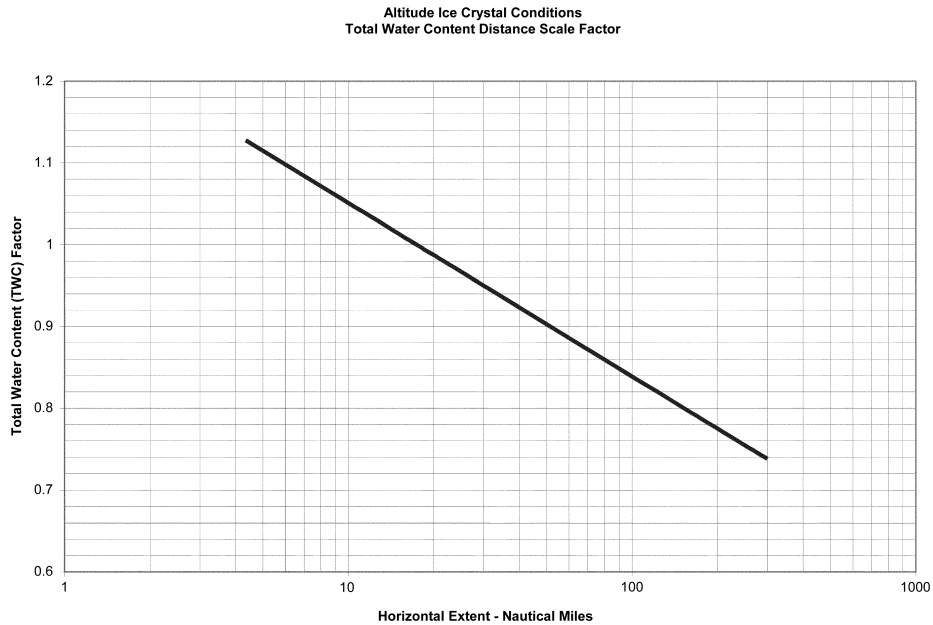


FIGURE D3 — Exposure Length Influence on TWC



[Amdt. 33-34, 79 FR 65538, Nov. 4, 2014]

**PART 34—FUEL VENTING AND EXHAUST EMISSION REQUIREMENTS FOR TURBINE ENGINE POWERED AIRPLANES**

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AUTHORITY: 42 U.S.C. 4321 *et seq.*, 7572; 49 U.S.C. 106(g), 40113, 44701-44702, 44704, 44714.

SOURCE: Docket No. 25613, 55 FR 32861, Aug. 10, 1990, unless otherwise noted.

## Subpart A—General Provisions

### § 34.1 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Clean Air Act, as amended (42 U.S.C. 7401 et. seq.):

*Act* means the Clean Air Act, as amended (42 U.S.C. 7401 et. seq.).

*Administrator* means the Administrator of the Federal Aviation Administration or any person to whom he has delegated his authority in the matter concerned.

*Administrator of the EPA* means the Administrator of the Environmental Protection Agency and any other officer or employee of the Environmental Protection Agency to whom the authority involved may be delegated.

*Aircraft* as used in this part means any airplane as defined in 14 CFR part 1 for which a U.S. standard airworthiness certificate or equivalent foreign airworthiness certificate is issued.

*Aircraft engine* means a propulsion engine which is installed in, or which is manufactured for installation in, an aircraft.

*Aircraft gas turbine engine* means a turboprop, turbofan, or turbojet aircraft engine.

*Characteristic level* has the meaning given in Appendix 6 of ICAO Annex 16 as of July 2008. The characteristic level is a calculated emission level for each pollutant based on a statistical assessment of measured emissions from multiple tests.<sup>1</sup>

*Class TP* means all aircraft turboprop engines.

*Class TF* means all turbofan or turbojet aircraft engines or aircraft en-

gines designed for applications that otherwise would have been fulfilled by turbojet and turbofan engines except engines of class T3, T8, and TSS.

*Class T3* means all aircraft gas turbine engines of the JT3D model family.

*Class T8* means all aircraft gas turbine engines of the JT8D model family.

*Class TSS* means all aircraft gas turbine engines employed for propulsion of aircraft designed to operate at supersonic flight speeds.

*Commercial aircraft engine* means any aircraft engine used or intended for use by an “air carrier” (including those engaged in “intrastate air transportation”) or a “commercial operator” (including those engaged in “intrastate air transportation”) as these terms are defined in Title 49 of the United States Code and Title 14 of the Code of Federal Regulations.

*Commercial aircraft gas turbine engine* means a turboprop, turbofan, or turbojet commercial aircraft engine.

*Date of manufacture* of an engine is the date the inspection acceptance records reflect that the engine is complete and meets the FAA approved type design.

*Derivative engine for emissions certification purposes* means an engine that has the same or similar emissions characteristics as an engine covered by a U.S. type certificate issued under 14 CFR part 33. These characteristics are specified in § 34.48.

*Emission measurement system* means all of the equipment necessary to transport the emission sample and measure the level of emissions. This includes the sample system and the instrumentation system.

*Engine model* means all commercial aircraft turbine engines which are of the same general series, displacement, and design characteristics and are approved under the same type certificate.

