

## § 27.1589

surface used in the tests and appropriate approach and glide airspeeds; and

(2) The horizontal takeoff distance determined in accordance with § 27.65(a)(2)(i).

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c) of the Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27-14, 43 FR 2326, Jan. 16, 1978; Amdt. 27-21, 49 FR 44435, Nov. 6, 1984]

### § 27.1589 Loading information.

There must be loading instructions for each possible loading condition between the maximum and minimum weights determined under § 27.25 that can result in a center of gravity beyond any extreme prescribed in § 27.27, assuming any probable occupant weights.

#### APPENDIX A TO PART 27—INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

##### A27.1 General.

(a) This appendix specifies requirements for the preparation of Instructions for Continued Airworthiness as required by § 27.1529.

(b) The Instructions for Continued Airworthiness for each rotorcraft must include the Instructions for Continued Airworthiness for each engine and rotor (hereinafter designated 'products'), for each appliance required by this chapter, and any required information relating to the interface of those appliances and products with the rotorcraft. If Instructions for Continued Airworthiness are not supplied by the manufacturer of an appliance or product installed in the rotorcraft, the Instructions for Continued Airworthiness for the rotorcraft must include the information essential to the continued airworthiness of the rotorcraft.

(c) The applicant must submit to the FAA a program to show how changes to the Instructions for Continued Airworthiness made by the applicant or by the manufacturers of products and appliances installed in the rotorcraft will be distributed.

##### A27.2 Format.

(a) The Instructions for Continued Airworthiness must be in the form of a manual or manuals as appropriate for the quantity of data to be provided.

(b) The format of the manual or manuals must provide for a practical arrangement.

##### A27.3 Content.

The contents of the manual or manuals must be prepared in the English language. The Instructions for Continued Airworthi-

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ness must contain the following manuals or sections, as appropriate, and information:

(a) *Rotorcraft maintenance manual or section.*

(1) Introduction information that includes an explanation of the rotorcraft's features and data to the extent necessary for maintenance or preventive maintenance.

(2) A description of the rotorcraft and its systems and installations including its engines, rotors, and appliances.

(3) Basic control and operation information describing how the rotorcraft components and systems are controlled and how they operate, including any special procedures and limitations that apply.

(4) Servicing information that covers details regarding servicing points, capacities of tanks, reservoirs, types of fluids to be used, pressures applicable to the various systems, location of access panels for inspection and servicing, locations of lubrication points, the lubricants to be used, equipment required for servicing, tow instructions and limitations, mooring, jacking, and leveling information.

(b) *Maintenance instructions.* (1) Scheduling information for each part of the rotorcraft and its engines, auxiliary power units, rotors, accessories, instruments and equipment that provides the recommended periods at which they should be cleaned, inspected, adjusted, tested, and lubricated, and the degree of inspection, the applicable wear tolerances, and work recommended at these periods. However, the applicant may refer to an accessory, instrument, or equipment manufacturer as the source of this information if the applicant shows the item has an exceptionally high degree of complexity requiring specialized maintenance techniques, test equipment, or expertise. The recommended overhaul periods and necessary cross references to the Airworthiness Limitations section of the manual must also be included. In addition, the applicant must include an inspection program that includes the frequency and extent of the inspections necessary to provide for the continued airworthiness of the rotorcraft.

(2) Troubleshooting information describing problem malfunctions, how to recognize those malfunctions, and the remedial action for those malfunctions.

(3) Information describing the order and method of removing and replacing products and parts with any necessary precautions to be taken.

(4) Other general procedural instructions including procedures for system testing during ground running, symmetry checks, weighing and determining the center of gravity, lifting and shoring, and storage limitations.

(c) Diagrams of structural access plates and information needed to gain access for inspections when access plates are not provided.

(d) Details for the application of special inspection techniques including radiographic and ultrasonic testing where such processes are specified.

(e) Information needed to apply protective treatments to the structure after inspection.

(f) All data relative to structural fasteners such as identification, discarded recommendations, and torque values.

(g) A list of special tools needed.

#### A27.4 Airworthiness Limitations section.

The Instructions for Continued Airworthiness must contain a section, titled Airworthiness Limitations that is segregated and clearly distinguishable from the rest of the document. This section must set forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure approved under §27.571. If the Instructions for Continued Airworthiness consist of multiple documents, the section required by this paragraph must be included in the principal manual. This section must contain a legible statement in a prominent location that reads: "The Airworthiness Limitations section is FAA approved and specifies inspections and other maintenance required under §§43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved."

