§ 33.91 Engine system and component tests.

(a) For those systems or components that cannot be adequately substantiated in accordance with endurance testing of §33.87, the applicant must conduct additional tests to demonstrate that the systems or components are able to perform the intended functions in all declared environmental and operating conditions.

(b) Temperature limits must be established for those components that require temperature controlling provisions in the aircraft installation to assure satisfactory functioning, reliability, and durability.

(c) Each unpressurized hydraulic fluid tank may not fail or leak when subjected to a maximum operating temperature and an internal pressure of 5 p.s.i., and each pressurized hydraulic fluid tank must meet the requirements of §33.64.

(d) For an engine type certificated for use in supersonic aircraft, the systems, safety devices, and external components that may fail because of operation at maximum and minimum operating temperatures must be identified and tested at maximum and minimum operating temperatures and while temperature and other operating conditions are cycled between maximum and minimum operating values.


§ 33.92 Rotor locking tests.

If continued rotation is prevented by a means to lock the rotor(s), the engine must be subjected to a test that includes:

(a) The engine must be shut down from rated maximum continuous thrust or power; and

(b) The means for stopping and locking the rotor(s) must be operated as specified in the engine operating instructions while being subjected to the maximum torque that could result from continued flight in this condition; and

(c) Following rotor locking, the rotor(s) must be held stationary under these conditions for five minutes for each of the 25 operations.

[Doc. No. 28107, 61 FR 28433, June 4, 1996]

§ 33.93 Teardown inspection.

(a) After completing the endurance testing of §33.87 (b), (c), (d), (e), or (g) of this part, each engine must be completely disassembled, and

(1) Each component having an adjustment setting and a functioning characteristic that can be established independent of installation on the engine must retain each setting and functioning characteristic within the limits that were established and recorded at the beginning of the test; and

(2) Each engine part must conform to the type design and be eligible for incorporation into an engine for continued operation, in accordance with information submitted in compliance with §33.4.

(b) After completing the endurance testing of §33.87(f), each engine must be completely disassembled, and

(1) Each component having an adjustment setting and a functioning characteristic that can be established independent of installation on the engine must retain each setting and functioning characteristic within the limits that were established and recorded at the beginning of the test; and

(2) Each engine may exhibit deterioration in excess of that permitted in paragraph (a)(2) of this section, including some engine parts or components that may be unsuitable for further use. The applicant must show by inspection, analysis, test, or by any combination thereof as found necessary by the FAA, that structural integrity of the engine is maintained; or

(c) In lieu of compliance with paragraph (b) of this section, each engine for which the 30-second OEI and 2-
minute OEI ratings are desired, may be subjected to the endurance testing of §§33.87 (b), (c), (d), or (e) of this part, and followed by the testing of §33.87(f) without intervening disassembly and inspection. However, the engine must comply with paragraph (a) of this section after completing the endurance testing of §33.87(f).


§ 33.94 Blade containment and rotor unbalance tests.

(a) Except as provided in paragraph (b) of this section, it must be demonstrated by engine tests that the engine is capable of containing damage without catching fire and without failure of its mounting attachments when operated for at least 15 seconds, unless the resulting engine damage induces a self shutdown, after each of the following events:

(1) Failure of the most critical compressor or fan blade while operating at maximum permissible r.p.m. The blade failure must occur at the outermost retention groove or, for integrally-bladed rotor discs, at least 80 percent of the blade must fail.

(2) Failure of the most critical turbine blade while operating at maximum permissible r.p.m. The blade failure must occur at the outermost retention groove or, for integrally-bladed rotor discs, at least 80 percent of the blade must fail. The most critical turbine blade must be determined by considering turbine blade weight and the strength of the adjacent turbine case at case temperatures and pressures associated with operation at maximum permissible r.p.m.

(b) Analysis based on rig testing, component testing, or service experience may be substitute for one of the engine tests prescribed in paragraphs (a)(1) and (a)(2) of this section if—

(1) That test, of the two prescribed, produces the least rotor unbalance; and

(2) The analysis is shown to be equivalent to the test.

(Secs. 313(a), 601, and 603, Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, and 1423); and 49 U.S.C. 106(g) Revised, Pub. L. 97–449, Jan. 12, 1983)

[Amdt. 33–10, 49 FR 6854, Feb. 23, 1984]

§ 33.95 Engine-propeller systems tests.

If the engine is designed with a propeller brake which will allow the propeller to be brought to a stop while the gas generator portion of the engine remains in operation, and remain stopped during operation of the engine as an auxiliary power unit (“APU mode”), in addition to the requirements of §33.87, the applicant must conduct the following tests:

(a) Ground locking: A total of 45 hours with the propeller brake engaged in a manner which clearly demonstrates its ability to function without adverse effects on the complete engine while the engine is operating in the APU mode.

(b) Dynamic braking: A total of 400 application-release cycles of brake engagements must be made in a manner which clearly demonstrates its ability to function without adverse effects on