*Excepted*, as used in § 34.9, means an engine that may be produced and sold that does not meet otherwise applicable standards. Excepted engines must conform to regulatory conditions specified for an exception in § 34.9. Excepted engines are subject to the standards of this part even though they are not required to comply with the otherwise

<sup>1</sup>This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. This document can be obtained from the ICAO, Document Sales Unit, 999 University Street, Montreal, Quebec H3C 5H7, Canada, phone + 1 514-954-8022, or [www.icao.int](http://www.icao.int) or [sales14icao.int](http://sales14icao.int). Copies can be reviewed at the FAA New England Regional Office, 12 New England Executive Park, Burlington, Massachusetts, 781-238-7101, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

applicable requirements. Engines excepted with respect to certain standards must comply with other standards from which they are not specifically excepted.

*Exempt* means an engine that does not meet certain applicable standards but may be produced and sold under the terms allowed by a grant of exemption issued pursuant to §34.7 of this part and part 11 of this chapter. Exempted engines must conform to regulatory conditions specified in the exemption as well as other applicable regulations. Exempted engines are subject to the standards of this part even though they are not required to comply with the otherwise applicable requirements. Engines exempted with respect to certain standards must comply with other standards as a condition of the exemption.

*Exhaust emissions* means substances emitted into the atmosphere from the exhaust discharge nozzle of an aircraft or aircraft engine.

*Fuel venting emissions* means raw fuel, exclusive of hydrocarbons in the exhaust emissions, discharged from aircraft gas turbine engines during all normal ground and flight operations.

*In-use aircraft gas turbine engine* means an aircraft gas turbine engine which is in service.

*Introduction date* means the date of manufacture of the first individual production engine of a given engine model or engine type certificate family to be certificated. Neither test engines nor engines not placed into service affect this date.

*New aircraft turbine engine* means an aircraft gas turbine engine which has never been in service.

*Power setting* means the power or thrust output of an engine in terms of kilonewtons thrust for turbojet and turbofan engines or shaft power in terms of kilowatts for turboprop engines.

*Rated output (rO)* means the maximum power/thrust available for take-off at standard day conditions as approved for the engine by the Federal Aviation Administration, including reheat contribution where applicable, but excluding any contribution due to water injection, expressed in kilowatts

or kilonewtons (as applicable), rounded to at least three significant figures.

*Rated pressure ratio (rPR)* means the ratio between the combustor inlet pressure and the engine inlet pressure achieved by an engine operation at rated output, rounded to at least three significant figures.

*Reference day conditions* means the reference ambient conditions to which the gaseous emissions (HC and smoke) are to be corrected. The reference day conditions are as follows: Temperature = 15 °C, specific humidity = 0.00629 kg H<sub>2</sub>O/kg of dry air, and pressure = 101325 Pa.

*Sample system* means the system which provides for the transportation of the gaseous emission sample from the sample probe to the inlet of the instrumentation system.

*Shaft power* means only the measured shaft power output of a turboprop engine.

*Smoke* means the matter in exhaust emissions which obscures the transmission of light.

*Smoke number (SN)* means the dimensionless term quantifying smoke emissions.

*Standard day conditions* means the following ambient conditions: temperature = 15 °C, specific humidity = 0.00634 kg H<sub>2</sub>O/kg dry air, and pressure = 101.325 kPa.

*Taxi/idle (in)* means those aircraft operations involving taxi and idle between the time of landing roll-out and final shutdown of all propulsion engines.

*Taxi/idle (out)* means those aircraft operations involving taxi and idle between the time of initial starting of the propulsion engine(s) used for the taxi and the turn onto the duty runway.

*Tier*, as used in this part, is a designation related to the NO<sub>x</sub> emission standard for the engine as specified in §34.21 or §34.23 of this part (e.g., Tier 0).

[Doc. No. 25613, 55 FR 32861, Aug. 10, 1990; 55 FR 37287, Sept. 10, 1990, as amended by Amdt. 34-3, 64 FR 5558, Feb. 3, 1999; Amdt. 34-5, 77 FR 76849, Dec. 31, 2012; Amdt. 34-5A, 78 FR 63016, Oct. 23, 2013]

## § 34.2

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### § 34.2 Abbreviations.

The abbreviations used in this part have the following meanings in both upper and lower case:

CO <sub>2</sub>	Carbon dioxide
CO	Carbon monoxide
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration, United States Department of Transportation
g	Gram(s)
HC	Hydrocarbon(s)
HP	Horsepower
hr	Hour(s)
H <sub>2</sub> O	water
kg	Kilogram(s)
kJ	Kilojoule(s)
kN	Kilonewton(s)
kW	Kilowatt(s)
lb	Pound(s)
LTO	Landing and takeoff
min	Minute(s)
NO <sub>x</sub>	Oxides of nitrogen
Pa	Pascal(s)
rO	Rated output
rPR	Rated pressure ratio
sec	Second(s)
SP	Shaft power
SN	Smoke number
T	Temperature, degrees Kelvin
TIM	Time in mode
°C	Degrees Celsius
%	Percent

