

(g) In demonstrating the qualities required by paragraphs (c) through (f) of this section, the procedure set forth in subparagraphs (1) and (2) of this paragraph shall be followed.

(1) With trim controls adjusted for straight flight at a speed of approximately 1.4 V_{s1}, the speed shall be reduced by means of the elevator control until the speed is steady at slightly above stalling speed; then

(2) The elevator control shall be pulled back at a rate such that the airplane speed reduction does not exceed 1 mile per hour per second until a stall is produced as evidenced by an uncontrollable downward pitching motion of the airplane, or until the control reaches the stop. Normal use of the elevator control for recovery shall be allowed after such pitching motion has unmistakably developed.

11. By amending § 3.124 (a) to read as follows:

3.124 Spinning

(a) Category N. All airplanes of 4,000 lbs. or less maximum weight shall recover from a one-turn spin with the controls applied normally for recovery in not more than one additional turn and without exceeding either the limiting air speed or the limit positive maneuvering load factor for the airplane. In addition, there shall be no excessive back pressure either during the spin or in the recovery. It shall not be possible to obtain uncontrollable spins by means of any possible use of the controls. Compliance with these requirements shall be demonstrated at any permissible combination of weight and center of gravity positions obtainable with all or any part of the designed useful load. All airplanes in category N, regardless of weight, shall be placarded against spins or demonstrated to be "characteristically incapable of spinning" in which case they shall be so designated. (See paragraph (d) of this section.)

12. By amending § 3.318 to read as follows:

3.318 Ribs. Rib tests shall simulate conditions in the airplane with respect to torsional rigidity of spars, fixity conditions, lateral support, and attachment to spars. The effects of ailerons and high lift devices shall be properly accounted for.

13. By rescinding §§ 3.319, "External bracing" and 3.320, "Covering."

14. By adding a new sentence at the end of paragraph (a) of § 3.390 to read as follows:

3.390 Seats and berths

(a) Passenger seats and berths

* * * The accelerations prescribed in § 3.386 shall be multiplied by a factor of 1.33 for determining the strength of the seat and berth attachments to the structure.

15. By adding a new sentence at the end of § 3.391 to read as follows:

3.391 Safety belt or harness provisions

* * * The accelerations prescribed in § 3.386 shall be multiplied by a factor of 1.33 for determining the strength of the belt anchorages to the seat or to the structure.

16. By amending the first sentence of § 3.417 to read as follows:

3.417 Propeller vibration. In the case of propellers with metal blades or other highly stressed metal components, the magnitude of the critical vibration stresses under all normal conditions of operation shall be determined by actual measurements or by comparison with similar installations for which such measurements have been made.

17. By amending § 3.431 to read as follows:

3.431 Multiengine fuel system arrangement. The fuel systems of multiengine airplanes which are required to comply with the provisions of § 3.85 (b) shall be arranged to permit operation in at least one configuration in such a manner that the failure of any one component will not result in the loss of power of more than one engine and will not require immediate action by the pilot to prevent the loss of power of more than one engine. Unless other provisions are made to comply with this requirement, the fuel system shall be arranged to permit supplying fuel to each engine through a system entirely independent of any portion of the system supplying fuel to the other engines. Other multiengine airplanes shall also comply with the requirement except that separate fuel tanks need not be provided for each engine.

18. By amending § 3.434 to read as follows:

3.434 Fuel flow rate for gravity systems. The fuel flow rate for gravity systems (main and reserve supply) shall be 150 percent of the actual take-off fuel consumption of the engine.

19. By amending § 3.438 to read as follows:

3.438 Fuel system hot weather operation. Airplanes with suction lift fuel systems or other fuel system features conducive to vapor formation shall be demonstrated to be free from vapor lock when using fuel at a temperature of 110°F under critical operating conditions.

