Subpart D—Design and Construction

§27.601 Design.
(a) The rotorcraft may have no design features or details that experience has shown to be hazardous or unreliable.
(b) The suitability of each questionable design detail and part must be established by tests.

§27.602 Critical parts.
(a) Critical part. A critical part is a part, the failure of which could have a catastrophic effect upon the rotorcraft, and for which critical characteristics have been identified which must be controlled to ensure the required level of integrity.
(b) If the type design includes critical parts, a critical parts list shall be established. Procedures shall be established to define the critical design characteristics, identify processes that affect those characteristics, and identify the design change and process change controls necessary for showing compliance with the quality assurance requirements of part 21 of this chapter.

§27.603 Materials.
The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must—
(a) Be established on the basis of experience or tests;
(b) Meet approved specifications that ensure their having the strength and other properties assumed in the design data; and
(c) Take into account the effects of environmental conditions, such as temperature and humidity, expected in service.

§27.605 Fabrication methods.
(a) The methods of fabrication used must produce consistently sound structures. If a fabrication process (such as gluing, spot welding, or heat-treating) requires close control to reach this objective, the process must be performed according to an approved process specification.
(b) Each new aircraft fabrication method must be substantiated by a test program.

§27.607 Fasteners.
(a) Each removable bolt, screw, nut, pin, or other fastener whose loss could jeopardize the safe operation of the rotorcraft must incorporate two separate locking devices. The fastener and its locking devices may not be adversely affected by the environmental conditions associated with the particular installation.
(b) No self-locking nut may be used on any bolt subject to rotation in operation unless a nonfriction locking device is used in addition to the self-locking device.

§27.609 Protection of structure.
Each part of the structure must—
(a) Be suitably protected against deterioration or loss of strength in service due to any cause, including—
(1) Weathering;
(2) Corrosion; and
(3) Abrasion; and
(b) Have provisions for ventilation and drainage where necessary to prevent the accumulation of corrosive, flammable, or noxious fluids.

§27.610 Lightning and static electricity protection.
(a) The rotorcraft must be protected against catastrophic effects from lightning.
(b) For metallic components, compliance with paragraph (a) of this section may be shown by—
§ 27.611 Inspection provisions.

There must be means to allow the close examination of each part that requires—
(a) Recurring inspection;
(b) Adjustment for proper alignment and functioning; or
(c) Lubrication.

§ 27.613 Material strength properties and design values.

(a) Material strength properties must be based on enough tests of material meeting specifications to establish design values on a statistical basis.
(b) Design values must be chosen to minimize the probability of structural failure due to material variability. Except as provided in paragraphs (d) and (e) of this section, compliance with this paragraph must be shown by selecting design values that assure material strength with the following probability—
(1) Electrically bonding the components properly to the airframe; or
(2) Designing the components so that a strike will not endanger the rotorcraft.
(c) For nonmetallic components, compliance with paragraph (a) of this section may be shown by—
(1) Designing the components to minimize the effect of a strike; or
(2) Incorporating acceptable means of diverting the resulting electrical current so as not to endanger the rotorcraft.
(d) The electrical bonding and protection against lightning and static electricity must—
(1) Minimize the accumulation of electrostatic charge;
(2) Minimize the risk of electric shock to crew, passengers, and service and maintenance personnel using normal precautions;
(3) Provide an electrical return path, under both normal and fault conditions, on rotorcraft having grounded electrical systems; and
(4) Reduce to an acceptable level the effects of static electricity on the functioning of essential electrical and electronic equipment.

[Amdt. 27–21, 49 FR 44433, Nov. 6, 1984, as amended by Amdt. 27–37, 64 FR 45094, Aug. 18, 1999; Amdt. 27–46, 76 FR 33135, June 8, 2011]

§ 27.619 Special factors.

(a) The special factors prescribed in §§27.621 through 27.625 apply to each part of the structure whose strength is—
(1) Uncertain;
(2) Likely to deteriorate in service before normal replacement; or
(3) Subject to appreciable variability due to—

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