[Doc. No. 25613, 55 FR 32861, Aug. 10, 1990, as amended by Amdt. 34-3, 64 FR 5559, Feb. 3, 1999; Amdt. 34-5, 77 FR 76850, Dec. 31, 2012]

### § 34.3 General requirements.

(a) This part provides for the approval or acceptance by the Administrator or the Administrator of the EPA of testing and sampling methods, analytical techniques, and related equipment not identical to those specified in this part. Before either approves or accepts any such alternate, equivalent, or otherwise nonidentical procedures or equipment, the Administrator or the Administrator of the EPA shall consult with the other in determining whether or not the action requires rulemaking under sections 231 and 232 of the Clean Air Act, as amended, consistent with the responsibilities of the Administrator of the EPA and the Secretary of Transportation under sections 231 and 232 of the Clean Air Act.

(b) Under section 232 of the Act, the Secretary of Transportation issues regulations to ensure compliance with 40 CFR part 87. This authority has been delegated to the Administrator of the FAA (49 CFR 1.47).

(c) *U.S. airplanes.* This part applies to civil airplanes that are powered by aircraft gas turbine engines of the classes specified herein and that have U.S. standard airworthiness certificates.

(d) *Foreign airplanes.* Pursuant to the definition of “aircraft” in 40 CFR 87.1, this regulation applies to civil airplanes that are powered by aircraft gas turbine engines of the classes specified herein and that have foreign airworthiness certificates that are equivalent to U.S. standard airworthiness certificates. This regulation applies only to those foreign civil airplanes that, if registered in the United States, would be required by applicable regulations to have a U.S. standard airworthiness certificate in order to conduct the operations intended for the airplane. Pursuant to 40 CFR 87.3(c), this regulation does not apply where it would be inconsistent with an obligation assumed by the United States to a foreign country in a treaty, convention, or agreement.

(e) Reference in this regulation to 40 CFR part 87 refers to title 40 of the Code of Federal Regulations, chapter I—Environmental Protection Agency, part 87, Control of Air Pollution from Aircraft and Aircraft Engines (40 CFR part 87).

(f) This part contains regulations to ensure compliance with certain standards contained in 40 CFR part 87. If EPA takes any action, including the issuance of an exemption or issuance of a revised or alternate procedure, test method, or other regulation, the effect of which is to relax or delay the effective date of any provision of 40 CFR part 87 that is made applicable to an aircraft under this FAR, the Administrator of FAA will grant a general administrative waiver of its more stringent requirements until this FAR is amended to reflect the more relaxed requirements prescribed by EPA.

(g) Unless otherwise stated, all terminology and abbreviations in this FAR that are defined in 40 CFR part 87 have the meaning specified in that part, and all terms in 40 CFR part 87

that are not defined in that part but that are used in this FAR have the meaning given them in the Clean Air Act, as amended by Public Law 91-604.

(h) All interpretations of 40 CFR part 87 that are rendered by the EPA also apply to this FAR.

(i) If the EPA, under 40 CFR 87.3(a), approves or accepts any testing and sampling procedures or methods, analytical techniques, or related equipment not identical to those specified in that part, this FAR requires an applicant to show that such alternate, equivalent, or otherwise nonidentical procedures have been complied with, and that such alternate equipment was used to show compliance, unless the applicant elects to comply with those procedures, methods, techniques, and equipment specified in 40 CFR part 87.

(j) If the EPA, under 40 CFR 87.5, prescribes special test procedures for any aircraft or aircraft engine that is not susceptible to satisfactory testing by the procedures in 40 CFR part 87, the applicant must show the Administrator that those special test procedures have been complied with.

(k) Wherever 40 CFR part 87 requires agreement, acceptance, or approval by the Administrator of the EPA, this FAR requires a showing that such agreement or approval has been obtained.

(l) Pursuant to 42 U.S.C. 7573, no state or political subdivision thereof may adopt or attempt to enforce any standard respecting emissions of any air pollutant from any aircraft or engine thereof unless that standard is identical to a standard made applicable to the aircraft by the terms of this FAR.

(m) If EPA, by regulation or exemption, relaxes a provision of 40 CFR part 87 that is implemented in this FAR, no state or political subdivision thereof may adopt or attempt to enforce the terms of this FAR that are superseded by the relaxed requirement.

(n) If any provision of this FAR is rendered inapplicable to a foreign aircraft as provided in 40 CFR 87.3(c) (international agreements), and §34.3(d) of this FAR, that provision may not be adopted or enforced against that foreign aircraft by a state or political subdivision thereof.

(o) For exhaust emissions requirements of this FAR that apply beginning February 1, 1974, January 1, 1976, January 1, 1978, January 1, 1984, and August 9, 1985, continued compliance with those requirements is shown for engines for which the type design has been shown to meet those requirements, if the engine is maintained in accordance with applicable maintenance requirements for 14 CFR chapter I. All methods of demonstrating compliance and all model designations previously found acceptable to the Administrator shall be deemed to continue to be an acceptable demonstration of compliance with the specific standards for which they were approved.

(p) Each applicant must allow the Administrator to make, or witness, any test necessary to determine compliance with the applicable provisions of this FAR.

