

Annex 3 (Relating to Article 14)

Standards for aircraft engine emissions (excluding carbon dioxide)

Chapter 1 Standards for the fuel venting from aircraft engines

Aircraft equipped with turbine engines for which the date of manufacture was on or after February 18, 1982 shall not emit liquid fuel into the atmosphere from the fuel nozzle manifold upon engine shutdown following normal flight or ground operations.

Chapter 2 Standards for Aircraft Engine Exhaust Emissions

2-1 The standards for the engine exhaust gas emissions of subsonic aircraft equipped with turbojet or turbofan engines shall be as specified below according to the type of exhaust gas. However, engines listed in the following paragraph a through f, and approved by the Minister of Land, Infrastructure, Transport and Tourism as difficult to modify in order to conform to the corresponding standards specified in each paragraph are excluded.

- a. For the engines listed in the table of 2-1-1, 2-1-2-1 or 2-1-2-2 for which the first Type Approval in accordance with the Article 14, paragraph 1 or other equivalent approval by a Contracting State of the International Civil Aviation Convention (hereinafter referred to as "Type Approval, etc.") was issued before January 1, 1965:
The corresponding standards set in 2-1-1, 2-1-2-1 or 2-1-2-2
- b. For the engines listed in the table of 2-1-1 for which the date of manufacture was within a specific period on or after January 1, 1983:
The standards set in 2-1-1
- c. For the engines listed in the table of 2-1-2-1 for which the date of manufacture was within a specific period on or after January 1, 1986:
The standards set in 2-1-2-1
- d. For the engines listed in the table of 2-1-2-2 for which the date of manufacture of the first individual production model was before January 1, 1996 and the date of manufacture of the individual engine was within a specific period on or after January 1, 2000, or on or after January 1, 2013, or for which the date of manufacture of the first individual production model was on or after January 1, 1996 and before January 1, 2008 and the date of manufacture of the individual engine was within a specific period after January 1, 2013:
The standards set in 2-1-2-2
- e. For the engines listed in the table of 2-1-2-3 for which the date of manufacture was within a specific period on or after January 1, 2020:
The standards set in 2-1-2-3 (limited to the part pertaining to the non-volatile

particulate matter weight concentration)

- f. For the engines listed in the table of 2-1-2-3 for which an application for the first Type Approval, etc. was received before January 1, 2023 and for which the date of manufacture of the individual engine was within a specific period after January 1, 2023:

The standards set in 2-1-2-3 (limited to the part pertaining to the Non-volatile particulate matter mass and non-volatile particulate matter particle number)

2-1-1 Smoke

	Smoke Number (dimensionless)
Engines for which the date of manufacture was on or after January 1, 1983 (engines with a rated thrust of more than 26.7 kN for which the date of manufacture was on or after January 1, 2023 are excluded)	$83.6 \times (F_{00})^{-0.274}$ or 50, whichever is lower.
Remarks 1. The Smoke Number shall be measured and computed in accordance with the methods specified in Annex 16 of the International Civil Aviation Convention. 2. The F_{00} shall be the rated thrust (in kN) of the engine as defined in Annex 16 of the International Civil Aviation Convention.	

2-1-2 Hydrocarbons, carbon monoxide, oxides of nitrogen and non-volatile particulate matter

2-1-2-1 Hydrocarbons and carbon monoxide

	Hydrocarbons mass (g/kN)	Carbon monoxide mass (g/kN)
Engines with a rated thrust of more than 26.7 kN for which the date of manufacture was on or after January 1, 1986	It shall be less than or equal to 19.6.	It shall be less than or equal to 118.
Remarks Hydrocarbons and carbon monoxide mass shall be measured and computed in accordance with the methods specified in Annex 16 of the International Civil Aviation Convention.		

