

(i) Be reliable, durable, and function properly with all external loads up to and including the maximum external limit load for which authorization is requested.

(ii) Be protected against electromagnetic interference (EMI) from external and internal sources and against lightning to prevent inadvertent load release.

(A) The minimum level of protection required for jettisonable rotorcraft-load combinations used for nonhuman external cargo is a radio frequency field strength of 20 volts per meter.

(B) The minimum level of protection required for jettisonable rotorcraft-load combinations used for human external cargo is a radio frequency field strength of 200 volts per meter.

(iii) Be protected against any failure that could be induced by a failure mode of any other electrical or mechanical rotorcraft system.

(c) For rotorcraft-load combinations to be used for human external cargo applications, the rotorcraft must—

(1) For jettisonable external loads, have a quick-release system that meets the requirements of paragraph (b) of this section and that—

(i) Provides a dual actuation device for the primary quick release subsystem, and

(ii) Provides a separate dual actuation device for the backup quick release subsystem;

(2) Have a reliable, approved personnel carrying device system that has the structural capability and personnel safety features essential for external occupant safety;

(3) Have placards and markings at all appropriate locations that clearly state the essential system operating instructions and, for the personnel carrying device system, ingress and egress instructions;

(4) Have equipment to allow direct intercommunication among required crewmembers and external occupants;

(5) Have the appropriate limitations and procedures incorporated in the flight manual for conducting human external cargo operations; and

(6) For human external cargo applications requiring use of Category A rotorcraft, have one-engine-inoperative hover performance data and procedures

in the flight manual for the weights, altitudes, and temperatures for which external load approval is requested.

(d) The critically configured jettisonable external loads must be shown by a combination of analysis, ground tests, and flight tests to be both transportable and releasable throughout the approved operational envelope without hazard to the rotorcraft during normal flight conditions. In addition, these external loads—must be shown to be releasable without hazard to the rotorcraft during emergency flight conditions.

(e) A placard or marking must be installed next to the external-load attaching means clearly stating any operational limitations and the maximum authorized external load as demonstrated under § 29.25 and this section.

(f) The fatigue evaluation of § 29.571 of this part does not apply to rotorcraft-load combinations to be used for nonhuman external cargo except for the failure of critical structural elements that would result in a hazard to the rotorcraft. For rotorcraft-load combinations to be used for human external cargo, the fatigue evaluation of § 29.571 of this part applies to the entire quick release and personnel carrying device structural systems and their attachments.

[Amdt. 29-12, 41 FR 55472, Dec. 20, 1976, as amended by Amdt. 27-26, 55 FR 8005, Mar. 6, 1990; Amdt. 29-43, 64 FR 43020, Aug. 6, 1999]

MISCELLANEOUS

§ 29.871 Leveling marks.

There must be reference marks for leveling the rotorcraft on the ground.

§ 29.873 Ballast provisions.

Ballast provisions must be designed and constructed to prevent inadvertent shifting of ballast in flight.

Subpart E—Powerplant

GENERAL

§ 29.901 Installation.

(a) For the purpose of this part, the powerplant installation includes each part of the rotorcraft (other than the main and auxiliary rotor structures) that—

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- (1) Is necessary for propulsion;
- (2) Affects the control of the major propulsive units; or
- (3) Affects the safety of the major propulsive units between normal inspections or overhauls.

(b) For each powerplant installation—

(1) The installation must comply with—

- (i) The installation instructions provided under § 33.5 of this chapter; and
- (ii) The applicable provisions of this subpart.

(2) Each component of the installation must be constructed, arranged, and installed to ensure its continued safe operation between normal inspections or overhauls for the range of temperature and altitude for which approval is requested.

(3) Accessibility must be provided to allow any inspection and maintenance necessary for continued airworthiness; and

(4) Electrical interconnections must be provided to prevent differences of potential between major components of the installation and the rest of the rotorcraft.

(5) Axial and radial expansion of turbine engines may not affect the safety of the installation.

(6) Design precautions must be taken to minimize the possibility of incorrect assembly of components and equipment essential to safe operation of the rotorcraft, except where operation with the incorrect assembly can be shown to be extremely improbable.

(c) For each powerplant and auxiliary power unit installation, it must be established that no single failure or malfunction or probable combination of failures will jeopardize the safe operation of the rotorcraft except that the failure of structural elements need not be considered if the probability of any such failure is extremely remote.

(d) Each auxiliary power unit installation must meet the applicable provisions of this subpart.

(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)))

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-3, 33 FR 969, Jan. 26, 1968; Amdt. 29-13, 42 FR 15046, Mar. 17, 1977; Amdt. 29-17, 43 FR 50600, Oct. 30, 1978; Amdt. 29-26, 53 FR 34215, Sept. 2, 1988; Amdt. 29-36, 60 FR 55776, Nov. 2, 1995]

§ 29.903 Engines.

(a) *Engine type certification.* Each engine must have an approved type certificate. Reciprocating engines for use in helicopters must be qualified in accordance with § 33.49(d) of this chapter or be otherwise approved for the intended usage.

(b) *Category A; engine isolation.* For each category A rotorcraft, the powerplants must be arranged and isolated from each other to allow operation, in at least one configuration, so that the failure or malfunction of any engine, or the failure of any system that can affect any engine, will not—

(1) Prevent the continued safe operation of the remaining engines; or

(2) Require immediate action, other than normal pilot action with primary flight controls, by any crewmember to maintain safe operation.

(c) *Category A; control of engine rotation.* For each Category A rotorcraft, there must be a means for stopping the rotation of any engine individually in flight, except that, for turbine engine installations, the means for stopping the engine need be provided only where necessary for safety. In addition—

(1) Each component of the engine stopping system that is located on the engine side of the firewall, and that might be exposed to fire, must be at least fire resistant; or

(2) Duplicate means must be available for stopping the engine and the controls must be where all are not likely to be damaged at the same time in case of fire.

(d) *Turbine engine installation.* For turbine engine installations—