



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-5B3/3 BYPASS RATIO (-): 5.4
 UNIQUE ID NUMBER: 01P08CM104 PRESSURE RATIO π_{co} (-): 32.6
 COMBUSTOR: Tech Insertion
 ENGINE TYPE: TF RATED OUTPUT F_{oo} (kN): 142.3

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}	150.0	9.36E+14	3136
AS % OF CAEP/10 LIMIT	-	-	56.3
AS % OF CAEP/11 LIMIT (InP)	9.4	8.7	
AS % OF CAEP/11 LIMIT (NT)	56.1	27.5	

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	1.462	88.5	3.40E+14	
CLIMB OUT	85	2.2	1.153	62.7	4.15E+14	
APPROACH	30	4.0	0.369	2.3	9.14E+13	
IDLE	7	26.0	0.113	0.7	2.04E+13	
LTO TOTAL (kg, mg, number of particles)			478	15305	9.57E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ F_{oo} VALUES (mg/kN, particles/kN)				108.0	6.73E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				88.5	4.34E+14	2436

* 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	100.0	7.58E+14
CLIMB OUT	85	73.4	1.07E+15
APPROACH	30	3.5	5.05E+14
IDLE	7	1.0	9.47E+13

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
- Also covers CFM56-5B3/3B1