



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: V2533-A5 SelectOne™ Upgrade Package BYPASS RATIO (-): 4.5
UNIQUE ID NUMBER: 01P10IA025 PRESSURE RATIO π_{co} (-): 33.7
COMBUSTOR: Floatwall
ENGINE TYPE: MTF RATED OUTPUT F_{oo} (kN): 140.6

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 $nvPM_{mass}$	781.0	7.27E+15	1766
AS % OF CAEP/10 LIMIT	-	-	31.6
AS % OF CAEP/11 LIMIT (InP)	48.1	67.0	
AS % OF CAEP/11 LIMIT (NT)	279.4	205.4	

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	1.433	96.7	5.07E+14	
CLIMB OUT	85	2.2	1.142	178.5	7.71E+14	
APPROACH	30	4.0	0.405	343.9	2.80E+15	
IDLE	7	26.0	0.147	56.2	1.38E+15	
LTO TOTAL (kg, mg, number of particles)			537	79028	7.36E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/F_{oo} VALUES (mg/kN, particles/kN)				562.1	5.23E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				450.6	2.88E+15	1372

* 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	110.4	1.23E+15
CLIMB OUT	85	202.0	1.83E+15
APPROACH	30	406.7	8.03E+15
IDLE	7	76.5	6.22E+15

AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	100.9	101.6	HEAT OF COMBUSTION (MJ/kg)	43.22
TEMPERATURE (K)	275.8	278.2	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0018	0.0025	AROMATICS CONTENT (%vol)	16.6
			NAPHTHALENE CONTENT (%vol)	2.38
			SULPHUR CONTENT (ppm by mass)	540

MANUFACTURER: International Aero Engines
TEST ORGANIZATION: Pratt & Whitney
TEST LOCATION: East Hartford, CT
TEST DATES: 12/12/2016-14/12/2016

REMARKS

1. Data from certification report IAE-0324
2. Engine performance reflects SelectOne™ and SelectTwo™ package upgrades
3. nvPM levels in accordance with Annex 16 Vol. II, Chapter 4, Appendix 7 and Appendix 8.