[Doc. No. 25613, 55 FR 32861, Aug. 10, 1990; 55 FR 37287, Sept. 10, 1990; Amdt. 34-5, 77 FR 76850, Dec. 31, 2012]

#### § 34.4 [Reserved]

#### § 34.5 Special test procedures.

The Administrator or the Administrator of the EPA may, upon written application by a manufacturer or operator of aircraft or aircraft engines, approve test procedures for any aircraft or aircraft engine that is not susceptible to satisfactory testing by the procedures set forth herein. Prior to taking action on any such application, the Administrator or the Administrator of the EPA shall consult with the other.

#### § 34.6 Aircraft safety.

(a) The provisions of this part will be revised if at any time the Administrator determines that an emission standard cannot be met within the specified time without creating a safety hazard.

(b) Consistent with 40 CFR 87.6, if the FAA Administrator determines that any emission control regulation in this part cannot be safely applied to an aircraft, that provision may not be adopted or enforced against that aircraft by any state or political subdivision thereof.

**§ 34.7 Exemptions.**

Notwithstanding part 11 of the Federal Aviation Regulations (14 CFR part 11), all petitions for rulemaking involving either the substance of an emission standard or test procedure prescribed by the EPA that is incorporated in this FAR, or the compliance date for such standard or procedure, must be submitted to the EPA. Information copies of such petitions are invited by the FAA. Petitions for rulemaking or exemption involving provisions of this FAR that do not affect the substance or the compliance date of an emission standard or test procedure that is prescribed by the EPA, and petitions for exemptions under the provisions for which the EPA has specifically granted exemption authority to the Secretary of Transportation are subject to part 11 of the Federal Aviation Regulations (14 CFR part 11). Petitions for rulemaking or exemptions involving these FARs must be submitted to the FAA.

(a) *Exemptions based on flights for short durations at infrequent intervals.* The emission standards of this part do not apply to engines which power aircraft operated in the United States for short durations at infrequent intervals. Such operations are limited to:

(1) Flights of an aircraft for the purpose of export to a foreign country, including any flights essential to demonstrate the integrity of an aircraft prior to a flight to a point outside the United States.

(2) Flights to a base where repairs, alterations or maintenance are to be performed, or to a point of storage, or for the purpose of returning an aircraft to service.

(3) Official visits by representatives of foreign governments.

(4) Other flights the Administrator determines, after consultation with the Administrator of the EPA, to be for short durations at infrequent intervals. A request for such a determination shall be made before the flight takes place.

(b) *Exemptions for very low production engine models.* The emissions standards of this part do not apply to engines of very low production after the date of applicability. For the purpose of this part, “very low production” is limited to a maximum total production for

United States civil aviation applications of no more than 200 units covered by the same type certificate after January 1, 1984. Engines manufactured under this provision must be reported to the FAA by serial number on or before the date of manufacture and exemptions granted under this provision are not transferable to any other engine. This exemption is limited to the requirements of § 34.21 only.

(c) *Exemptions for new engines in other categories.* The emissions standards of this part do not apply to engines for which the Administrator determines, with the concurrence of the Administrator of the EPA, that application of any standard under § 34.21 is not justified, based upon consideration of—

(1) Adverse economic impact on the manufacturer;

(2) Adverse economic impact on the aircraft and airline industries at large;

(3) Equity in administering the standards among all economically competing parties;

(4) Public health and welfare effects; and

(5) Other factors which the Administrator, after consultation with the Administrator of the EPA, may deem relevant to the case in question.

(d) *Applicants seeking exemption from other emissions standards of this part and 40 CFR part 87.* Applicants must request exemption from both the FAA and the EPA, even where the underlying regulatory requirements are the same. The FAA and EPA will jointly consider such exemption requests, and will assure consistency in the respective agency determinations.

(e) Applications for exemption from this part shall be submitted in duplicate to the Administrator in accordance with the procedures established by the Administrator in part 11.

(f) The Administrator shall publish in the FEDERAL REGISTER the name of the organization to whom exemptions are granted and the period of such exemptions.

(g) No state or political subdivision thereof may attempt to enforce a standard respecting emissions from an

aircraft or engine if such aircraft or engine has been exempted from such standard under this part.

[Doc. No. 25613, 55 FR 32861, Aug. 10, 1990, as amended by Amdt. 34-5, 77 FR 76850, Dec. 31, 2012]

#### § 34.9 Exceptions.

(a) *Spare engines.* Certain engines that meet the following description are excepted:

(1) This exception allows production of an engine for installation on an in-service aircraft. A spare engine may not be installed on a new aircraft.

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

(3) A spare engine may be used only when the emissions of the spare do not exceed the certification requirements of the original engine, for all regulated pollutants.

(4) No separate approval is required to produce spare engines.

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

(6) Engines produced under this exception must be labeled "EXCEPTED SPARE" in accordance with § 45.13 of this chapter.

