



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-7B26E/F BYPASS RATIO (-): 5.1  
UNIQUE ID NUMBER: 01P11CM119 PRESSURE RATIO  $\pi_{co}$  (-): 27.7  
COMBUSTOR: Tech Insertion  
ENGINE TYPE: TF RATED OUTPUT  $F_{oo}$  (kN): 117.0

### REGULATORY DATA

| CHARACTERISTIC VALUES:              | $LTO_{mass}/F_{oo}$<br>(mg/kN) | $LTO_{num}/F_{oo}$<br>(particles/kN) | NVPM MASS CONCENTRATION<br>( $\mu\text{g}/\text{m}^3$ ) |
|-------------------------------------|--------------------------------|--------------------------------------|---|
| LTO/ $F_{oo}$ AND MAX $nvPM_{mass}$ | 103.0                          | 1.04E+15                             | 1936  |
| AS % OF CAEP/10 LIMIT               | -                              | -                                    | 31.6  |
| AS % OF CAEP/11 LIMIT (InP)         | 4.8                            | 7.7                                  |   |
| AS % OF CAEP/11 LIMIT (NT)          | 23.3                           | 19.3                                 |   |

### MEASURED DATA

| MODE  | POWER<br>SETTING<br>(% $F_{oo}$ ) | TIME<br>minutes | FUEL FLOW<br>kg/s | EMISSIONS INDICES*     |                              | NVPM MASS CONCENTRATION<br>PEAK $nvPM_{mass}$<br>( $\mu\text{g}/\text{m}^3$ ) |
|---|-----------------------------------|-----------------|-------------------|------------------------|------------------------------|---|
|   |                                   |                 |                   | $EI_{mass}$<br>(mg/kg) | $EI_{num}$<br>(particles/kg) |   |
| TAKE-OFF  | 100                               | 0.7             | 1.213             | 61.8                   | 4.15E+14                     |   |
| CLIMB OUT   | 85                                | 2.2             | 0.986             | 40.3                   | 4.33E+14                     |   |
| APPROACH  | 30                                | 4.0             | 0.331             | 1.6                    | 6.54E+13                     |   |
| IDLE  | 7                                 | 26.0            | 0.108             | 0.8                    | 2.95E+13                     |   |
| LTO TOTAL (kg, mg, number of particles)   |                                   |                 | 429               | 8646                   | 8.77E+16                     | -   |
| NUMBER OF ENGINES   |                                   |                 |                   | 1                      | 1                            | 1   |
| NUMBER OF TESTS   |                                   |                 |                   | 3                      | 3                            | 3   |
| AVERAGE LTO/ $F_{oo}$ VALUES (mg/kN, particles/kN)                                  |                                   |                 |                   | 73.9                   | 7.50E+14                     | -   |
| MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ ) |                                   |                 |                   | 61.8                   | 4.33E+14                     | 1504  |

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

| MODE      | POWER<br>SETTING<br>(% $F_{oo}$ ) | CORRECTED EMISSIONS INDICES |                                   |
|-----------|-----------------------------------|-----------------------------|-----------------------------------|
|           |                                   | $EI_{mass_{SL}}$<br>(mg/kg) | $EI_{num_{SL}}$<br>(particles/kg) |
| TAKE-OFF  | 100                               | 72.3                        | 1.10E+15                          |
| CLIMB OUT | 85                                | 49.2                        | 1.34E+15                          |
| APPROACH  | 30                                | 2.4                         | 3.69E+14                          |
| IDLE      | 7                                 | 1.1                         | 1.54E+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