[Amdt. 27-17, 45 FR 60178, Sept. 11, 1980, as amended by Amdt. 27-24, 54 FR 34329, Aug. 18, 1989]

### APPENDIX B TO PART 27—AIRWORTHINESS CRITERIA FOR HELICOPTER INSTRUMENT FLIGHT

I. *General.* A normal category helicopter may not be type certificated for operation under the instrument flight rules (IFR) of this chapter unless it meets the design and installation requirements contained in this appendix.

II. *Definitions.* (a)  $V_{YI}$  means instrument climb speed, utilized instead of  $V_Y$  for compliance with the climb requirements for instrument flight.

(b)  $V_{NEI}$  means instrument flight never exceed speed, utilized instead of  $V_{NE}$  for compliance with maximum limit speed requirements for instrument flight.

(c)  $V_{MINI}$  means instrument flight minimum speed, utilized in complying with minimum limit speed requirements for instrument flight.

III. *Trim.* It must be possible to trim the cyclic, collective, and directional control forces to zero at all approved IFR airspeeds, power settings, and configurations appropriate to the type.

IV. *Static longitudinal stability.* (a) *General.* The helicopter must possess positive static longitudinal control force stability at critical combinations of weight and center of

gravity at the conditions specified in paragraph IV (b) or (c) of this appendix, as appropriate. The stick force must vary with speed so that any substantial speed change results in a stick force clearly perceptible to the pilot. For single-pilot approval, the airspeed must return to within 10 percent of the trim speed when the control force is slowly released for each trim condition specified in paragraph IV(b) of this appendix.

(b) *For single-pilot approval:*

(1) *Climb.* Stability must be shown in climb throughout the speed range 20 knots either side of trim with—

(i) The helicopter trimmed at  $V_{YI}$ ;

(ii) Landing gear retracted (if retractable); and

(iii) Power required for limit climb rate (at least 1,000 fpm) at  $V_{YI}$  or maximum continuous power, whichever is less.

(2) *Cruise.* Stability must be shown throughout the speed range from 0.7 to 1.1  $V_H$  or  $V_{NEI}$ , whichever is lower, not to exceed  $\pm 20$  knots from trim with—

(i) The helicopter trimmed and power adjusted for level flight at 0.9  $V_H$  or 0.9  $V_{NEI}$ , whichever is lower; and

(ii) Landing gear retracted (if retractable).

(3) *Slow cruise.* Stability must be shown throughout the speed range from 0.9  $V_{MINI}$  to 1.3  $V_{MINI}$  or 20 knots above trim speed, whichever is greater, with—

(i) the helicopter trimmed and power adjusted for level flight at 1.1  $V_{MINI}$ ; and

(ii) Landing gear retracted (if retractable).

(4) *Descent.* Stability must be shown throughout the speed range 20 knots either side of trim with—

(i) The helicopter trimmed at 0.8  $V_H$  or 0.8  $V_{NEI}$  (or 0.8  $V_{LE}$  for the landing gear extended case), whichever is lower;

(ii) Power required for 1,000 fpm descent at trim speed; and

(iii) Landing gear extended and retracted, if applicable.

(5) *Approach.* Stability must be shown throughout the speed range from 0.7 times the minimum recommended approach speed to 20 knots above the maximum recommended approach speed with—

(i) The helicopter trimmed at the recommended approach speed or speeds;

(ii) Landing gear extended and retracted, if applicable; and

(iii) Power required to maintain a 3° glide path and power required to maintain the steepest approach gradient for which approval is requested.

(c) Helicopters approved for a minimum crew of two pilots must comply with the provisions of paragraphs IV(b)(2) and IV(b)(5) of this appendix.

V. *Static lateral-directional stability.* (a) Static directional stability must be positive throughout the approved ranges of airspeed, power, and vertical speed. In straight, steady sideslips up to  $\pm 10^\circ$  from trim, directional

control position must increase in approximately constant proportion to angle of sideslip. At greater angles up to the maximum sideslip angle appropriate to the type, increased directional control position must produce increased angle of sideslip.

