

§ 29.621

(i) Uncertainties in manufacturing processes; or

(ii) Uncertainties in inspection methods.

(b) For each part of the rotorcraft to which §§ 29.621 through 29.625 apply, the factor of safety prescribed in § 29.303 must be multiplied by a special factor equal to—

(1) The applicable special factors prescribed in §§ 29.621 through 29.625; or

(2) Any other factor great enough to ensure that the probability of the part being understrength because of the uncertainties specified in paragraph (a) of this section is extremely remote.

§ 29.621 Casting factors.

(a) *General.* The factors, tests, and inspections specified in paragraphs (b) and (c) of this section must be applied in addition to those necessary to establish foundry quality control. The inspections must meet approved specifications. Paragraphs (c) and (d) of this section apply to structural castings except castings that are pressure tested as parts of hydraulic or other fluid systems and do not support structural loads.

(b) *Bearing stresses and surfaces.* The casting factors specified in paragraphs (c) and (d) of this section—

(1) Need not exceed 1.25 with respect to bearing stresses regardless of the method of inspection used; and

(2) Need not be used with respect to the bearing surfaces of a part whose bearing factor is larger than the applicable casting factor.

(c) *Critical castings.* For each casting whose failure would preclude continued safe flight and landing of the rotorcraft or result in serious injury to any occupant, the following apply:

(1) Each critical casting must—

(i) Have a casting factor of not less than 1.25; and

(ii) Receive 100 percent inspection by visual, radiographic, and magnetic particle (for ferromagnetic materials) or penetrant (for nonferromagnetic materials) inspection methods or approved equivalent inspection methods.

(2) For each critical casting with a casting factor less than 1.50, three sample castings must be static tested and shown to meet—

(i) The strength requirements of § 29.305 at an ultimate load corresponding to a casting factor of 1.25; and

(ii) The deformation requirements of § 29.305 at a load of 1.15 times the limit load.

(d) *Noncritical castings.* For each casting other than those specified in paragraph (c) of this section, the following apply:

(1) Except as provided in paragraphs (d)(2) and (3) of this section, the casting factors and corresponding inspections must meet the following table:

Casting factor	Inspection
2.0 or greater	100 percent visual.
Less than 2.0, greater than 1.5.	100 percent visual, and magnetic particle (ferromagnetic materials), penetrant (nonferromagnetic materials), or approved equivalent inspection methods.
1.25 through 1.50	100 percent visual, and magnetic particle (ferromagnetic materials), penetrant (nonferromagnetic materials), and radiographic or approved equivalent inspection methods.

(2) The percentage of castings inspected by nonvisual methods may be reduced below that specified in paragraph (d)(1) of this section when an approved quality control procedure is established.

(3) For castings procured to a specification that guarantees the mechanical properties of the material in the casting and provides for demonstration of these properties by test of coupons cut from the castings on a sampling basis—

(i) A casting factor of 1.0 may be used; and

(ii) The castings must be inspected as provided in paragraph (d)(1) of this section for casting factors of “1.25 through 1.50” and tested under paragraph (c)(2) of this section.

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-41, 62 FR 46173, Aug. 29, 1997]

§ 29.623 Bearing factors.

(a) Except as provided in paragraph (b) of this section, each part that has clearance (free fit), and that is subject to pounding or vibration, must have a bearing factor large enough to provide

for the effects of normal relative motion.

(b) No bearing factor need be used on a part for which any larger special factor is prescribed.

§ 29.625 Fitting factors.

For each fitting (part or terminal used to join one structural member to another) the following apply:

(a) For each fitting whose strength is not proven by limit and ultimate load tests in which actual stress conditions are simulated in the fitting and surrounding structures, a fitting factor of at least 1.15 must be applied to each part of—

- (1) The fitting;
- (2) The means of attachment; and
- (3) The bearing on the joined members.

(b) No fitting factor need be used—

(1) For joints made under approved practices and based on comprehensive test data (such as continuous joints in metal plating, welded joints, and scarf joints in wood); and

(2) With respect to any bearing surface for which a larger special factor is used.

(c) For each integral fitting, the part must be treated as a fitting up to the point at which the section properties become typical of the member.

(d) Each seat, berth, litter, safety belt, and harness attachment to the structure must be shown by analysis, tests, or both, to be able to withstand the inertia forces prescribed in § 29.561(b)(3) multiplied by a fitting factor of 1.33.

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-42, 63 FR 43285, Aug. 12, 1998]

§ 29.629 Flutter and divergence.

Each aerodynamic surface of the rotorcraft must be free from flutter and divergence under each appropriate speed and power condition.

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

§ 29.631 Bird strike.

The rotorcraft must be designed to ensure capability of continued safe flight and landing (for Category A) or safe landing (for Category B) after impact with a 2.2-lb (1.0 kg) bird when the

velocity of the rotorcraft (relative to the bird along the flight path of the rotorcraft) is equal to V_{NE} or V_H (whichever is the lesser) at altitudes up to 8,000 feet. Compliance must be shown by tests or by analysis based on tests carried out on sufficiently representative structures of similar design.

[Doc. No. 28008, 61 FR 21907, May 10, 1996; 61 FR 33963, July 1, 1996]

ROTORS

§ 29.653 Pressure venting and drainage of rotor blades.

(a) For each rotor blade—

(1) There must be means for venting the internal pressure of the blade;

(2) Drainage holes must be provided for the blade; and

(3) The blade must be designed to prevent water from becoming trapped in it.

(b) Paragraphs (a)(1) and (2) of this section does not apply to sealed rotor blades capable of withstanding the maximum pressure differentials expected in service.

[Amdt. 29-3, 33 FR 967, Jan. 26, 1968]

§ 29.659 Mass balance.

(a) The rotor and blades must be mass balanced as necessary to—

(1) Prevent excessive vibration; and

(2) Prevent flutter at any speed up to the maximum forward speed.

(b) The structural integrity of the mass balance installation must be substantiated.

[Amdt. 29-3, 33 FR 967, Jan. 26, 1968]

§ 29.661 Rotor blade clearance.

There must be enough clearance between the rotor blades and other parts of the structure to prevent the blades from striking any part of the structure during any operating condition.

[Amdt. 29-3, 33 FR 967, Jan. 26, 1968]

§ 29.663 Ground resonance prevention means.

(a) The reliability of the means for preventing ground resonance must be shown either by analysis and tests, or