20. By amending § 3.442(a) to read as follows:

3.442 Fuel tank installation.

(a) The method of supporting tanks shall not be such as to concentrate the loads resulting from the weight of the fuel in the tanks. Pads shall be provided to prevent chafing between the tank and its supports. Materials employed for padding shall be nonabsorbent or shall be treated to prevent the absorption of fuels. If flexible tank liners are employed, they shall be of an approved type, and they shall be so supported that the liner is not required to withstand fluid loads. Interior surfaces of compartments for such liners shall be smooth and free of projections which are apt to cause wear of the liner, unless provisions are made for the protection of the liner at such points or unless the construction of the liner itself provides such protection. A positive pressure shall be maintained within the vapor space of all bladder cells under all conditions of operation including the critical condition of low air speed and rate of descent likely to be encountered in normal operation.

21. By amending paragraphs (a) and (b) of § 3.444 to read as follows:

3.444 Fuel tank sump.

(a) Each tank shall be provided with a drainable sump having a capacity of not less than 0.25 percent of the tank capacity or 1/16 gallon, whichever is the greater. It shall be acceptable to dispense with the sump if the fuel system is provided with a sediment bowl permitting ground inspection. The sediment bowl shall also be accessible for drainage. The capacity of the sediment chamber shall not be less than 1 ounce per each 20 gallons of the fuel tank capacity.

(b) If a fuel tank sump is provided, the capacity specified in paragraph (a) of this section shall be effective with the airplane in the normal ground attitude and in all normal flight attitudes.

22. By amending § 3.449 (b) to read as follows:

3.449 Fuel pump and pump installation. * * *

(b) Emergency fuel pumps shall be provided to permit supplying all engines with fuel in case of the failure of any one engine-driven pump, except that if an engine fuel injection pump which has been certificated as an integral part of the engine is used, an emergency pump is not required. Emergency pumps shall be available for immediate use in case of the failure of any other pump. If both the normal pump and emergency pump operate continuously, means shall be provided to indicate to the crew when either pump is malfunctioning.

23. By amending § 3.553 to read as follows:

3.553 Fuel system drains Drains shall be provided to permit safe drainage of the entire fuel system and shall incorporate means for locking in the closed position. The provisions for drainage shall be effective in the normal ground attitude.

24. By amending § 3.561 to read as follows:

3.561 Oil system. Each engine shall be provided with an independent oil system capable of supplying the engine with an ample quantity of oil at a temperature not exceeding the maximum which has been established as safe for continuous operation. The usable oil tank capacity shall not be less than the product of the endurance of the airplane under critical operating conditions and the maximum oil consumption of the engine under the same conditions, plus a suitable margin to assure adequate system circulation and cooling. In lieu of a rational analysis of airplane range and oil consumption, a fuel-oil ratio of 30:1 by volume shall be considered acceptable.

25. By amending § 3.605 (b) to read as follows:

3.605 General * * *

(b) Each engine shall be provided with at least two separate air intake sources, except that in the case of an engine equipped with a fuel injector only one air intake source need be provided, if the air intake, opening, or passage is unobstructed by a screen, filter, or other part on which ice might form and so restrict the air flow as to affect adversely engine operation. It shall be permissible for primary air intakes to open within the cowling only if that portion of the cowling is isolated from the engine accessory section by means of a fire-resistant diaphragm or if provision is made to prevent the emergence of backfire flames. Alternate air intakes shall be located in a sheltered position and shall not open within the cowling unless they are so located that the emergence of backfire flames will not result in a hazard. Supplying air to the engine through the alternate air intake system of the carburetor air preheater shall not result in the loss of excessive power in addition to the power lost due to the rise in the temperature of the air.

26. By adding a new paragraph (d) to § 3.606 to read as follows:

3.606 Induction system de-icing and anti-icing provisions * * *

(d) Airplanes equipped with sea level engines employing carburetors which embody features tending to reduce the possibility of ice formation shall be provided with a sheltered source of air warmed at least to the extent to which the cylinder cooling air is warmed.

