

§ 87.60

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does not allow for installation of a spare engine on a new aircraft.

(2) Each spare engine must be identical to a sub-model previously certificated to meet all requirements applicable to Tier 4 engines or later requirements.

(3) Spare engines excepted under this paragraph (c) may be used only where the emissions of the spare engines are certificated to equal to or lower emission standards than those of the engines they are replacing, for all regulated pollutants.

(4) No prior approval is required to produce spare engines. Engine manufacturers must include information about their production of spare engines in the annual report specified in paragraph (d) of this section

(5) The permanent record for each engine excepted under this paragraph (c) must indicate that the engine was produced as an excepted spare engine.

(6) Engines excepted under this paragraph (c) must be labeled with the following statement: “EXCEPTED SPARE”.

(d) *Annual reports.* If you produce engines with an exemption/exception under this section, you must submit an annual report with respect to such engines.

(1) You must send the Designated EPA Program Officer a report describing your production of exempted/excepted engines for each calendar year in which you produce such engines by February 28 of the following calendar year. You may include this information in the certification report described in § 87.42. Confirm that the information in your initial request is still accurate, or describe any relevant changes.

(2) Provide the information specified in this paragraph (d)(2). For purposes of this paragraph (d), treat spare engine exceptions separate from other new engine exemptions. Include the following for each exemption/exception and each engine model and sub-model:

(i) Engine model and sub-model names.

(ii) Serial number of each engine.

(iii) Use of each engine (for example, spare or new installation).

(iv) Types of aircraft in which the engines were installed (or are intended to be installed for spare engines).

(v) Serial number of the new aircraft in which engines are installed (if known), or the name of the air carriers (or other operators) using spare engines.

(3) Include information in the report only for engines having a date of manufacture within the specific calendar year.

Subpart G—Test Procedures

§ 87.60 Introduction.

(a) Except as provided under § 87.5, the procedures described in this subpart shall be the test program to determine the conformity of new aircraft gas turbine engines with the applicable standards set forth in this part.

(b) The test consists of operating the engine at prescribed power settings on an engine dynamometer (for engines producing primarily shaft power) or thrust measuring test stand (for engines producing primarily thrust). The exhaust gases generated during engine operation are sampled continuously for specific component analysis through the analytical train.

(c) The exhaust emission test is designed to measure hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen concentrations, and to determine mass emissions through calculations during a simulated aircraft landing-takeoff cycle (LTO). The LTO cycle is based on time in mode data during high activity periods at major airports. The test for propulsion engines consists of at least the following four modes of engine operation: taxi/idle, takeoff, climbout, and approach. The mass emission for the modes are combined to yield the reported values.

(d) When an engine is tested for exhaust emissions on an engine dynamometer or test stand, the complete engine shall be used with all accessories which might reasonably be expected to influence emissions to the atmosphere installed and functioning, if not otherwise prohibited by § 87.62(a)(2). Use of service air bleed and shaft power extraction to power auxiliary gearbox-mounted components required to drive aircraft systems is not permitted.

(e) Other gaseous emissions measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator or the Secretary.

[47 FR 58470, Dec. 30, 1982, as amended at 49 FR 31875, Aug. 9, 1984; 62 FR 25366, May 8, 1997]

EFFECTIVE DATE NOTE: At 77 FR 36386, June 18, 2012, §87.60 was revised, effective July 18, 2012. For the convenience of the user, the revised text is set forth as follows:

§ 87.60 Testing engines.

(a) Use the equipment and procedures specified in Appendix 3, Appendix 5, and Appendix 6 of ICAO Annex 16 (incorporated by reference in §87.8), as applicable, to demonstrate whether engines meet the gaseous emission standards specified in subpart C of this part. Measure the emissions of all regulated gaseous pollutants. Similarly, use the equipment and procedures specified in Appendix 2 and Appendix 6 of ICAO Annex 16 to determine whether engines meet the smoke standard specified in subpart C of this part. The compliance demonstration consists of establishing a mean value from testing some number of engines, then calculating a “characteristic level” by applying a set of statistical factors that take into account the number of engines tested. Round each characteristic level to the same number of decimal places as the corresponding emission standard. For turboprop engines, use the procedures specified for turbofan engines, consistent with good engineering judgment.

(b) Use a test fuel meeting the specifications described in Appendix 4 of ICAO Annex 16 (incorporated by reference in §87.8). The test fuel must not have additives whose purpose is to suppress smoke, such as organometallic compounds.

(c) Prepare test engines by including accessories that are available with production engines if they can reasonably be expected to influence emissions. The test engine may not extract shaft power or bleed service air to provide power to auxiliary gearbox-mounted components required to drive aircraft systems.

(d) Test engines must reach a steady operating temperature before the start of emission measurements.

(e) In consultation with the EPA, the FAA may approve alternate procedures for measuring emissions as specified in this paragraph (e). This might include testing and sampling methods, analytical techniques, and equipment specifications that differ from those specified in this part. Manufacturers and operators may request this approval by sending a written request with supporting justification to the FAA and to the Designated EPA Program Officer. Such a request may be approved only if one of the following conditions is met:

(1) The engine cannot be tested using the specified procedures.

(2) The alternate procedure is shown to be equivalent to or better (e.g., more accurate or precise) than the specified procedure.

(f) The following landing and take-off (LTO) cycles apply for emission testing and calculating weighted LTO values:

TABLE 1 TO § 87.60—LTO TEST CYCLES

Mode	Turboprop		Subsonic turbofan		Supersonic turbofan	
	Percent of rated output	Time in mode (minutes)	Percent of rated output	Time in mode (minutes)	Percent of rated output	Time in mode (minutes)
Take-off	100	0.5	100	0.7	100	1.2
Climb	90	2.5	85	2.2	65	2.0
Descent	15	1.2
Approach	30	4.5	30	4.0	34	2.3
Taxi/ground idle	7	26.0	7	26.0	5.8	26.0

(g) Engines comply with an applicable standard if the testing results show that the engine type certificate family’s characteristic level does not exceed the numerical level of that standard, as described in §87.60.

§87.61 Turbine fuel specifications.

For exhaust emission testing, fuel meeting the specifications listed in this section shall be used. Additives used for the purpose of smoke suppress-

sion (such as organometallic compounds) shall not be present.

Property and Allowable Range of Values

- Density kg/m³ at 15 °C: 780–820.
- Distillation temperature, °C: 10% boiling point, 155–201; final boiling point, 235–285.
- Net heat of combustion, MJ/kg: 42.86–43.50.
- Aromatics, volume %: 15–23.
- Naphthalenes, volume %: 1.0–3.5.
- Smoke point, mm: 20–28.
- Hydrogen, mass %: 13.4–14.1.
- Sulfur, mass %: less than 0.3%.