(b) On and after July 18, 2012, and before August 31, 2013, a manufacturer may produce up to six Tier 4 compliant engines that meet the NO<sub>x</sub> standards of paragraph (d)(1)(vi) of this section rather than § 34.23(a)(2). No separate approval is required to produce these engines. Engines produced under this exception are to be labeled "COMPLY" in accordance with § 45.13 of this chapter.

[Doc. No. FAA-2012-1333, 77 FR 76850, Dec. 31, 2012]

### Subpart B—Engine Fuel Venting Emissions (New and In-Use Aircraft Gas Turbine Engines)

#### § 34.10 Applicability.

(a) The provisions of this subpart are applicable to all new aircraft gas turbine engines of classes T3, T8, TSS, and TF equal to or greater than 36 kN (8,090 lb) rated output, manufactured on or after January 1, 1974, and to all in-use

aircraft gas turbine engines of classes T3, T8, TSS, and TF equal to or greater than 36 kN (8,090 lb) rated output manufactured after February 1, 1974.

(b) The provisions of this subpart are also applicable to all new aircraft gas turbine engines of class TF less than 36 kN (8,090 lb) rated output and class TP manufactured on or after January 1, 1975, and to all in-use aircraft gas turbine engines of class TF less than 36 kN (8,090 lb) rated output and class TP manufactured after January 1, 1975.

[Doc. No. FAA-2012-1333, 77 FR 76850, Dec. 31, 2012]

#### § 34.11 Standard for fuel venting emissions.

(a) No fuel venting emissions shall be discharged into the atmosphere from any new or in-use aircraft gas turbine engine subject to the subpart. This paragraph is directed at the elimination of intentional discharge to the atmosphere of fuel drained from fuel nozzle manifolds after engines are shut down and does not apply to normal fuel seepage from shaft seals, joints, and fittings.

(b) Conformity with the standard set forth in paragraph (a) of this section shall be determined by inspection of the method designed to eliminate these emissions.

(c) As applied to an airframe or an engine, any manufacturer or operator may show compliance with the fuel venting and emissions requirements of this section that were effective beginning February 1, 1974 or January 1, 1975, by any means that prevents the intentional discharge of fuel from fuel nozzle manifolds after the engines are shut down. Acceptable means of compliance include one of the following:

(1) Incorporation of an FAA-approved system that recirculates the fuel back into the fuel system.

(2) Capping or securing the pressurization and drain valve.

(3) Manually draining the fuel from a holding tank into a container.

§ 34.20

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**Subpart C—Exhaust Emissions  
(New Aircraft Gas Turbine Engines)**

**§ 34.20 Applicability.**

The provisions of this subpart are applicable to all aircraft gas turbine engines of the classes specified beginning on the dates specified in § 34.21.

**§ 34.21 Standards for exhaust emissions.**

(a) Exhaust emissions of smoke from each new aircraft gas turbine engine of class T8 manufactured on or after February 1, 1974, shall not exceed a smoke number (SN) of 30.

(b) Exhaust emissions of smoke from each new aircraft gas turbine engine of class TF and of rated output of 129 kN (29,000 lb) thrust or greater, manufactured on or after January 1, 1976, shall not exceed

$SN = 83.6 (rO)^{-0.274}$  (rO is in kN).

(c) Exhaust emission of smoke from each new aircraft gas turbine engine of class T3 manufactured on or after January 1, 1978, shall not exceed a smoke number (SN) of 25.

(d) Gaseous exhaust emissions from each new aircraft gas turbine engine shall not exceed:

(1) For Classes TF, T3, T8 engines greater than 26.7 kN (6,000 lb) rated output:

(i) Engines manufactured on or after January 1, 1984:

Hydrocarbons: 19.6 g/kN rO.

(ii) Engines manufactured on or after July 7, 1997:

Carbon Monoxide: 118 g/kN rO.

(iii) Engines of a type or model of which the date of manufacture of the first individual production model was on or before December 31, 1995, and for which the date of manufacture of the individual engine was on or before December 31, 1999 (Tier 2):

Oxides of Nitrogen:  $(40 + 2(rPR))$  g/kN rO.

(iv) Engines of a type or model of which the date of manufacture of the first individual production model was after December 31, 1995, or for which the date of manufacture of the indi-

vidual engine was after December 31, 1999 (Tier 2):

Oxides of Nitrogen:  $(32 + 1.6(rPR))$  g/kN rO.

(v) The emission standards prescribed in paragraphs (d)(1)(iii) and (iv) of this section apply as prescribed beginning July 7, 1997.

(vi) The emission standards of this paragraph apply as prescribed after December 18, 2005. For engines of a type or model of which the first individual production model was manufactured after December 31, 2003 (Tier 4):

(A) That have a rated pressure ratio of 30 or less and a maximum rated output greater than 89 kN:

Oxides of Nitrogen:  $(19 + 1.6(rPR))$  g/kN rO.

(B) That have a rated pressure ratio of 30 or less and a maximum rated output greater than 26.7 kN but not greater than 89 kN:

Oxides of Nitrogen:  $(37.572 + 1.6(rPR) - 0.2087(rO))$  g/kN rO.

(C) That have a rated pressure ratio greater than 30 but less than 62.5, and a maximum rated output greater than 89 kN:

Oxides of Nitrogen:  $(7 + 2(rPR))$  g/kN rO.

