UNITED STATES OF AMERICA
FEDERAL AVIATION AGENCY
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Civil Air Regulations Amendment 7-4
Effective: October 1, 1959
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PART 7—ROTORCRAFT 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.

In the flight requirements, a revision to § 7.121 replaces the current requirement for a demonstration of controllability after power failure at only one high speed condition with a requirement for controllability after power failure over the range of air speeds and altitudes for which certification is sought. A revision to § 7.123, while still requiring satisfactory controllability, permits a slight negative slope of the stick position versus speed curve over the speed range prescribed.

A number of changes are being made with respect to the structural provisions. The requirement for ground vibration tests previously set forth in § 7.203 is being deleted. This action is based upon the conclusion that if any major component has a natural frequency which would be significantly excited by some operating parameter, such a condition would be revealed in the course of other ground and flight tests. The arbitrary design loads established for primary control systems in § 7.225 preclude the use of some otherwise acceptable installations. Therefore, this section is being revised to permit a rational approach to be used in establishing design loads which will be sufficient to insure a satisfactory control system. Section 7.235, having to do with the braked roll condition, is being amended to indicate that where rotor lift is present a load factor of 1.0 is acceptable in place of 1.33. This is also being reflected in § 7.246.

Several changes are being made to the sections dealing with control system design. One, to § 7.320, adds a requirement aimed at minimizing the possibility of incorrect assembly of the elements of the flight control system. In addition, a new § 7.328 is being included to provide minimum safety standards for power-operated control systems. Another change to the design requirements is being made to § 7.332, wherein the test procedure is being standardized insofar as the attitude of the landing gear is concerned during the drop test.

By the amendment to § 7.483, the use of rigid fuel lines is permitted regardless of whether or not the line is under pressure, provided there is no other requirement for flexibility.

An amendment to § 7.612 establishes more realistic requirements for airspeed indicator accuracy at low speeds. This change is based on the fact that it is extremely difficult to maintain low speeds during climb-out and the pilot's attention is not likely to be concentrated on the air-speed indicator during the take-off maneuver much before climb-out speed is reached. Section 7.625 is being amended to cover new types of storage batteries as well as the conventional lead-acid type.

In addition, there are included other changes which are of a clarifying or editorial nature.

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 7 of the Civil Air Regulations (14 CFR Part 7, as amended) is hereby amended as follows, effective October 1, 1959:

§ 7.1 [Amendment]

1. By amending § 7.1(c)(3) by deleting the phrase "by the U.S. National Advisory Committee for Aeronautics" and inserting in lieu thereof the phrase "by the National Aeronautics and Space Administration (formerly the National Advisory Committee for Aeronautics)".

§ 7.20 [Deletion]

2. By deleting § 7.20(c).

3. By amending § 7.120(c) to read as follows:

§ 7.120 General.

* * * * *

(c) For night or instrument certification the rotorcraft shall have such additional flight characteristics as the Administrator finds are required for safe operation under these conditions.

4. By amending § 7.121 by adding a new paragraph (e) to read as follows:

§ 7.121 Controllability.

* * * * *

(e) Controllability after power failure shall be demonstrated over the range of air speeds and altitudes for which certification is sought, starting with maximum continuous power at critical weight. In taking corrective action, the time delay for all flight conditions shall be based on the normal pilot reaction time, except that for the cruise condition the time delay shall not be less than one second.

5. By amending § 7.123(b) by deleting the words "and maintain" in two places, by amending the introductory paragraphs of subparagraphs (1), (2), and (3), and by adding a note to read as follows:

§ 7.123 Stability.

* * * * *

(b) *Static longitudinal stability*. * * *

(1) *Climb*. At all speeds from 0.85 V_Y to 1.2 V_Y, with: * * *

(2) *Cruise*. At all speeds from 0.7 V_H or 0.7 V_{NE}, whichever is less, to 1.1 V_H or 1.1 V_{NE}, whichever is less, with: * * *

(3) *Autorotation*. Throughout the speed range for which certification is sought, with: * * *

(4) *Hovering*. * * *

NOTE: It is considered acceptable for the stick position versus speed curve to have a negative slope within the speed range specified for each of the conditions in subparagraphs (1) through (3) of this paragraph, provided the negative stick displacement required is not greater than 10 percent of the total stick travel.

§ 7.203 [Amendment]

6. By amending § 7.203 by deleting paragraph (f) and redesignating paragraph (g) as paragraph (f).

§ 7.225 [Amendment]

7. By amending § 7.225(a) by deleting from the introductory paragraph the last part of the last sentence which reads "except that design loads less than those resulting from 0.60 of the specified pilot-applied forces shall not be employed" and inserting in lieu thereof two new sentences to read as follows: "The minimum design loads shall in any case be sufficient to provide a rugged system for service use, including consideration of fatigue, jamming, ground gusts, control inertia, and friction loads. In the absence of a rational analysis, the design loads resulting from 0.60 of the specified pilot-applied forces shall be considered as acceptable minimum design loads."

