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PART 7—ROTORCRAFT AIRWORTHINESS; TRANSPORT CATEGORIES

Miscellaneous Amendments Resulting From First Airworthiness Review

As a result of the First Federal Aviation Agency Airworthiness Review, the Agency published a notice of proposed rule making affecting several parts of the Civil Air Regulations. This notice was published in the FEDERAL REGISTER (26 F.R. 5130) and circulated as Civil Air Regulations Draft Release No. 61-12 dated June 8, 1961. There are contained herein amendments to Part 7 of the Civil Air Regulations which stem from this First FAA Airworthiness Review.

Interested persons have been afforded an opportunity to express their comments in regard to the proposal and, in some cases, the proposal has been modified in accordance with such comments. The more significant amendments being adopted by the Agency are discussed herein.

Two changes are being made 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 being amended to make certain that it applies to all control systems. The other change is of an editorial nature, making § 7.226 consistent with the change to Part 6 covering the design of dual flight control systems.

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 3 sample castings are subjected to radiographic inspection and strength tests. Section 7.307 is being amended to provide a series of casting factors and corresponding test and inspection requirements which reflect current methods and practices. In addition, a minor revision in the format of this section has been made from that which was proposed and the rule now provides for alternative methods of compliance with the requirements therein.

A revision to the note under § 7.332 dealing with shock absorption tests is being made because it does not reflect the ground loading conditions for tailwheel type landing gear. It was proposed in Draft Release 61-12 to add a new § 7.342 setting forth minimum design standards for hull and float design of "sea and amphibian type rotorcraft." To avoid having the requirement affect all amphibian rotorcraft, i.e., even those which have an extremely limited capability as an amphibian, the proposal has been confined in applicability only to those rotorcraft which are to be approved for both taking off from and alighting on water. The requirement is being set forth in a new paragraph (c) under § 7.340 rather than as a new § 7.342 because it is concerned with buoyancy. This change necessitates the inclusion of the word "hulls" in § 7.340.

The upper aisle width specified in § 7.357(g) has been reduced from 20 to 18 inches, for rotorcraft having a passenger seating capacity of 10 or less, on the basis of studies indicating that this reduction would not adversely affect safe emergency evacuation. However, a further reduction of this dimension to 16 inches, as suggested by several interested persons, has not been justified. Biometric data derived from a general sampling of the civilian population reveals that a significant percentage of passengers have a standing hip-breadth exceeding 16 inches, whereas the percentage exceeding 18 inches is negligible. A 16-inch upper aisle width, therefore, introduces the probability that a single passenger may jam the aisle between seats in the excitement and near-panic of an emergency evacuation; and, in any event, movement along the aisle would be retarded by the awkward sideward gait which large-hipped passengers must assume for passage.

It had been proposed that the optional provision of § 7.385, which permits the control of fire once it has started, would be deleted. Comments made on that proposal have led to the conclusion that such an amendment might be unnecessarily restrictive and would not be compatible with other requirements which do permit the control of fire in cargo compartments and nacelles. Accordingly, presently effective § 7.385 remains unchanged. Section 7.412 dealing with fuel line location is being deleted because §§ 7.358 and 7.385 cover both the ventilation and fire control aspects of § 7.412.

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, the paragraph is being deleted.

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. As a result of comment received on Draft Release 61-12, specific requirements for demonstrations or tests are being deleted from §§ 7.413 and 7.416. Adequate authority for any ground or flight tests which might be required continues to rest in presently effective §§ 7.15 and 7.16. The unusable fuel supply is defined as that 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 an unusable fuel supply is selected as a quantity which is in excess of that which would produce a malfunction. Accordingly, the definition of unusable fuel supply is being revised to make it not less than the quantity at which the first evidence of malfunction occurs, the same as in other airworthiness parts. The form of § 7.413 is being arranged to make it consistent with that of corresponding § 4b.413 in Part 4b. This change eliminates 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, in-

spection, and overhaul. Accordingly, the presently effective provisions of paragraph (c) of § 7.413 are being deleted. The provisions of paragraph (b) of § 7.416, as proposed, are being transferred to a new paragraph (c) under § 7.413, as an editorial change, since the provision for fuel feed belongs more appropriately in the fuel flow section than in the unusable fuel supply section.

