



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: PW1133G-JM BYPASS RATIO (-): 11.6
UNIQUE ID NUMBER: 01P18PW157 PRESSURE RATIO π_{co} (-): 38.1
COMBUSTOR: TALON X, Block-C
ENGINE TYPE: TF RATED OUTPUT F_{co} (kN): 147.3

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} | 126.5 | 2.52E+15 | 3051 |
| AS % OF CAEP/10 LIMIT | - | - | 55.7 |
| AS % OF CAEP/11 LIMIT (InP) | 8.5 | 25.0 | |
| AS % OF CAEP/11 LIMIT (NT) | 54.3 | 84.2 | |

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 | 1.023 | 93.3 | 7.08E+14 | |
| CLIMB OUT | 85 | 2.2 | 0.839 | 70.8 | 9.57E+14 | |
| APPROACH | 30 | 4.0 | 0.278 | 6.9 | 4.25E+14 | |
| IDLE | 7 | 26.0 | 0.099 | 7.0 | 6.65E+14 | |
| LTO TOTAL (kg, mg, number of particles) | | | 375 | 13399 | 2.67E+17 | - |
| NUMBER OF ENGINES | | | | 1 | 1 | 1 |
| NUMBER OF TESTS | | | | 3 | 3 | 3 |
| AVERAGE LTO/ F_{co} VALUES (mg/kN, particles/kN) | | | | 91.0 | 1.82E+15 | - |
| MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$) | | | | 93.3 | 9.64E+14 | 2371 |

* 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 | 109.7 | 1.77E+15 |
| CLIMB OUT | 85 | 87.9 | 3.58E+15 |
| APPROACH | 30 | 9.8 | 3.36E+15 |
| IDLE | 7 | 14.4 | 6.59E+15 |

AMBIENT CONDITIONS

| | From | To | FUEL | |
|--------------------------------|--------|--------|-------------------------------|-------|
| BAROMETER (kPa) | 100.8 | 103.0 | HEAT OF COMBUSTION (MJ/kg) | 43.27 |
| TEMPERATURE (K) | 266.7 | 277.2 | HYDROGEN CONTENT (%mass) | 13.84 |
| HUMIDITY (kg water/kg dry air) | 0.0004 | 0.0017 | AROMATICS CONTENT (%vol) | 15.3 |
| | | | NAPHTHALENE CONTENT (%vol) | 1.87 |
| | | | SULPHUR CONTENT (ppm by mass) | 705 |

MANUFACTURER: Pratt & Whitney
TEST ORGANIZATION: Pratt & Whitney
TEST LOCATION: East Hartford, CT
TEST DATES: 02/03/2017-04/03/2017

REMARKS

1. Data from certification report PWA-12243
2. 1 engine tested
3. TALON-X, Block-C* combustor
4. Certification in accordance with ICAO Annex 16 Vol. II., Part III, Chapter 2.
5. nvPM levels in accordance with ICAO Annex 16 Vol. II, Part III, Chapter 4 and Appendices 7 and 8. (CAEP/10)