



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: Trent7000-68 BYPASS RATIO (-): 9.2
UNIQUE ID NUMBER: 04P24RR144 PRESSURE RATIO π_{co} (-): 42.3
COMBUSTOR: Phase5 Tiled (Improved nvPM combustor)
ENGINE TYPE: TF RATED OUTPUT F_{oo} (kN): 308.7

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}	96.1	1.19E+15	1690
AS % OF CAEP/10 LIMIT	-	-	42.2
AS % OF CAEP/11 LIMIT (InP)	27.7	28.5	
AS % OF CAEP/11 LIMIT (NT)	44.9	42.7	

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	2.294	37.8	1.63E+14	
CLIMB OUT	85	2.2	1.881	58.4	3.30E+14	
APPROACH	30	4.0	0.631	27.3	6.61E+14	
IDLE	7	26.0	0.247	10.4	3.30E+14	
LTO TOTAL (kg, mg, number of particles)			881	26289	3.25E+17	-
NUMBER OF ENGINES				3	3	3
NUMBER OF TESTS				5	5	5
AVERAGE LTO/ F_{oo} VALUES (mg/kN, particles/kN)				85.1	1.05E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				86.4	9.50E+14	1537

* 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	44.2	2.44E+14
CLIMB OUT	85	68.1	5.11E+14
APPROACH	30	33.7	1.35E+15
IDLE	7	13.1	7.18E+14

AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	100.2	101.6	HEAT OF COMBUSTION (MJ/kg)	43.37
TEMPERATURE (K)	291.4	299.6	HYDROGEN CONTENT (%mass)	14.01
HUMIDITY (kg water/kg dry air)	0.0047	0.0099	AROMATICS CONTENT (%vol)	16.1
			NAPHTHALENE CONTENT (%vol)	0.18
			SULPHUR CONTENT (ppm by mass)	300

MANUFACTURER: Rolls-Royce plc
TEST ORGANIZATION: Rolls-Royce plc
TEST LOCATION: Derby
TEST DATES: 05/05/2020-11/09/2020

REMARKS

1. Certification Report EDNS01000945310
2. Improved nvPM combustor
3. The maximum EI_{mass} occurs between 30% and 85% F_{oo}
4. The maximum EI_{num} occurs between 30% and 85% F_{oo}
5. Corrected peak EI number value (fuel correction) since EEDB v30