

MINISTÉRIO DA AERONÁUTICA  
DEPARTAMENTO DE PESQUISAS E DESENVOLVIMENTO  
CENTRO TÉCNICO AEROESPACIAL

TYPE CERTIFICATE DATA SHEET N° 8715

Type Certificate Holder:

CFM INTERNATIONAL, S.A.  
2 Boulevard Victor  
75015 Paris, FRANCE

EM-8715
Page 1
CFM INTERNATIONAL, SA
CFM56-3 CFM56-3B CFM56-3C
AUGUST 89

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Engine of models described herein conforming with this data sheet which is a part of Type Certificate n° 8715 meet the minimum standards for use in certificate aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Brazilian Requirements for Aeronautical Certification - RBHA - provided they are installed, operated, and maintained as prescribed by the manufacturer's approved manuals and other instructions.

- MODEL

CFM56-3

CFM56-3B

CFM56-3C

- TYPE

High bypass turbofan  
coaxial front fan/  
booster driven by  
multi-stage low pres-  
sure turbine, multi-  
stage compressor with  
one stage turbine and  
annular combustor.

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- MODEL	<u>CFM56-3</u>	<u>CFM56-3B</u>	<u>CFM56-3C</u>
<b>- RATING (at sea level)</b>			
. Maximum continuous static thrust N (lbf) .....	8407 (18.900)	9118 (20.500)	9718 (21.850)
. Take off static thrust dry (5 min) N (lbf) .....	8941 (20.100)	9830 (22.100)	10459 (23.515)
<b>- FLAT RATING AMBIENT TEMPERATURE</b>			
. Take off °C (°F) .....	30 (86)	30 (86)	30 (86)
. Maximum continuous °C (°F)	25 (77)	25 (77)	25 (77)
<b>- FUEL</b>			
. Type	Approved fuel conforming to GE Specification D50TF2. MIL-T-5624, Grades JP-4 or JP-5, ASTM D1655, JET A, A1 and B are consistent with this General Electric Specification. Primary fuel is JET A, with other fuels listed being acceptable alternates (see Note 10)	- -	- -
. Fuel pump	TRW 301-779-001-0	- -	- -

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- MODEL	<u>CFM56-3</u>	<u>CFM56-3B</u>	<u>CFM56-3C</u>
- OIL	Approved oils are those synthetic types conforming to GE Specification 050 TF1, Class B. Use Type II MIL-L-23699 oils as listed in CFM I Service Bulletin. CFM56-39( ) N <sup>o</sup> 79-001.	- -	- -
- IGNITION SYSTEMS	Two ignition units BENDIX P/N 9238M66	- -	- -
. Igniter plug	Two igniter plugs CHAMPION P/N 9276M36 or BENDIX P/N 9275M71	- -	- -
- MAIN DIMENSIONS mm (inches)			
. Length (Fan spinner to LPT AFT flange face) .....	2830 (111,53)	- -	- -
. Width (Maximum envelope)..	2010 (79,448)	- -	- -
. Height (Maximum envelope).	1810 (71,535)	- -	- -
- WEIGHT N (lbf) (Includes basic engine accessories and some optional and customers equipment)	19071 (4290)	- -	- -

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- MODEL	<u>CFM56-3</u>	<u>CFM56-3B</u>	<u>CFM56-3C</u>
<b>- CENTER OF GRAVITY (basic engine)</b>			
. Engine station mm (in) .....	5319 (209,4)	- -	- -
. Engine waterline mm (in) .....	2502 ( 98,4)	- -	- -
. Engine buttline mm (in) .....	2489 ( 98,0)	- -	- -
Note: Waterline 100, (254 cm) is centerline of engine			
Buttline 100, (254 cm) is centerline of engine			
<b>- ENGINE CONTROL SYSTEM</b>			
. Main Engine Control (MEC)			
. Power Management control (PMC), GE .....	7139 M84	- -	7147 M10
. Compressor inlet Temperature sensor, woodward .....	9334 M96	- -	- -
. FUEL CONTROL, WOODWARD .....	9368 M57	9387 M15	- -
. HEAT EXCHANGER .....	SN P/N 301-776-401-0	- -	- -
. SERVO FUEL HEATER .....	SN P/N 301-776-501-0	- -	- -