(b) During sideslips up to  $\pm 10^\circ$  from trim throughout the approved ranges of airspeed, power, and vertical speed, there must be no negative dihedral stability perceptible to the pilot through lateral control motion or force. Longitudinal cyclic movement with sideslip must not be excessive.

VI. *Dynamic stability.* (a) For single-pilot approval—

(1) Any oscillation having a period of less than 5 seconds must damp to  $\frac{1}{2}$  amplitude in not more than one cycle.

(2) Any oscillation having a period of 5 seconds or more but less than 10 seconds must damp to  $\frac{1}{2}$  amplitude in not more than two cycles.

(3) Any oscillation having a period of 10 seconds or more but less than 20 seconds must be damped.

(4) Any oscillation having a period of 20 seconds or more may not achieve double amplitude in less than 20 seconds.

(5) Any aperiodic response may not achieve double amplitude in less than 6 seconds.

(b) For helicopters approved with a minimum crew of two pilots—

(1) Any oscillation having a period of less than 5 seconds must damp to  $\frac{1}{2}$  amplitude in not more than two cycles.

(2) Any oscillation having a period of 5 seconds or more but less than 10 seconds must be damped.

(3) Any oscillation having a period of 10 seconds or more may not achieve double amplitude in less than 10 seconds.

VII. *Stability augmentation system (SAS).* (a) If a SAS is used, the reliability of the SAS must be related to the effects of its failure. The occurrence of any failure condition which would prevent continued safe flight and landing must be extremely improbable. For any failure condition of the SAS which is not shown to be extremely improbable—

(1) The helicopter must be safely controllable and capable of prolonged instrument flight without undue pilot effort. Additional unrelated probable failures affecting the control system must be considered; and

(2) The flight characteristics requirements in Subpart B of Part 27 must be met throughout a practical flight envelope.

(b) The SAS must be designed so that it cannot create a hazardous deviation in flight path or produce hazardous loads on the helicopter during normal operation or in the event of malfunction or failure, assuming corrective action begins within an appropriate period of time. Where multiple systems are installed, subsequent malfunction conditions must be considered in sequence

unless their occurrence is shown to be improbable.

VIII. *Equipment, systems, and installation.* The basic equipment and installation must comply with §§29.1303, 29.1431, and 29.1433 through Amendment 29-14, with the following exceptions and additions:

(a) *Flight and Navigation Instruments.* (1) A magnetic gyro-stabilized direction indicator instead of a gyroscopic direction indicator required by §29.1303(h); and

(2) A standby attitude indicator which meets the requirements of §§29.1303(g)(1) through (7) instead of a rate-of-turn indicator required by §29.1303(g). For two-pilot configurations, one pilot's primary indicator may be designated for this purpose. If standby batteries are provided, they may be charged from the aircraft electrical system if adequate isolation is incorporated.

(b) *Miscellaneous requirements.* (1) Instrument systems and other systems essential for IFR flight that could be adversely affected by icing must be adequately protected when exposed to the continuous and intermittent maximum icing conditions defined in appendix C of Part 29 of this chapter, whether or not the rotorcraft is certificated for operation in icing conditions.

(2) There must be means in the generating system to automatically de-energize and disconnect from the main bus any power source developing hazardous overvoltage.

(3) Each required flight instrument using a power supply (electric, vacuum, etc.) must have a visual means integral with the instrument to indicate the adequacy of the power being supplied.

(4) When multiple systems performing like functions are required, each system must be grouped, routed, and spaced so that physical separation between systems is provided to ensure that a single malfunction will not adversely affect more than one system.

(5) For systems that operate the required flight instruments at each pilot's station—

(i) Only the required flight instruments for the first pilot may be connected to that operating system;

(ii) Additional instruments, systems, or equipment may not be connected to an operating system for a second pilot unless provisions are made to ensure the continued normal functioning of the required instruments in the event of any malfunction of the additional instruments, systems, or equipment which is not shown to be extremely improbable;

(iii) The equipment, systems, and installations must be designed so that one display of the information essential to the safety of flight which is provided by the instruments will remain available to a pilot, without additional crewmember action, after any single failure or combination of failures that is not shown to be extremely improbable; and

(iv) For single-pilot configurations, instruments which require a static source must be provided with a means of selecting an alternate source and that source must be calibrated.

