



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: LEAP-1A35A/33/33B2/32/30 BYPASS RATIO (-): 10.5
UNIQUE ID NUMBER: 01P20CM132 PRESSURE RATIO π_{co} (-): 38.5
COMBUSTOR: TAPS II
ENGINE TYPE: TF RATED OUTPUT F_{oo} (kN): 143.1

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}	6.9	1.17E+14	206
AS % OF CAEP/10 LIMIT	-	-	3.7
AS % OF CAEP/11 LIMIT (InP)	0.4	1.1	
AS % OF CAEP/11 LIMIT (NT)	2.6	3.5	

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	1.062	3.0	1.82E+11	
CLIMB OUT	85	2.2	0.869	1.4	8.94E+10	
APPROACH	30	4.0	0.284	4.8	1.50E+14	
IDLE	7	26.0	0.098	0.6	1.15E+13	
LTO TOTAL (kg, mg, number of particles)			380	712	1.20E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ F_{oo} VALUES (mg/kN, particles/kN)				5.0	8.41E+13	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				7.5	2.17E+14	160

* 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	3.6	2.44E+11
CLIMB OUT	85	1.6	1.20E+11
APPROACH	30	7.1	9.22E+14
IDLE	7	0.8	4.59E+13

AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	97.8	98.8	HEAT OF COMBUSTION (MJ/kg)	43.26
TEMPERATURE (K)	274.6	279.8	HYDROGEN CONTENT (%mass)	13.69
HUMIDITY (kg water/kg dry air)	0.0020	0.0032	AROMATICS CONTENT (%vol)	16.5
			NAPHTHALENE CONTENT (%vol)	0.66
			SULPHUR CONTENT (ppm by mass)	150

MANUFACTURER: CFM International
TEST ORGANIZATION: CFM International
TEST LOCATION: PTO, Ohio
TEST DATES: 21/11/2016-02/12/2016

REMARKS

1. Certification Report CRL-2201_2/Rev. 4
2. Engine S/N 600-104