(D) That have a rated pressure ratio greater than 30 but less than 62.5, and a maximum rated output greater than 26.7 kN but not greater than 89 kN:

Oxides of Nitrogen:  $(42.71 + 1.4286(rPR) - 0.4013(rO) + 0.00642(rPR \times rO))$  g/kN rO.

(E) That have a rated pressure ratio of 62.5 or more:

Oxides of Nitrogen:  $(32 + 1.6(rPR))$  g/kN rO.

(2) For Class TSS Engines manufactured on or after January 1, 1984:

Hydrocarbons:  $140 (0.92)^{rPR}$  g/kN rO.

(e) Smoke exhaust emissions from each gas turbine engine of the classes specified below shall not exceed:

(1) For Class TF of rated output less than 26.7 kN (6,000 lb) manufactured on or after August 9, 1985:

$SN = 83.6(rO)^{-0.274}$  (rO is in kN) not to exceed a maximum of SN = 50.



(2) For Classes T3, T8, TSS, and TF of rated output equal to or greater than 26.7 kN (6,000 lb) manufactured on or after January 1, 1984:

$$SN = 83.6(rO)^{-0.274} \text{ (rO is in kN) not to exceed a maximum of } SN = 50.$$

(3) For Class TP of rated output equal to or greater than 1,000 kW manufactured on or after January 1, 1984:

$$SN = 187(rO)^{-0.168} \text{ (rO is in kW).}$$

(f) The standards set forth in paragraphs (a), (b), (c), (d), and (e) of this section refer to a composite gaseous emission sample representing the operation cycles and exhaust smoke emission emitted during operation of the engine as specified in the applicable sections of subpart G of this part, and measured and calculated in accordance with the procedures set forth in subpart G.

(g) Where a gaseous emission standard is specified by a formula, calculate and round the standard to three significant figures or to the nearest 0.1 g/kN (for standards at or above 100 g/kN). Where a smoke standard is specified by a formula, calculate and round the standard to the nearest 0.1 SN. 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 § 34.60.

[Doc. No. 25613, 55 FR 32861, Aug. 10, 1990; 55 FR 37287, Sept. 10, 1990, as amended by Amdt. 34-3, 64 FR 5559, Feb. 3, 1999; Amdt. 34-4, 74 FR 19127, Apr. 28, 2009; Amdt. 34-5, 77 FR 76851, Dec. 31, 2012]

**§ 34.23 Exhaust Emission Standards for Engines Manufactured on and after July 18, 2012.**

The standards of this section apply to aircraft engines manufactured on and after July 18, 2012, unless otherwise exempted or excepted. Where a gaseous emission standard is specified by a formula, calculate and round the standard to three significant figures or to the nearest 0.1 g/kN (for standards at or above 100 g/kN). Where a smoke standard is specified by a formula, calculate and round the standard to the nearest 0.1 SN. 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 § 34.60.

(a) Gaseous exhaust emissions from each new aircraft gas turbine engine shall not exceed:

(1) For Classes TF, T3 and T8 of rated output less than 26.7 kN (6,000 lb) manufactured on and after July 18, 2012:

$$SN = 83.6(rO)^{-0.274} \text{ or } 50.0, \text{ whichever is smaller}$$

(2) Except as provided in §§ 34.9(b) and 34.21(c), for Classes TF, T3 and T8 engines manufactured on and after July 18, 2012, and for which the first individual production model was manufactured on or before December 31, 2013 (Tier 6):

TIER 6 OXIDES OF NITROGEN EMISSION STANDARDS FOR SUBSONIC ENGINES

Class	Rated pressure ratio— rPR	Rated output rO (kN)	NO <sub>x</sub> (g/kN)
TF, T3, T8	rPR ≤ 30	26.7 < rO ≤ 89.0	38.5486 + 1.6823 (rPR) - 0.2453 (rO) - (0.00308 (rPR) (rO)).
		rO > 89.0	16.72 + 1.4080 (rPR).
	30 < rPR < 82.6	26.7 < rO ≤ 89.0	46.1600 + 1.4286 (rPR) - 0.5303 (rO) + (0.00642 (rPR) (rO)).
		rO > 89.0	- 1.04 + 2.0 (rPR).
rPR ≥ 82.6	rO ≥ 26.7	32 + 1.6 (rPR).	

(3) Engines exempted from paragraph (a)(2) of this section produced on or before December 31, 2016 must be labeled “EXEMPT NEW” in accordance with

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§ 45.13 of this chapter. No exemptions to the requirements of paragraph (a)(2) of this section will be granted after December 31, 2016.

(4) For Class TSS Engines manufactured on and after July 18, 2012:

**GASEOUS EMISSION STANDARDS FOR SUPERSONIC ENGINES**

Class	Rated output rO <sup>1</sup> (kN)	NO <sub>x</sub> (g/kN)	CO (g/kN)
TSS .....	All .....	36 + 2.42 (rPR) .....	4,550 (rPR) <sup>-1.03</sup>

<sup>1</sup>rO is the rated output with afterburning applied.