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. Section 7.414 is being deleted, therefore, and all fuel pump requirements are being combined 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 to § 7.413 eliminate the horsepower basis for establishing flow rate, § 7.415 is being deleted.

Presently effective § 7.438 merely repeats the requirement of § 7.604(f) for a low fuel warning device. Therefore, § 7.438 is being deleted and the definition of low fuel is being transferred 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, this section is being deleted. Consistent with this change, the reference to § 7.488 in § 7.487(c) is being deleted and, as proposed, a provision is being added making the requirements of § 7.487(c) applicable to any rotorcraft equipped with a diaphragm to isolate the engine power section from the engine accessory section.

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, § 7.604(m) is being amended to require oil temperature warning devices only for each main rotor drive gearbox including those gearboxes essential to rotor phasing.

Several changes are being made to the electric system requirements. Section 7.622(b) is being amended by adding two provisions which relate to the proper functioning of the generating system with respect to load equipment. Section 7.624(d) is also being amended 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 new § 7.627 is being added which is intended to insure the validity of electrical system tests under simulated conditions in the laboratory.

Two changes are being made 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, figure 7–2 is being amended to require an intensity of 0.05 I for these angles.

The current anticollision light requirements in § 7.637(a) permit .03 steradians blockage. In view of recent qualitative studies, it has been determined that such a limitation might be unduly restrictive. Therefore, § 7.637(a) is being amended to permit 0.5 steradians of obstruction.

Hydraulic system service difficulties have arisen which affect the proposal to add a new section, § 7.653, concerning hydraulic system tests. Therefore, the proposed addition of the new test requirement is not being included at this time. A study of the matter is being made outside the framework of this review.

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, § 7.738(f) is being added to require that tail rotors be marked conspicuously.

Miscellaneous changes of an editorial or clarifying nature are being made to §§ 7.11, 7.306, 7.325, 7.436, 7.447, 7.612, 7.634, 7.642, 7.714, and 7.738. Among the miscellaneous amendments there is one to expressly exclude from the provisions of § 7.11(b) consideration of provisional type certificates. While it was proposed that this be accomplished by a note, it now appears that it is more appropriate to include such a provision within § 7.11(b) rather than as a note thereto.

The proposed revisions to § 7.612(a) (3) and (4), have been withdrawn pending completion of a more comprehensive review of rotorcraft airspeed indicating system regulations. Furthermore, the proposed § 7.612(f)(4) requiring two complete static air pressure operating systems for the required instruments at the first pilot's station has been withdrawn in the light of comment received. It has been determined that one such static air pressure operating system as presently required is all that is necessary as a minimum requirement in the interest of safety. In addition, while not proposed, § 7.436 is being amended to delete redundant and contradictory requirements. This is in accordance with Part 4b requirements and the deletion imposes no additional burden on any person.

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, Part 7 of the Civil Air Regulations (14 CFR Part 7, as amended) is hereby amended as follows, effective May 3, 1962:

§ 7.11 [Amendment]

1. By amending § 7.11(b) by adding at the end of the first sentence the words "notwithstanding the applicant may have been issued 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 and 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) Values contained in MIL–HDBK–5, MIL–HDBK–17 Part I, ANC–17 Part II, ANC–18, MIL–HDBK–23 Part I, and ANC–23 Part II shall be used unless shown to be inapplicable in a particular case.

