



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-5B5/3 BYPASS RATIO (-): 6.0
 UNIQUE ID NUMBER: 01P08CM106 PRESSURE RATIO π_{co} (-): 23.1
 COMBUSTOR: Tech Insertion
 ENGINE TYPE: TF RATED OUTPUT F_{co} (kN): 97.9

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}	59.4	9.13E+14	1040
AS % OF CAEP/10 LIMIT	-	-	15.5
AS % OF CAEP/11 LIMIT (InP)	2.3	5.8	
AS % OF CAEP/11 LIMIT (NT)	10.3	13.0	

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	0.894	37.6	4.29E+14	
CLIMB OUT	85	2.2	0.743	26.3	3.88E+14	
APPROACH	30	4.0	0.264	1.0	3.98E+13	
IDLE	7	26.0	0.092	0.9	5.30E+13	
LTO TOTAL (kg, mg, number of particles)			343	4178	6.43E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ F_{co} VALUES (mg/kN, particles/kN)				42.7	6.57E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				37.6	4.29E+14	808

* 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	46.2	1.34E+15
CLIMB OUT	85	33.1	1.34E+15
APPROACH	30	1.5	2.25E+14
IDLE	7	1.5	3.61E+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