European Aviation Safety Agency

EASA
TYPE-CERTIFICATE
DATA SHEET

Number: E.066
Issue: 01
Date: 28 November 2008
Type: CFM International SA
CFM56-2 & CFM56-3 series engines

Variants

CFM56-2 CFM56-2, CFM56-2A ,CFM56-2B

CFM56-3 CFM56-3, CFM56-3B ,CFM56-3C

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I. General

1. Type/Variants:

CFM56-2	CFM56-2, CFM56-2A ,CFM56-2B
CFM56-3	CFM56-3, CFM56-3B ,CFM56-3C

2. Type Certificate Holder:

CFM International S.A.
2, boulevard du Général Martial Valin
F-75724 Paris Cedex 15
France

Design Organisation Approval No.: EASA.21J.086

3. Manufacturers:

SNECMA 10 allée du Brévent CE 1420 - Courcouronnes F-91019 Evry Cedex France	GE Aviation One Neumann Way Cincinnati - Ohio 45215 United States of America

4. EASA Certification Application Date:

CFM56-2	08 August 1975 (*)
CFM56-2A	15 December 1983 (*)
CFM56-2B	04 August 1981 (*)
CFM56-3	17 September 1980 (*)
CFM56-3B	05 March 1984 (*)
CFM56-3C	07 April 1986 (*)

(*) = Application was made to DGAC-France before EASA was established – See note 9

5. Certification Reference Date: 15 November 1976

6. EASA Certification Date:

CFM56-2	08 November 1979
CFM56-2A	06 June 1985
CFM56-2B	19 May 1982
CFM56-3	12 January 1984
CFM56-3B	20 June 1984
CFM56-3C	18 December 1986

II. Certification Basis

1. EASA Certification Basis:

1.1 Airworthiness Standards:

CFM56-2, CFM56-2A ,CFM56-2B CFM56-3, CFM56-3B ,CFM56-3C	JAR-E Change 2 (18 August 1975 – based on Section C, Issue 9 of British Civil Airworthiness Requirements) as amended by BCAR Paper N° 560 (18 August 1975), BCAR Paper N° 625 (18 August 1975), and BCAR Paper N° 627 (18 August 1975)

1.2 Special Conditions: None

1.3 Equivalent safety findings: None

1.4 Deviations: None

1.5 EASA environmental protection requirements: ICAO Annex 16, Volume II, First Edition, 18th February 1982

III. Technical Characteristics

1. Type Design Definition:

Engine type is identified by an engine part list reference:

CFM56-2 + Thrust reverser FR02B	9026M70 + N4940
CFM56-2A + Thrust reverser FR03B	9323M50 + N5681
CFM56-2B	9995M60
CFM56-3	9325M80
CFM56-3B	9325M85
CFM56-3C	9325M90

2. Description:

Dual rotor, axial flow, high bypass ratio turbofan engine:

- single stage fan, 3-stage low pressure compressor (LPC), 9-stage high pressure compressor (HPC)
- annular combustion chamber
- single stage high pressure turbine (HPT), 4-stage low pressure turbine (LPT)
- hydro-mechanical main engine control (MEC) with limited authority electronic power management control (PMC)

The CFM56-2 and CM56-2A engine Type Design includes the thrust reversers FR02B and FR03B respectively.

3. Equipment:

The engine starter is part of the engine type design for the CFM56-2, -2A, -2B. It is not for the CFM56-3, -3B, -3C.

4. Dimensions (mm):

	Length (*)	Width	Height
CFM56-2, CFM56-2B	2430	1830	2140
CFM56-2A	2430	2000	2160
CFM56-3, CFM56-3B ,CFM56-3C	2364	2018	1817

(*) = From fan casing forward flange to turbine frame aft flange

5. Weight (kg – dry engine):

CFM56-2(*), CFM56-2B	2139
CFM56-2A(*)	2200
CFM56-3	1954
CFM56-3B, CFM56-3C	1966

(*) = Basic engine weight, does not include the thrust reverser weight

6. Ratings (daN):

	Take Off	Maximum Continuous
CFM56-2	10676	10230
CFM56-2A	10676	10411
CFM56-2B	9786	9599
CFM56-3	8941	8407
CFM56-3B	9830	9118
CFM56-3C	10460	9719

(See notes 1 and 2)

7. Control System:

At initial certification:

	MEC	PMC
CFM56-2	9378M47	7076M20
CFM56-2A	1323M36	7129M23
CFM56-2B	9278M96	7084M61
CFM56-3	9368M57	7090M98
CFM56-3B	9387M15	7125M15
CFM56-3C	9387M15	7147M10

8. Fluids

8.1 Fuel and Additives:
Refer to the applicable engine “Installation Manual” and “Specific Operating Instructions” documents.