**- NOTES**

- " - - " Indicates "same as preceding model"  
 " - " Indicates "does not apply"
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- **CERTIFICATION BASIS:** Certified according to RBHA 1510 which is equivalent to the FAR Part 33 effective February 1, 1965 with Amendments 33-1 through 33-6 thereto. In addition, the engines are in compliance with the emission requirements of Special Federal Aviation Regulation n<sup>o</sup> 27-5. Exemption n<sup>o</sup> 2641 from compliance with FAR 33.88 issued Nov 20, 1978, exemption n<sup>o</sup> 2850 from compliance with FAR 33.7 issued October 31, 1979 and Exemption n<sup>o</sup> 83-ANE-001E from compliance with FAR 33.14 issued July 27, 1983.
- **TYPE CERTIFICATION APPLICATION DATE:**
- |         |                             |
|---------|-----------------------------|
| 56-3/3b | May 14 <sup>th</sup> , 1986 |
| 56-3C   | May 9 <sup>th</sup> , 1989  |
- **CERTIFICATION DATE** Type Certificate por Import n<sup>o</sup> 8715 issued on July 1<sup>st</sup>, 1988 and revised on August 15, 1989.
- **IMPORT REQUIREMENTS** Each engine imported separately and/or spare parts must be accompanied by an Airworthiness Certificate for Export and/or an Airworthiness Approval Tag respectively, issued by DGAC or FAA - Federal Aviation Administration - attesting that the particular engine and/or parts were submitted to the governmental quality control before delivery and are in conformity with the CTA approved type design.
- **NOTE 1 : MAX PERMISSIBLE TEMPERATURE °C (°F)**
- Exhaust gas temperature (EGT)  
Exhaust gas temperature T495 is measured from a harness combining the output of six or nine chromel-alumel thermocouples located within the low pressure turbine stator vane assembly.
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	<u>CFM56-3</u>	<u>CFM56-3B</u>	<u>CFM56-3C</u>
. Take-off (5 min) ....	930 (1706)	- -	- -
. Maximum continuous ..	895 (1643)	- -	- -

Time-temperature envelopes are defined in the applicable CFM56 Specific Operating Instructions.

- Fuel pump inlet temperature

. Maximum fuel inlet temperature

a) Aircraft boost pump operative

The temperature of the fuel provided to the inlet of the engine fuel system shall be up to a maximum of 55°C (130°F) as shown below.

Fuel Type	Altitude	Maximum fuel inlet temperature
JET A, A1, JP5	0-30000 ft	55°C (130°F)
JP8		
JET B, JP4	30000-40000 ft	46°C (115°F)

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## b) Aircraft boost pump inoperative

The fuel system can operate continuously at any engine rating including flight idle at a minimum fuel flow of 330 pph (150 kg/h) with the following fuel inlet maximum temperature:

Fuel Type	Altitude [ft]	Maximum fuel inlet temperature °C (°F)
JP4	0-14000	49°C (120°F)
	14000-20000	27°C ( 80°F)
JET B	20000-30000	4°C ( 40°F)
	JET A, JET A1	0-20000
JP5, JP8	20000-35000	21°C ( 70°F)

## . Minimum fuel inlet temperature

With water content of up to 300 PPM, the fuel system will operate satisfactorily down to -45°C (-49°F).

- Oil temperature °C (°F)

	<u>CFM56-3</u>	<u>CFM56-3B</u>	<u>CFM56-3C</u>
. Continuous Operation..	140 (284)	- -	- -
. Transient Operation...	155 (311)	- -	- -

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- NOTE 2: PRESSURE LIMITS FOR OIL AND FUEL

- Fuel

a) Aircraft boost pump operative.

From a minimum of TVP 34,5 kPa (5 psi) and vapor/liquid ratio of zero to a maximum of 345 kPa (50 psig);

b) Aircraft boost pump inoperative.

From a minimum fuel inlet pressure of TVP 24 kPa (3,5 psi) or vapor/liquid ratio of 0.45, whichever is limiting to a minimum of 50 psig, when using primary fuel (JP4, RVP = 3 Psia);

c) Engine not operating.

The engine system is capable of withstanding a fuel inlet pressure of 1650 kPa abs (239,25 psia) when the engine is not operating;

- Oil

At idle 89,5 kPa dif (13,0 psid) minimum. The lube oil supply nominal operating pressure is a function of engine speed and is 310 kPa dif (45 psid) at cruise thrust. It will be limited during cold starts by a 2069 kPa dif (300 psid) pressure valve which returns the oil to the supply pump inlet.

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- NOTE 3: ACCESSORY DRIVE PROVISIONS (CFM56-3/-3B/-3C):

ACCESSORY	ROTATION (facing pad)	SPEED RATIO TO TURBINE SHAFT	TORQUE N.m (lbf.in)		OVERHANG MOMENT N.m (lb.in)
			CONTINUOUS	STATIC	
Starter	CC	0,996 : 1	610 (5.400)	1510 (13.370)	34 (300)
Electrical	C	0,562 : 1	282 (2.500)	994 ( 8.800)	282 (2500)
Hydraulic Pump (Fwd and Aft)	C	0,255 : 1	113 (1.000)	497 ( 4.400)	56 ( 500)

C = Clockwise.