2-1-2-2 Oxides of nitrogen

		Oxides of nitrogen mass (g/kN)
Engines with a rated thrust of more than 26.7 kN for which the date of manufacture of the first individual production model was before January 1, 1996 and the date of manufacture of the individual engine was on or after January 1, 1986 and before January 1, 2000		It shall be less than or equal to $40 + 2 \times \pi_{00}$.
Engines with a rated thrust of more than 26.7 kN for which the date of manufacture of the first individual production model was on or after January 1, 1996 and before January 1, 2004 and the date of manufacture of the individual engine was before January 1, 2013 or for which the date of manufacture of the first individual production model was before January 1, 1996 and the date of manufacture of the individual engine was on or after January 1, 2000 and before January 1, 2013		It shall be less than or equal to $32 + 1.6 \times \pi_{00}$.
Engines with a rated thrust of more than 26.7 kN but not more than 89.0 kN for which the date of manufacture of the first individual production model was on or after January 1, 2004 and before January 1, 2008 and the date of manufacture of the individual engine was before January 1, 2013	Engines with a pressure ratio of 30 or less	It shall be less than or equal to $37.572 + 1.6 \times \pi_{00} - 0.2087 \times F_{00}$.
	Engines with a pressure ratio of more than 30 but less than 62.5	It shall be less than or equal to $42.71 + 1.4286 \times \pi_{00} - 0.4013 \times F_{00} + 0.00642 \times \pi_{00} \times F_{00}$.
	Engines with a pressure ratio of 62.5 or more	It shall be less than or equal to $32 + 1.6 \times \pi_{00}$.

Engines with a rated thrust of more than 89.0 kN for which the date of manufacture of the first individual production model was on or after January 1, 2004 and before January 1, 2008 and the date of manufacture of the individual engine was before January 1, 2013	Engines with a pressure ratio of 30 or less	It shall be less than or equal to $19 + 1.6 \times \pi_{00}$.
	Engines with a pressure ratio of more than 30 but less than 62.5	It shall be less than or equal to $7 + 2.0 \times \pi_{00}$.
	Engines with a pressure ratio of 62.5 or more	It shall be less than or equal to $32 + 1.6 \times \pi_{00}$.
Engines with a rated thrust of more than 26.7 kN but not more than 89.0 kN for which the date of manufacture of the first individual production model was on or after January 1, 2008 and before January 1, 2014 or for which the date of manufacture of the first individual production model was before January 1, 2008 and the date of manufacture of the individual engine was on or after January 1, 2013	Engines with a pressure ratio of 30 or less	It shall be less than or equal to $38.5486 + 1.6823 \times \pi_{00} - 0.2453 \times F_{00} - 0.00308 \times \pi_{00} \times F_{00}$.
	Engines with a pressure ratio of more than 30 but less than 82.6	It shall be less than or equal to $46.1600 + 1.4286 \times \pi_{00} - 0.5303 \times F_{00} + 0.00642 \times \pi_{00} \times F_{00}$.
	Engines with a pressure ratio of 82.6 or more	It shall be less than or equal to $32 + 1.6 \times \pi_{00}$.
Engines with a rated thrust of more than 89.0 kN for which the	Engines with a pressure ratio of 30 or less	It shall be less than or equal to $16.72 + 1.4080 \times \pi_{00}$.

date of manufacture of the first individual production model was on or after January 1, 2008 and before January 1, 2014 or for which the date of manufacture of the first individual production model was before January 1, 2008 and the date of manufacture of the individual engine was on or after January 1, 2013	Engines with a pressure ratio of more than 30 but less than 82.6	It shall be less than or equal to $-1.04 + 2.0 \times \pi_{00}$.
	Engines with a pressure ratio of 82.6 or more	It shall be less than or equal to $32 + 1.6 \times \pi_{00}$.
Engines with a rated thrust of more than 26.7 kN but not more than 89.0 kN for which the date of manufacture of the first individual production model was on or after January 1, 2014	Engines with a pressure ratio of 30 or less	It shall be less than or equal to $40.052 + 1.5681 \times \pi_{00} - 0.3615 \times F_{00} - 0.0018 \times \pi_{00} \times F_{00}$.
	Engines with a pressure ratio of more than 30 but less than 104.7	It shall be less than or equal to $41.9435 + 1.505 \times \pi_{00} - 0.5823 \times F_{00} + 0.005562 \times \pi_{00} \times F_{00}$.
	Engines with a pressure ratio of 104.7 or more	It shall be less than or equal to $32 + 1.6 \times \pi_{00}$.
Engines with a rated thrust of more than 89.0 kN for which the date of manufacture of the first individual production model was on or after January 1, 2014	Engines with a pressure ratio of 30 or less	It shall be less than or equal to $7.88 + 1.4080 \times \pi_{00}$.
	Engines with a pressure ratio of more than 30 but less than 104.7	It shall be less than or equal to $-9.88 + 2.0 \times \pi_{00}$.
	Engines with a pressure ratio of 104.7 or more	It shall be less than or equal to $32 + 1.6 \times \pi_{00}$.