(b) Gaseous exhaust emissions from each new aircraft gas turbine engine shall not exceed:

dividual production model was manufactured after December 31, 2013 (Tier 8):

(1) For Classes TF, T3 and T8 engines of a type or model of which the first in-

**TIER 8 OXIDES OF NITROGEN EMISSION STANDARDS FOR SUBSONIC ENGINES**

Class	Rated pressure ratio—rPR	Rated output rO (kN)	NO <sub>x</sub> (g/kN)
TF, T3, T8 .....	rPR ≤ 30 .....	26.7 < rO ≤ 89.0 .....	40.052 + 1.5681 (rPR) - 0.3615 (rO) - (0.0018 (rPR) (rO)).
		rO > 89.0 .....	7.88 + 1.4080 (rPR).
	30 < rPR < 104.7 .....	26.7 < rO ≤ 89.0 .....	41.9435 + 1.505 (rPR) - 0.5823 (rO) + (0.005562 (rPR) (rO)).
		rO > 89.0 .....	- 9.88 + 2.0 (rPR).
rPR ≥ 104.7 .....	rO ≥ 26.7 .....	32 + 1.6 (rPR).	

(c) Engines (including engines that are determined to be derivative engines for the purposes of emission certification) type certificated with characteristic levels at or below the NO<sub>x</sub> standards of § 34.21(d)(1)(vi) of this part (as applicable based on rated output and rated pressure ratio) and introduced before July 18, 2012, may be produced through December 31, 2012, without meeting the NO<sub>x</sub> standard of paragraph (a)(2) of this section.

**§ 34.31 Standards for exhaust emissions.**

(a) Exhaust emissions of smoke from each in-use aircraft gas turbine engine of Class T8, beginning February 1, 1974, shall not exceed a smoke number (SN) of 30.

(b) Exhaust emissions of smoke from each in-use aircraft gas turbine engine of Class TF and of rated output of 129 kN (29,000 lb) thrust or greater, beginning January 1, 1976, shall not exceed SN = 83.6(rO)<sup>-0.274</sup> (rO is in kN).

[Doc. No. 34-5, 77 FR 76851, Dec. 31, 2012, as amended by Amdt. 34-5A, 78 FR 63017, Oct. 23, 2013; 78 FR 65554, Nov. 1, 2013]

(c) The standards set forth in paragraphs (a) and (b) of this section refer to exhaust smoke emission emitted during operation of the engine as specified in the applicable sections of subpart G of this part, and measured and calculated in accordance with the procedures set forth in subpart G.

**Subpart D—Exhaust Emissions (In-use Aircraft Gas Turbine Engines)**

**§ 34.30 Applicability.**

The provisions of this subpart are applicable to all in-use aircraft gas turbine engines certificated for operation within the United States of the classes specified, beginning on the dates specified in § 34.31.

[Doc. No. FAA-2012-1333, 77 FR 76852, Dec. 31, 2012]

**Subpart E—Certification Provisions****§ 34.48 Derivative engines for emissions certification purposes.**

(a) *General.* A derivative engine for emissions certification purposes is an engine configuration that is determined to be similar in design to a previously certificated (original) engine for purposes of compliance with exhaust emissions standards (gaseous and smoke). A type certificate holder may request from the FAA a determination that an engine configuration is considered a derivative engine for emissions certification purposes. To be considered a derivative engine for emission purposes under this part, the configuration must have been derived from the original engine that was certificated to the requirements of part 33 of this chapter and one of the following:

(1) The FAA has determined that a safety issue exists that requires an engine modification.

(2) Emissions from the derivative engines are determined to be similar. In general, this means the emissions must meet the criteria specified in paragraph (b) of this section. The FAA may amend the criteria of paragraph (b) in unusual circumstances, for individual cases, consistent with good engineering judgment.

(3) All of the regulated emissions from the derivative engine are lower than the original engine.

(b) *Emissions similarity.* (1) The type certificate holder must demonstrate that the proposed derivative engine model's emissions meet the applicable standards and differ from the original model's emission rates only within the following ranges:

(i)  $\pm 3.0$  g/kN for NO<sub>x</sub>.

(ii)  $\pm 1.0$  g/kN for HC.

(iii)  $\pm 5.0$  g/kN for CO.

(iv)  $\pm 2.0$  SN for smoke.

(2) If the characteristic level of the original certificated engine model (or any other sub-models within the emission type certificate family tested for certification) before modification is at or above 95% of the applicable standard for any pollutant, an applicant must measure the proposed derivative engine model's emissions for all pollutants to demonstrate that the derivative engine's resulting characteristic levels

will not exceed the applicable emission standards. If the characteristic levels of the originally certificated engine model (and all other sub-models within the emission type certificate family tested for certification) are below 95% of the applicable standard for each pollutant, the applicant may use engineering analysis consistent with good engineering judgment to demonstrate that the derivative engine will not exceed the applicable emission standards. The engineering analysis must address all modifications from the original engine, including those approved for previous derivative engines.

(c) *Continued production allowance.* Derivative engines for emissions certification purposes may continue to be produced after the applicability date for new emissions standards when the engines conform to the specifications of this section.