NOTE: MIL–HDBK–5, "Strength of Metal Aircraft Elements"; MIL–HDBK–17, "Plastics for Flight Vehicles, Part I—Reinforced Plastics"; ANC–17, "Plastics for Aircraft, Part II—Transparent Glazing Materials"; ANC–18, "Design of Wood Aircraft Structures", MIL–HDBK–23, "Composite Construction for Flight Vehicles, Part I—Fabrication Inspection Durability and Repair"; and ANC–23, "Sandwich Construction for Aircraft, Part II—Material Properties and Design Criteria", 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.* For structural castings, the factor of safety prescribed in § 7.200 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 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 or approved equivalent nondestructive inspection methods. Where

such castings have a casting factor less than 1.50, 3 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 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 factors and inspections shall be in accordance with the following table except that it shall be acceptable to reduce the percentage of castings inspected by nonvisual methods when an approved quality control procedure is established. For castings procured to a specification which guarantees the mechanical properties of the material in the castings and provides for demonstration of these properties by test of coupons cut from castings on a sampling basis, it shall be acceptable to use a casting factor of 1.0. The inspection requirements for such castings shall be in accordance with those specified in the following table for casting factors of 1.25 to 1.50, and the testing requirements shall be in accordance with subparagraph (1) of this paragraph.

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 or equivalent nondestructive inspection methods.
1.25 to 1.50	100 percent visual, magnetic particle or penetrant, and radiographic, or approved equivalent nondestructive inspection methods.

(3) 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 rotorcraft structural loads.

(4) The casting factor need not exceed 1.25 with regard to bearing stresses regardless of the method of inspection employed. 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.

§ 7.325 [Amendment]

6. By amending § 7.325(a)(4) by deleting the expression "ANC-5" and inserting in lieu thereof "MIL-HDBK-5".

§ 7.332 [Amendment]

7. 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 (pounds) 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).)

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

9. By amending § 7.340 by amending the heading and by adding a new paragraph (c) to read as follows:

§ 7.340 Buoyancy.

* * * * *

(c) If a rotorcraft, constructed with a hull and auxiliary floats, is to be approved for both taking off from and alighting on water, the hull and auxiliary floats 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. (See § 7.741(e).)

10. 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	15
11 to 19	12	20
20 or more	15	20

§ 7.405 [Amendment]

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.

(a) The fuel system shall provide not less than 100 percent of the fuel flow required by the engines when the rotorcraft is operated under all intended operating conditions and maneuvers.

(b) In determining compliance with the provisions of 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 whatever minimum quantity of fuel it may be necessary to add for the purpose of determining compliance.

(3) Such main pumps shall be used as are necessary for each operating condition and airplane attitude for which compliance is determined and, in addition, for each main pump so used, the appropriate emergency pump shall be substituted. (See § 7.430(b).)

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

(c) 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.

§§ 7.414, 7.415 [Deletion]

14. By deleting §§ 7.414 and 7.415.

15. By amending § 7.416 to read as follows:

§ 7.416 Unusable fuel supply.

The unusable fuel supply shall be selected by the applicant and shall be established for each tank 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 all intended operations and flight maneuvers involving use of that tank.

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.* 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.

17. By amending § 7.436 to read as follows:

§ 7.436 Fuel system drains.

Drainage of the fuel system shall be accomplished by fuel strainer drains and other drains as provided in § 7.424. The drains shall discharge clear of all portions of the rotorcraft and shall incorporate means for positive locking of the drain in the closed position, either manually or automatically.

§ 7.438 [Deletion]

18. By deleting § 7.438 including the associated note.

19. 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]

20. 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]

21. By deleting § 7.488.

22. 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.

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

§ 7.612 Flight and navigational instruments.

* * * * *

(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 (3) 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.

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

§ 7.622 Generating system.

* * * * *

(b) The generating system shall be designed so 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 and frequency (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 be simulated adequately 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".

31. 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.

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

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

§ 7.738 Miscellaneous markings and placards.

* * * * *

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

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

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N. E. HALABY,
Administrator.

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