§ 7.235 [Amendment]

8. By amending § 7.235 by deleting the second sentence and inserting in lieu thereof a new sentence to read as follows: "The limit vertical load shall be based upon a load factor of 1.33 when the rotorcraft attitude is as specified in § 7.231(a)(1); the limit vertical load factor may be reduced to 1.0 when the attitude is as specified in § 7.231(a)(2).

9. By adding a new § 7.246 to read as follows:

§ 7.246 Tail-wheel type landing gear ground loading conditions.

The structure of a rotorcraft equipped with landing gears arranged such that two wheels are located forward and one wheel is located aft of the center of gravity shall be assumed to be subjected to the loading conditions in accordance with paragraph (a) through (h) of this section:

(a) *Level landing on forward gear only*. The rotorcraft shall be assumed to be in the level landing attitude with only the forward wheels contacting the ground.

(1) Vertical loads shall be applied in accordance with provisions of § 7.230.

(2) The vertical loads specified in subparagraph (1) of this paragraph shall be combined with a drag load at each wheel axle of not less than 25 percent of the respective vertical load.

(3) In the conditions of subparagraphs (1) and (2) of this paragraph, unbalanced pitching moments shall be assumed resisted by angular inertia forces.

(b) *Level landings; all wheels contacting simultaneously*. The rotorcraft shall be assumed to be in the level landing attitude with all wheels contacting the ground simultaneously.

(1) Vertical loads shall be applied in accordance with the provisions of § 7.230.

(2) The vertical loads specified in subparagraph (1) of this paragraph shall be combined with a drag load at each wheel axle of not less than 25 percent of the respective vertical load. Unbalanced pitching moments shall be assumed resisted by angular inertia forces.

(c) *Nose-up landing condition*. The rotorcraft shall be assumed to contact the ground on the rear wheel only at the maximum nose-up attitude to be expected under all operational landing conditions including landings in autorotation. The conditions of this paragraph need not be applied if it can be demonstrated that the probability of landing with initial contact on the rear wheel is extremely remote. In determining the applicable ground loads, it shall be acceptable to use a rational method to account for the distance between the direction of the rear wheel ground reactions and the rotorcraft c.g.

(1) Vertical loads shall be applied in accordance with the provisions of § 7.230.

(2) The vertical loads specified in subparagraph (1) of this paragraph shall be combined with a drag load at the wheel axle of not less than 25 percent of the vertical load.

(d) *One-wheel landing condition.* The rotorcraft shall be assumed in the level attitude to contact the ground on one of the wheels located forward of the c.g. The vertical load shall be the same as that obtained on the one side in the condition specified in paragraph (a)(1) of this section. Unbalanced moments shall be assumed resisted by angular inertia forces.

(e) *Side load landing condition*. The rotorcraft shall be assumed in the landing attitudes of paragraphs (a) and (b) of this section. Side loads in combination with one-half the maximum vertical ground reactions obtained in the landing conditions of paragraphs (a)(1) and (b)(1) of this section shall be applied at each wheel. The magnitude of the side loads on the forward wheels in each case shall be 0.8 of the vertical reaction (on one side) acting inward and 0.6 of the vertical reaction (on the other side) acting outward. The magnitude of the side load on the rear wheel shall be equal to 0.8 of the vertical reaction. These loads shall be applied at the ground contact point, unless the landing gear is of the full-swiveling type in which case the loads shall be applied at the center of the axle. When a lock, steering device, or shimmy damper is provided, the swiveled wheel shall also be assumed to be in the trailing position with the side load acting at the ground contact point.

(f) *Braked roll condition.* The rotorcraft attitudes shall be assumed to be the same as those prescribed in paragraphs (a) (b) of this section with the shock absorbers deflected to their static position. The limit vertical load shall be based upon a load factor of 1.33 when the rotorcraft attitude is as specified in paragraph (b) of this section; the limit load factor may be reduced to 1.0 when the attitude is as specified in paragraph (a) of this section. A drag load equal to the vertical load multiplied by a coefficient of friction of 0.8 shall be applied at the ground contact point of each wheel equipped with brakes, except that the drag load need not exceed the maximum value based on limiting brake torque.

(g) *Rear wheel turning condition.* The rotorcraft shall be assumed to be in the static ground attitude with the shock absorbers and tires deflected to their static position. A vertical ground reaction equal to the static load on the rear wheel in combination with a side component of equal magnitude shall be assumed. When a swivel is provided, the rear

wheel shall be assumed to be swiveled 90 degrees to the rotorcraft longitudinal axis with the resultant load passing through the axle. When a lock, steering device, or shimmy damper is provided, the rear wheel shall be assumed to be in the trailing position with the side load acting at the ground contact point.