Remarks

1. Oxides of nitrogen mass shall be measured and computed in accordance with the methods specified in Annex 16 of the International Civil Aviation Convention.
2. The F_{00} shall be the rated thrust (in kN) of the engine as defined in Annex 16 of the International Civil Aviation Convention.
3. The π_{00} shall be the pressure ratio of the engine as defined in Annex 16 of the International Civil Aviation Convention.

2-1-2-3 Non-volatile particulate matter

	Non-volatile particulate matter mass concentration ($\mu\text{g}/\text{m}^3$)	Non-volatile particulate matter mass (mg/kN)	Non-volatile particulate matter particle number (particles/kN)
Engines with a rated thrust of more than 26.7 kN for which the date of manufacture was on or after January 1, 2020 and before December 31, 2022	It shall be less than or equal to $10^{(3 + 2.9 \times F_{00}^{-0.274})}$.		
Engines with a rated thrust of more than 26.7 kN but not more than 200 kN for which an application for the first Type Approval, etc. was received before January 1, 2023 and for which the date of manufacture of the individual engine was on or after January 1, 2023		It shall be less than or equal to $4646.9 - 21.497 \times F_{00}$.	It shall be less than or equal to $2.669 \times 10^{16} - 1.126 \times 10^{14} \times F_{00}$.
Engines with a rated thrust of more than		It shall be less than or equal to	It shall be less than or equal to

200 kN for which an application for the first Type Approval, etc. was received before January 1, 2023 and for which the date of manufacture of the individual engine was on or after January 1, 2023		347.5.	4.170×10^{15} .
Engines with a rated thrust of more than 26.7 kN but not more than 150 kN for which an application for the first Type Approval, etc. was received on or after January 1, 2023		It shall be less than or equal to $1251.1 - 6.914 \times F_{00}$.	It shall be less than or equal to $1.490 \times 10^{16} - 8.080 \times 10^{13} \times F_{00}$.
Engines with a rated thrust of more than 150 kN for which an application for the first Type Approval, etc. was received on or after January 1, 2023		It shall be less than or equal to 214.0.	It shall be less than or equal to 2.780×10^{15} .
<p>Remarks</p> <ol style="list-style-type: none"> 1. Non-volatile particulate matter shall be measured and computed in accordance with the methods specified in Annex 16 of the International Civil Aviation Convention. 2. The F_{00} shall be the rated thrust (in kN) of the engine as defined in Annex 16 of the International Civil Aviation Convention. 			

2-2 The standards for the engine exhaust emissions of supersonic aircraft equipped with turbojet or turbofan engines listed in the following table shall be as specified below according to the type of exhaust gas.

2-2-1 Smoke

	Smoke Number (dimensionless)
Engines whose date of manufacture was on or after February 18, 1982	$83.6 \times (F^*_{00})^{-0.274}$ or 50, whichever is lower.
<p>Remarks</p> <p>1 The Smoke Number shall be measured and computed in accordance with the methods specified in Annex 16 of the International Civil Aviation Convention.</p> <p>2 The F^*_{00} shall be the rated thrust (in kN) with afterburning applied as defined in Annex 16 of the International Civil Aviation Convention.</p>	

2-2-2 Hydrocarbons, carbon monoxide and oxides of nitrogen

	Hydrocarbon mass (g/kN)	Carbon monoxide mass (g/kN)	Oxides of nitrogen mass (g/kN)
Engines whose date of manufacture was on or after February 18, 1982	It shall be less than or equal to $140 \times (0.92)^{\pi_{00}}$.	It shall be less than or equal to $4550 \times (\pi_{00})^{-1.03}$.	It shall be less than or equal to $36 + 2.42 \times \pi_{00}$.
<p>Remarks</p> <p>1. Hydrocarbon, carbon monoxide and oxides of nitrogen mass shall be measured and computed in accordance with the methods specified in Annex 16 of the International Civil Aviation Convention.</p> <p>2. The π_{00} shall be the pressure ratio of the engine as defined in Annex 16 of the International Civil Aviation Convention.</p>			