27. By adding a new sentence at the end of paragraph (a) of § 3.624 to read as follows:

3.624 Fire wall construction

(a) * * * However, fire-resistant material may be used in such applications on single-engine airplanes using unsupercharged wet sump engines, provided that the opening which may result in case of fire will not involve a serious hazard from the standpoint of flame propagation to the sheltered side of the fire wall.

28. By amending § 3.637 to read as follows:

3.637 Powerplant fire protection Suitable means shall be provided to shut off the flow in all lines carrying flammable fluids into the engine compartment of multiengine airplanes required to comply with the provisions of § 3.85 (b).

29. By amending § 3.672 to read as follows:

3.672 Fuel quantity indicator. Means shall be provided to indicate to the flight personnel the quantity of fuel in each tank during flight. Tanks, the outlet and air spaces of which are interconnected, may be considered as one tank and need not be provided with separate indicators. Exposed sight gauges shall be so installed and guarded as to preclude the possibility of breakage or damage. Sight gauges which form a trap in which water can collect and freeze shall be provided with means to permit drainage on the ground. Fuel quantity gauges shall be calibrated to read zero during level flight when the quantity of fuel remaining in the tank is equal to the unusable fuel supply as defined by § 3.437. Fuel gauges need not be provided for small auxiliary tanks which are used only to transfer fuel to other tanks, provided that the relative size of the tanks, the rate of fuel transfer, and the instructions pertaining to the use of the tanks are adequate to guard against overflow and to assume that the crew will receive prompt warning in case transfer is not being achieved as intended.

30. By amending §§ 3.700 through 3.703 to read as follows:

3.700 Position light system installation.

(a) General. The provisions of §§ 3.700 through 3.703 shall be applicable to the position light system as a whole, and shall be complied with if a single circuit type system is installed.[1] The single circuit system shall include the items specified in paragraphs (b) through (f) of this section.

(b) Forward position lights. Forward position lights shall consist of a red and a green light spaced laterally as far apart as practicable and installed forward on the airplane in such a location that, with the airplane in normal flying position, the red light is displayed on the left side and the green light is displayed on the right side. The individual lights shall be type certificated in accordance with the applicable provisions of Part 15 of the Civil Air Regulations.

(c) Rear position light. The rear position light shall be a white light mounted as far aft as practicable. The light shall be type certificated in accordance with the applicable provisions of Part 15 of the Civil Air Regulations.

(d) Circuit. The two forward position lights and the rear position light shall constitute a single circuit.

(e) Flasher. If employed, an approved position light flasher for a single circuit system shall be installed. The flasher shall be such that the system is energized automatically at a rate of not less than 60 nor more than 100 flashes per minute with an on-off ratio between 2:1 and 1:1. Unless the flasher is of a fail-safe type, means shall be provided in the system to indicate to the pilot when there is a failure of the flasher and a further means shall be provided for turning the lights on steady in the event of such failure.

(f) Light covers and color filters. Light covers or color filters used shall be of noncumbustible material and shall be constructed so that they will not change color or shape or suffer any appreciable loss of light transmission during normal use.

3.701 Position light system dihedral angles. The forward and rear position lights as installed on the airplane shall show unbroken light within dihedral angles specified in paragraphs (a) through (c) of this section.

(a) Dihedral angle L (left) shall be considered formed by two intersecting vertical planes, one parallel to the longitudinal axis of the airplane and the either at 110° to the left of the first, when looking forward along the longitudinal axis.

(b) Dihedral angle R (right) shall be considered formed by two intersecting vertical planes, one parallel to the longitudinal axis of the airplane and the other at 110° to the right of the first, when looking forward along the longitudinal axis.

(c) Dihedral angle A (aft) shall be considered formed by two intersecting vertical planes making angles of 70° to the right and 70° to the left, respectively, looking aft along the longitudinal axis, to a vertical plane passing through the longitudinal axis.

[1]Requirements for dual circuit position light systems are contained in Part 4b of the Civil Air Regulations.