(h) *Taxying condition.* The rotorcraft and its landing gear shall be designed for loads which occur when the rotorcraft is taxied over the roughest ground which it is reasonable to expect in normal operation.

10. By amending § 7.320 by adding before the parenthetical expression a new sentence to read as follows: "The elements of the flight control system shall be designed or shall be distinctively and permanently marked to minimize the possibility of incorrect assembly which could result in the malfunctioning of the control system."

11. By amending § 7.328 to read as follows:

§ 7.328 Power boost and power-operated control systems.

When a power boost or power-operated control system is used, an alternate system shall be immediately available, such that the rotorcraft can be flown and landed safely in the event of any single failure in the power portion of the system or in the event of failure of all engines. Such alternate system may be a duplicate power portion or a manually operated mechanical system. The power portion shall include the power source (e.g., hydraulic pumps), and such items as valves, lines, and actuators. The failure of mechanical parts (such as piston rods and links), and the jamming of power cylinders need not be considered if failure or jamming is considered to be extremely remote.

§ 7.332 [Amendment]

12. By amending § 7.332(a) by adding at the end thereof a new sentence to read as follows: "The attitude in which the landing gear unit is tested shall be such as to simulate the landing condition which is critical from the standpoint of energy to be absorbed by the particular unit."

§ 7.334 [Amendment]

13. By amending § 7.334(c) by deleting from the last sentence the words "In any case, the emergency system" and inserting in lieu thereof the words "When an emergency system is installed, it".

14. By amending § 7.483 to read as follows:

§ 7.483 Lines and fittings.

(a) All lines and fittings carrying flammable fluids in areas subject to engine fire conditions shall be fire resistant, except as otherwise provided in this section. If flexible hose is used, the assembly of hose and end fittings shall be of an approved type. The provisions of this paragraph shall not apply to those lines and fittings which form an integral part of the engine.

(b) Vent and drain lines and their fittings shall be subject to the provisions of paragraph (a) of this section unless a failure of such line or fitting will not result in, or add to, a fire hazard.

15. By amending § 7.612(a) by adding a title to subparagraph (3), by redesignating subparagraphs (4) and (5) as subparagraphs (5) and (6), respectively, and by adding a new subparagraph (4) to read as follows:

§ 7.612 Flight and navigational instruments.

(a) *Air-speed indicating systems.* * * *

(3) *Category A and Category B; multi-engine rotorcraft.* * * *

(4) *Category B; single-engine rotorcraft.* Calibration of the air-speed indicator, shall be made in flight at all forward speeds of 10 mph or over. The air-speed error of the installation, including the air-speed indicator instrument calibration error, shall not exceed 3 percent or 5 mph, whichever is greater, at any forward speed above 80 percent of the climb-out speed.

16. By amending the second sentence of § 7.612(f) by deleting the word "pitot" between the words "first" and "system" and inserting in lieu thereof the word "pilot".

17. By amending § 7.625(d) to read as follows:

§ 7.625 Electrical equipment and installation.

* * * * *

(d) Storage batteries shall be of such design and so installed that:

(1) Safe cell temperatures and pressures are maintained during any probable charging or discharging condition. No uncontrolled increase in cell temperature shall result when the storage battery is recharged (after previous complete discharge) at maximum regulated voltage, during a flight of maximum duration, under the most adverse cooling condition likely to occur in service. Tests to demonstrate compliance with this regulation shall not be required if satisfactory operating experience with similar batteries and installations has shown that maintaining safe cell temperatures and pressures presents no problem.

(2) Explosive or toxic gases emitted by the storage battery in normal operation, or as the result of any probable malfunction in the charging system or the battery installation, shall not accumulate in hazardous quantities within the rotorcraft.

(3) Corrosive fluids or gases which may be emitted or spilled from the storage battery shall not damage surrounding rotorcraft structure or adjacent essential equipment.

§ **6.644 [Amendment]**

18. By amending § 7.644(d) by deleting the second sentence.

§ 7.715 [Amendment]

19. By amending § 7.715 by deleting the parenthetical expression "(See §§ 7.11(a)(1), 7.111(b), and 7.741(f).)" and inserting in lieu thereof "(See §§ 7.111(a), 7.111(b), and 7.741(f).)".

§ 7.743 [Amendment]

20. By amending § 7.743(b)(5) by deleting the parenthetical expression "(See § 7.612(a)(2) and (3).)" and inserting in lieu thereof "(See § 7.612(a) (2), (3), and (4).)".

(Secs. 313(a), 601, 603, 72 Stat. 752, 775, 776; 49 U.S.C. 1354(a), 1421, 1423)

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E. R. QUESADA,

Administrator.

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