



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-7B22E/B1 BYPASS RATIO (-): 5.3
UNIQUE ID NUMBER: 01P11CM113 PRESSURE RATIO π_{co} (-): 24.2
COMBUSTOR: Tech Insertion
ENGINE TYPE: TF RATED OUTPUT F_{co} (kN): 101.0

REGULATORY DATA

CHARACTERISTIC VALUES:	LTO_{mass}/F_{co} (mg/kN)	LTO_{num}/F_{co} (particles/kN)	NVPM MASS CONCENTRATION ($\mu\text{g}/\text{m}^3$)
LTO/ F_{co} AND MAX nvPM _{mass}	71.2	1.01E+15	1176
AS % OF CAEP/10 LIMIT	-	-	17.9
AS % OF CAEP/11 LIMIT (InP)	2.9	6.6	
AS % OF CAEP/11 LIMIT (NT)	12.9	15.0	

MEASURED DATA

MODE	POWER SETTING (% F_{co})	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM _{mass} ($\mu\text{g}/\text{m}^3$)
				EI _{mass} (mg/kg)	EI _{num} (particles/kg)	
TAKE-OFF	100	0.7	1.004	41.5	4.31E+14	
CLIMB OUT	85	2.2	0.832	29.3	4.07E+14	
APPROACH	30	4.0	0.291	1.1	4.79E+13	
IDLE	7	26.0	0.099	0.8	4.38E+13	
LTO TOTAL (kg, mg, number of particles)			377	5175	7.30E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ F_{co} VALUES (mg/kN, particles/kN)				51.2	7.23E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				41.5	4.31E+14	914

* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% F_{co})	CORRECTED EMISSIONS INDICES	
		EI _{mass_SL} (mg/kg)	EI _{num_SL} (particles/kg)
TAKE-OFF	100	50.6	1.32E+15
CLIMB OUT	85	36.9	1.38E+15
APPROACH	30	1.8	2.73E+14
IDLE	7	1.3	2.69E+14

AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	99.5	100.2	HEAT OF COMBUSTION (MJ/kg)	43.27
TEMPERATURE (K)	295.5	311.8	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0066	0.0122	AROMATICS CONTENT (%vol)	18.7
			NAPHTHALENE CONTENT (%vol)	0.67
			SULPHUR CONTENT (ppm by mass)	519

MANUFACTURER: CFM International
TEST ORGANIZATION: Safran Aircraft Engines
TEST LOCATION: Villaroche, France
TEST DATES: 25/07/2019-30/07/2019

REMARKS

- Engine 849-166/1
- Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B