



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-7B24E/B1 BYPASS RATIO (-): 5.3
UNIQUE ID NUMBER: 01P11CM115 PRESSURE RATIO π_{co} (-): 25.6
COMBUSTOR: Tech Insertion
ENGINE TYPE: TF RATED OUTPUT F_{oo} (kN): 107.6

REGULATORY DATA

CHARACTERISTIC VALUES:	LTO_{mass}/F_{oo} (mg/kN)	LTO_{num}/F_{oo} (particles/kN)	NVPM MASS CONCENTRATION ($\mu\text{g}/\text{m}^3$)
LTO/ F_{oo} AND MAX $nvPM_{mass}$	82.8	1.03E+15	1434
AS % OF CAEP/10 LIMIT	-	-	22.5
AS % OF CAEP/11 LIMIT (InP)	3.5	7.0	
AS % OF CAEP/11 LIMIT (NT)	16.3	16.6	

MEASURED DATA

MODE	POWER SETTING (% F_{oo})	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	1.086	48.6	4.28E+14	
CLIMB OUT	85	2.2	0.895	33.6	4.24E+14	
APPROACH	30	4.0	0.308	1.3	5.46E+13	
IDLE	7	26.0	0.103	0.8	3.69E+13	
LTO TOTAL (kg, mg, number of particles)			398	6408	7.95E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ F_{oo} VALUES (mg/kN, particles/kN)				59.6	7.39E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				48.6	4.31E+14	1114

* 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_{oo})	CORRECTED EMISSIONS INDICES	
		$EI_{mass_{SL}}$ (mg/kg)	$EI_{num_{SL}}$ (particles/kg)
TAKE-OFF	100	58.3	1.24E+15
CLIMB OUT	85	41.7	1.39E+15
APPROACH	30	2.0	3.10E+14
IDLE	7	1.2	2.12E+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