8.2 Oil:
Refer to the latest revision of applicable CFM Service Bulletins: CFM56-2 S/B 79-001, CFM56-2A S/B 79-001, CFM56-2B S/B 79-001, and CFM56-3/3B/3C S/B 79-001

8.3 Hydraulic Fluid (Thrust Reverser):
For CFM56-2 (FR02B): Skydrol 500B4, Chevron Hyjet IV, Skydrol LD4
For CFM56-2A (FR03B): MIL-H 83282, MIL-H 5606E

9. Aircraft Accessory Drives:

CFM56-2, CFM56-2B					
Drive	Rotation	Gear ratio / HP rotor	Max. Power or Torque	Shear Torque (m.daN)	Overhung Moment (m.daN)
Pneumatic Starter	CW	1.343	46.9 m.daN	109.6	3.4
Aircraft Electrical Generator	CW	0.561	125 kW	123.2	24.2
Aircraft Front Hydraulic Generator	CCW	0.254	27 m.daN	72.3	5.8
Aircraft Rear Hydraulic Generator	CW	0.254	27 m.daN	72.3	4.6

CFM56-2A					
Drive	Rotation	Gear ratio / HP rotor	Max. Power or Torque	Shear Torque (m.daN)	Overhung Moment (m.daN)
Pneumatic Starter	CW	1.343	46.9 m.daN	118	3.9
Aircraft Electrical Generator I	CW	0.582	123 kW	76.3	18
Aircraft Electrical Generator II	CW	0.582	123 kW	76.3	18
Aircraft Hydraulic Generator	CW	0.255	11.3 m.daN	49.7	4.5

CFM56-3, CFM56-3B ,CFM56-3C					
Drive	Rotation	Gear ratio / HP rotor	Max. Power or Torque	Shear Torque (m.daN)	Overhung Moment (m.daN)
Pneumatic Starter	CCW	0.996	61 m.daN	151	3.4
Aircraft Electrical Generator	CW	0.562	136 kW	99.4	28.2
Aircraft Hydraulic Generator	CW	0.255	12 m.daN	49.7	5.7

CW = Clock-Wise
CCW = Counter Clock-Wise

10. Maximum Permissible Air Bleed Extraction:

CFM56-2, CFM56-2A, CFM56-2B		
Bleed location	LP rotor speed	Airflow limit
Fan discharge	All speeds above 20 % N1K	2 % of secondary airflow
HPC 5th stage only	All speeds above 20 % N1K	10 % of primary airflow
HPC 9th stage only	From 20% to 61 % of N1K From 61 % to 75 % of N1K Above 75 % of N1K	14 % of primary airflow Linear variation between 14% and 9,2 % of primary airflow 7% of primary airflow
HPC 5th and 9th stages combined	From 20 % to 61 % of N1K From 61 % to 72,7 % of N1K Above 72,7 % of N1K	14 % of primary airflow Linear variation between 14% and 10% of primary airflow 10% of primary airflow

CFM56-3, CFM56-3B ,CFM56-3C		
Bleed location	LP rotor speed	Airflow limit
Fan discharge	All speeds above 20 % N1K	5 % of secondary airflow
HPC 5th stage only	All speeds above 20 % N1K	10 % of primary airflow
HPC 9th stage only	From 20% to 61 % of N1K From 61 % to 75 % of N1K Above 75 % of N1K	14 % of primary airflow Linear variation between 14% and 9,2 % of primary airflow 7% of primary airflow
HPC 5th and 9th stages combined	From 20 % to 61 % of N1K From 61 % to 72,7 % of N1K Above 72,7 % of N1K	14 % of primary airflow Linear variation between 14% and 10% of primary airflow 10% of primary airflow

IV. Operational Limits:

1. Temperature Limits:

1.1 Exhaust Gas Temperature (°C):
The exhaust gas temperature is measured at station T49.5 (stage 2 LPT nozzle).

	Take Off	Take Off Transitory (20 seconds)	Maximum Continuous
CFM56-2, CFM56-2B	905	N/A	870
CFM56-2A	930	N/A	895
CFM56-3, CFM56-3B, CFM56-3C	930	940	895

1.2 Oil Temperature (°C):

At the pressure pump inlet:

Maximum Continuous: 140
Maximum Transitory (15 minutes): 155

1.3 Fuel Inlet Temperature (°C):

At the engine fuel pump inlet:

	Minimum	Maximum
CFM56-2, CFM56-2A, CFM56-2B	- 30 without servo-fuel heater - 45 with servo-fuel heater installed	+ 49 (JET B or equivalent) + 54 (JET A or equivalent)
CFM56-3, CFM56-3B, CFM56-3C	- 45	+ 49 (w/o aircraft boost pump) + 57 (with aircraft boost pump)

1.4 Engine Equipment Temperatures:
Refer to the applicable engine “Installation Manual” document.

2. Rotational Speed Limits:

Maximum rotational speeds:

	Low pressure rotor (N1)	High pressure rotor (N2)
CFM56-2, CFM56-2A, CFM56-2B	5280 (102 %)	15183 (105 %)
CFM56-3, CFM56-3B, CFM56-3C	5490 (106 %)	15183 (105 %)

Minimum rotational speed in icing condition:

	Low pressure rotor (N1)
CFM56-2, CFM56-2A, CFM56-2B	37 % (*)
CFM56-2 modified per CFM56-2 S/B 73-047	29 %
CFM56-3, CFM56-3B, CFM56-3C	21.8 %

(*) = Below 3000 m altitude-pressure, temporary (less than 60 seconds) operation below 37% N1 is allowed for approach and landing.