3.702 Position light distribution and intensities.

(a) General. The intensities prescribed in this section are those to be provided by new equipment with all light covers and color filters in place. Intensities shall be determined with the light source operating at a steady value equal to the average luminous output of the light source at the normal operating voltage of the airplane. The light distribution and intensities of position lights shall comply with the provisions of paragraph (b) and (c) of this section.

(b) Forward position lights. Within dihedral angle L for the left light and within dihedral angle R for the right light each forward position light shall have intensities, in any plane through the longitudinal axis of the unit, of not less than 8 candles for the first 30° as measured from the longitudinal axis, of not less than 4 candles for the next 30°, and of not less than 3 candles for the remaining directions. The intensity of an overlapping beam of the right forward position light shall be reduced to two candles or less in all directions within the first 10° of dihedral angle L. Within the next 10° of dihedral angle L the overlapping intensity in all directions shall be reduced to 0.5 candle or less. Similar limits shall apply to an overlapping beam of the left forward position light in dihedral angle R. The intensities of overlapping beams of the forward position light shall be reduced to 0.5 candle or less in all directions within the first 10° of dihedral angle A. Outside of the aforementioned overlap limits the stray light intensity from the forward position lights shall not exceed 0.5 candle in all directions within dihedral angles L, R, and A.

(c) Rear position light. The rear position light shall have an intensity of not less than 4 candles in any direction within dihedral angle A. Within a 140° cone, the axis of which is coincident with the longitudinal axis of the airplane, in dihedral angle A, the intensity shall not be less than 8 candles. The intensity of an overlapping beam of the rear position light shall be reduced to 1 candle or less in all directions within the first 20° of dihedral angles L and R. Outside of these overlap limits the stray light intensity from the rear position light shall not exceed 1 candle in all directions within dihedral angles L and R.

3.703 Color specifications. The colors of the position lights shall have the International Commission on Illumination chromatically coordinates as set forth in paragraph (a) through (c) of this section.

(a) Aviation red.

y is not greater than 0.335,

z is not greater than 0.002;

(b) Aviation green.

x is not greater than 0.440 - 0.320y,

x is not greater than y - 0.170,

y is not less than 0.390 - 0.170x;

(c) Aviation white.

x is not less than 0.350,

x is not greater than 0.540,

$y - y_o$ is not numerically greater than 0.01, where y_o is the y coordinate of the Planckian radiator for which $x = x_o$.

31. By amending the center heading preceding § 3.704 to read, “RIDING LIGHT.”

32. By amending § 3.704 to read as follows:

3.704 Riding light.

(a) When a riding (anchor) light is required for a seaplane, flying boat, or amphibian, it shall be capable of showing a white light for at least 2 miles at night under clear atmospheric conditions.

(b) The riding light shall be installed to show the maximum unbroken light practicable when the airplane is moored or drifting on the water. Externally hung lights shall be acceptable.

33. By rescinding § 3.705.

34. By adding a new sentence at the end of § 3.759 to read as follows:

3.759 Powerplant instruments* * * Ranges of engine speed which are restricted as a result of excessive engine or propeller vibration shall be marked with a red arc.

35. By amending § 3.780 (a) to read as follows:

3.780 Performance information

(a) For airplanes with a maximum certificated take-off weight of more than 6,000 lbs. information relative to the items of performance set forth in subparagraphs (1) through (5) of this paragraph shall be included.

36. By amending § 3.791 by deleting the reference therein to "§ 2.36" and substituting therefor a reference to "§ 1.50."

37. By amending § 3.792 by deleting the reference therein to "§ 43.10 (c)" and substituting therefor a reference to "§ 1.100."

(Sec. 205 (a), 52 Stat. 984; 49 U.S.C. 425(a). Interpret or apply secs. 601, 603, 52 Stat. 1007, 1009, 62 Stat. 1216; 49 U.S.C. 551, 553, Act of July 1, 1948)

By the Civil Aeronautics Board:
/s/ M.C. Mulligan
M.C. Mulligan
Secretary

(SEAL)

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