(d) *Non-derivative engines.* If the FAA determines that an engine model does not meet the requirements for a derivative engine for emissions certification purposes, the type certificate holder is required to demonstrate that the engine complies with the emissions standards applicable to a new engine type.

[Doc. No. 34-5, 77 FR 76852, Dec. 31, 2012]

**Subpart F [Reserved]****Subpart G—Test Procedures for Engine Exhaust Gaseous Emissions (Aircraft and Aircraft Gas Turbine Engines)****§ 34.60 Introduction.**

(a) Use the equipment and procedures specified in Appendix 3, Appendix 5, and Appendix 6 of ICAO Annex 16, as applicable, to demonstrate whether engines meet the applicable gaseous emission standards specified in subpart C of this part. Measure the emissions of all regulated gaseous pollutants. Use the equipment and procedures specified in Appendix 2 and Appendix 6 of ICAO Annex 16 to determine whether engines meet the applicable smoke standard specified in subpart C of this part. The compliance demonstration consists of establishing a mean value from testing the specified number of engines, then

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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 that meets the specifications described in Appendix 4 of ICAO Annex 16. 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 alternative procedures for measuring emissions, including testing and sampling methods, analytical techniques, and equipment specifications that differ from those specified in this part. Manufacturers and operators may request approval of alternative procedures by written request with supporting justification to the FAA Aircraft Certification Office and to the Designated EPA Program Officer. To be approved, one of the following conditions must be met:

- (1) The engine cannot be tested using the specified procedures; or
- (2) The alternative procedure is shown to be equivalent to, or more accurate or precise than, the specified procedure.

(f) The following landing and takeoff (LTO) cycles apply for emissions testing and for calculating weighted LTO values:

LTO TEST CYCLES AND TIME IN MODE

Mode	Class					
	TP		TF, T3, T8		TSS	
	TIM (min)	% of rO	TIM (min)	% of rO	TIM (min)	% of rO
Taxi/idle .....	26.0	7	26.0	7	26.0	5.8
Takeoff .....	0.5	100	0.7	100	1.2	100
Climbout .....	2.5	90	2.2	85	2.0	65
Descent .....	NA	NA	NA	NA	1.2	15
Approach .....	4.5	30	4.0	30	2.3	34

(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 the applicable appendix of Annex 16.

(h) The system and procedure for sampling and measurement of gaseous emissions shall be as specified by in Appendices 2, 3, 4, 5 and 6 to the International Civil Aviation Organization (ICAO) Annex 16, Environmental Protection, Volume II, Aircraft Engine Emissions, Third Edition, July 2008. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. This docu-

ment can be obtained from the ICAO, Document Sales Unit, 999 University Street, Montreal, Quebec H3C 5H7, Canada, phone + 1 514-954-8022, or [www.icao.int](http://www.icao.int) or [sales25icao.int](http://sales25icao.int). Copies can be reviewed at the FAA New England Regional Office, 12 New England Executive Park, Burlington, Massachusetts, 781-238-7101, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

[Doc. No. FAA-2012-1333, 77 FR 76853, Dec. 31, 2012]

§§ 34.61–34.71 [Reserved]

## PART 35—AIRWORTHINESS STANDARDS: PROPELLERS

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#### APPENDIX A TO PART 35—INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

AUTHORITY: 49 U.S.C. 106(g), 40113, 44701–44702, 44704.

SOURCE: Docket No. 2095, 29 FR 7458, June 10, 1964, unless otherwise noted.

### Subpart A—General

#### § 35.1 Applicability.

(a) This part prescribes airworthiness standards for the issue of type certificates and changes to those certificates, for propellers.

(b) Each person who applies under part 21 for such a certificate or change must show compliance with the applicable requirements of this part.

(c) An applicant is eligible for a propeller type certificate and changes to those certificates after demonstrating compliance with subparts A, B and C of this part. However, the propeller may not be installed on an airplane unless the applicant has shown compliance with either §23.907 or §25.907 of this chapter, as applicable, or compliance is not required for installation on that airplane.

(d) For the purposes of this part, the propeller consists of those components listed in the propeller type design, and the propeller system consists of the propeller and all the components necessary for its functioning, but not necessarily included in the propeller type design.

[Amdt. 35-3, 41 FR 55475, Dec. 20, 1976, as amended by Amdt. 35-8, 73 FR 63346, Oct. 24, 2008]

#### § 35.2 Propeller configuration.

The applicant must provide a list of all the components, including references to the relevant drawings and software design data, that define the type design of the propeller to be approved under §21.31 of this chapter.

[Amdt. 35-8, 73 FR 63346, Oct. 24, 2008]

#### § 35.3 Instructions for propeller installation and operation.

The applicant must provide instructions that are approved by the Administrator. Those approved instructions must contain:

(a) Instructions for installing the propeller, which:

(1) Include a description of the operational modes of the propeller control system and functional interface of the control system with the airplane and engine systems;

(2) Specify the physical and functional interfaces with the airplane, airplane equipment and engine;

(3) Define the limiting conditions on the interfaces from paragraph (a)(2) of this section;

(4) List the limitations established under § 35.5;