IX. *Rotorcraft Flight Manual*. A Rotorcraft Flight Manual or Rotorcraft Flight Manual IFR Supplement must be provided and must contain—

(a) *Limitations*. The approved IFR flight envelope, the IFR flightcrew composition, the revised kinds of operation, and the steepest IFR precision approach gradient for which the helicopter is approved;

(b) *Procedures*. Required information for proper operation of IFR systems and the recommended procedures in the event of stability augmentation or electrical system failures; and

(c) *Performance*. If  $V_{YI}$  differs from  $V_Y$ , climb performance at  $V_{YI}$  and with maximum continuous power throughout the ranges of weight, altitude, and temperature for which approval is requested.

[Amdt. 27-19, 48 FR 4389, Jan. 31, 1983]

#### APPENDIX C TO PART 27—CRITERIA FOR CATEGORY A

##### C27.1 General.

A small multiengine rotorcraft may not be type certificated for Category A operation unless it meets the design installation and performance requirements contained in this appendix in addition to the requirements of this part.

C27.2 Applicable part 29 sections. The following sections of part 29 of this chapter must be met in addition to the requirements of this part:

- 29.45(a) and (b)(2)—General.
- 29.49(a)—Performance at minimum operating speed.
- 29.51—Takeoff data: General.
- 29.53—Takeoff: Category A.
- 29.55—Takeoff decision point: Category A.
- 29.59—Takeoff Path: Category A.
- 29.60—Elevated heliport takeoff path: Category A.
- 29.61—Takeoff distance: Category A.
- 29.62—Rejected takeoff: Category A.
- 29.64—Climb: General.
- 29.65(a)—Climb: AEO.
- 29.67(a)—Climb: OEI.
- 29.75—Landing: General.
- 29.77—Landing decision point: Category A.
- 29.79—Landing: Category A.
- 29.81—Landing distance (Ground level sites): Category A.
- 29.85—Balked landing: Category A.
- 29.87(a)—Height-velocity envelope.
- 29.547(a) and (b)—Main and tail rotor structure.
- 29.861(a)—Fire protection of structure, controls, and other parts.
- 29.901(c)—Powerplant: Installation.

- 29.903(b) (c) and (e)—Engines.
- 29.908(a)—Cooling fans.
- 29.917(b) and (c)(1)—Rotor drive system: Design.
- 29.927(c)(1)—Additional tests.
- 29.953(a)—Fuel system independence.
- 29.1027(a)—Transmission and gearboxes: General.
- 29.1045(a)(1), (b), (c), (d), and (f)—Climb cooling test procedures.
- 29.1047(a)—Takeoff cooling test procedures.
- 29.1181(a)—Designated fire zones: Regions included.
- 29.1187(e)—Drainage and ventilation of fire zones.
- 29.1189(c)—Shutoff means.
- 29.1191(a)(1)—Firewalls.
- 29.1193(e)—Cowling and engine compartment covering.
- 29.1195(a) and (d)—Fire extinguishing systems (one shot).
- 29.1197—Fire extinguishing agents.
- 29.1199—Extinguishing agent containers.
- 29.1201—Fire extinguishing system materials.
- 29.1305(a) (6) and (b)—Powerplant instruments.
- 29.1309(b)(2) (i) and (d)—Equipment, systems, and installations.
- 29.1323(c)(1)—Airspeed indicating system.
- 29.1331(b)—Instruments using a power supply.
- 29.1351(d)(2)—Electrical systems and equipment: General (operation without normal electrical power).
- 29.1587(a)—Performance information.

NOTE: In complying with the paragraphs listed in paragraph C27.2 above, relevant material in the AC ‘‘Certification of Transport Category Rotorcraft’’ should be used.

[Doc. No. 28008, 61 FR 21907, May 10, 1996]

## PART 29—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY ROTORCRAFT

### Subpart A—General

- Sec.
- 29.1 Applicability.
- 29.2 Special retroactive requirements.

### Subpart B—Flight

#### GENERAL

- 29.21 Proof of compliance.
- 29.25 Weight limits.
- 29.27 Center of gravity limits.
- 29.29 Empty weight and corresponding center of gravity.
- 29.31 Removable ballast.
- 29.33 Main rotor speed and pitch limits.

#### PERFORMANCE

- 29.45 General.
- 29.49 Performance at minimum operating speed.