3. Pressure Limits:

3.1 Fuel Pressure Limits:
When the engine is running, the fuel pressure at engine pump inlet must be kept 34.4 kPa above the true vapour pressure of the fuel with a vapour/liquid ratio lower than 0.45 under normal operating conditions.

3.2 Oil Pressure Limits:
Minimum: 76 kPa (CFM56-2A, CFM56-2B - differential pressure)
90 kPa (CFM56-2, CFM56-3, CFM56-3B, CFM56-3C - differential pressure)
When the engine is running, the oil pressure varies with the rotating speed of the HP rotor (Refer to the applicable engine "Specific Operating Instruction" document).
Engine running with an oil pressure lower than minimum is limited to 10 seconds maximum.

4. Installation Assumptions:

The installation assumptions are quoted in the applicable engine “Installation Manual” document.

5. Time Limited Dispatch:

Not Applicable

V. Operating and Service Instructions

	CFM56-2	CFM56-2A	CFM56-2B	CFM56-3, -3B, -3C
Turbofan Engine Installation Manual	CFM 2055	CFM 2079	CFM 2032	CFM 2031 (-3) CFM 2068 (-3B) CFM 2095 (-3C)
Thrust Reverser Installation Manual	CFM 2058	CFM 2080	N/A	N/A
Specific Operating Instructions	CFM TP OI.6	CFM TP.OI.10	CFM TP.OI.7	CFM TP.OI.9
Engine Maintenance Manual	CFM TP.MM.5	CFM TP.MM.7	CFM TP.MM.10	CFM TP.MM.6
Engine Shop Manual	CFM TP.SM.4	CFM TP.SM.6	CFM TP.SM.6	CFM TP.SM.5

VI. Notes

1. The take-off thrust, with the associated limits, shall not be used continuously more than 5 minutes. For the CFM56-2A and the CFM56-3, -3B, -3C only the duration may be extended to 10 minutes in case of engine failure in multi-engine aircraft. If the duration exceeds 5 minutes, this shall be recorded in the engine log book.

2. Engine ratings are based on calibrated test stand performance, and performance calculations are based on accepted parameter correction methods documented in the “Production Test Requirements” document. These calculations assume the following conditions:

- Static sea level standard conditions of 15°C and 101.32 kPa;
- No aircraft accessory loads or air extraction;
- No anti-icing; no inlet distortion; no inlet screen losses; and 100% ram recovery;
- Production engine inlet and production exhaust system.

3. The life limits of certain engine parts are defined in the applicable "Engine Shop Manual" document, chapter 5 "Airworthiness Limitations".

4. The type certificate holder, CFM International S.A., is a company jointly owned by SNECMA (France) and GE Aviation (USA). CFM International S.A. is responsible for the certification program, the sale and the customer support activities of the CFM56 engines. With respect to the benefits of type certification for production of series engines, SNECMA and GE Aviation function as licensees of CFM International S.A.

5. The engine assembly line is identified by a 3 digit prefix in the engine serial number: even number for GE Aviation and odd number for SNECMA.

6. The CFM56-2A and CFM56-2B variants are designed for military applications only. The engine serial numbers of these variants include the prefix 710, 711, 712, 713, 714, 715, 782, or 783 depending on the engine final assembly location. EASA certified engines used in military service are not necessarily operated or maintained in accordance with the EASA regulations. Commercial service use of the CFM56-2A and CFM56-2B variants, and the installation of used CFM56-2A and CFM56-2B parts in another CFM56-2 or CFM56-3 variant, are subject to prior approval of the Agency.

7. The engine model number stamped on the engine identification plate may include a suffix to identify minor variations in relation with the aircraft application (by example CFM56-2-C2, CFM56-3-B1, or CFM56-2A-2). Such model identification numbers are listed in CFM56-2 S/B 72-0001, CFM56-2A S/B 72-0001, CFM56-2B S/B 72-0001, or CFM56-3/3B/3C S/B 72-0001.

8. For the CFM56-3, -3B, -3C models, the throat area of the inlet installed on the engine shall not exceed 1.742 square meters of area.

9. EASA Type Certificate and Type Certificate Data Sheet N°E.066 replaces DGAC-France Type Certificates and Type Certificate Data Sheets N°M-IM8 and N°M9.