CC = Counterclockwise.

- NOTE 4: CONDITIONS FOR ENGINE RATING EVALUATION

- Engines ratings are based on calibrated stand performance under the following conditions:
  - . Takeoff thrust is nominally independent of ambient temperature (flat rated) up to ambient temperature of std. + 15°C for CFM56-3, CFM56-3B and CFM56-3C;
  - . Maximum continuous is nominally independent of ambient temperature (flat rated) to std. + 10°C;
  - . Zero customer bleed and horsepower extraction;
  - . No scrubbing drags;
  - . 100% inlet recovery;
  - . Based on CFM International referenced separate flow exhaust system.

**- NOTE 5: MODEL DESCRIPTION**

CFM56-3 - BASIC MODEL. A suffix may be added to the basic engine model number to identify minor variations in engine configuration and the engine model differences are defined in the (CFM56 - 3/3B/3C) 72-1 Service Bulletin.

**- NOTE 6: ENGINE ACCESSORY CERTIFIED WITH AIRCRAFT**

The fuel flowmeter is engine fuel system component but certified together with the aircraft.

**- NOTE 7: MODEL CANCELLATIONS**

Not applicable.

**- NOTE 8: ROTATIONAL VELOCITY, STANDARD, OVERSPEED AND ALTERNATIVE RATINGS**

- The maximum permissible engine rotor speeds are:

	<u>CFM56-3</u>	<u>CFM56-3B</u>	<u>CFM56-3C</u>
Low pressure rotor			
N1, rpm .....	5490 (106 %)	- -	- -
High pressure rotor			
N2, rpm .....	15183 (105 %)	- -	- -

**- NOTE 9: BLEED AIR EXTRACTION**

LOCATION	FAN CORRECTED SPEED	FLOW LIMIT
Fan discharge	All	5 % of fan engine airflow
HPC stage 5 only	All	10 % of core engine airflow
Compressor discharge only	Below 61 %	14 % of core engine airflow
	Above 75 %	7 % of core engine airflow
	61 to 75 %	9,2 % of core engine airflow
HPC combined 5 <sup>th</sup> stage and discharge	Below 61 %	14 % of core engine airflow
	Above 72,7 %	10 % of core engine airflow
	61 to 72,7 %	Varying linearly from 14 % to 10 % of core engine airflow

**- NOTE 10: ALTERNATE FUEL (EMERGENCY)**

- Use of Aviation gasoline is not authorized. No fuel control adjustment is required when changing from primary to alternative fuels.

**- NOTE 11: ADDITIVES**

- The additives permissible for addition to the approved fuels follow specific operating instructions CFMI-TP.01.9 and can be used in combinations.

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- **NOTE 12:REQUIREMENTS FOR ANTI-ICING AND DE-ICING EQUIPMENT**

- For CFM56-3/-3B/-3C engines the minimum permissible N1 rpm for inflight operation during icing conditions is 21.8 %.

- **NOTE 13:POWER RATINGS FOR NON-STANDARD CONDITIONS**

- Operating Instructions Manual is to be consulted.

- **NOTE 14:ENGINE COMPONENT LIMITATIONS (DISC AND BLADES)**

- Life limits established for critical rotating components are published in the CFM56-3 Shop Manual.

- **NOTE 15:OPERATIONAL TORQUES: POWER RATING AND OTHER SPECIFIC LIMITATIONS**

- Power setting/power checks and controls of engine thrust output in all operations is to be based on CFMI engine charts referring to Fan speed. Fan speed sensors are included in the engine assembly for this purpose.

- **NOTE 16:ENGINE MOUNT SYSTEM**

- See Installation Manual.
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**- NOTE 17: AUXILIARY POWER AND INJECTION**

Not applicable.

**- NOTE 18: SPECIAL EQUIPMENT**

Not applicable.

**- NOTE 19:** Provisional Power Limitation FAA-TAD/NUMBER T89-13-51 issued on June 14, 1989 limits operation of the CFM56-3C engine at 9830 dan (22.100 lbf) take off thrust rating.

**- NOTE 20: REQUIRED MANUALS AS PER FAR 33.5, FAA APPROVED AND CTA ACCEPTED**

	<u>CFM56-3</u>	<u>CFM56-3B</u>	<u>CFM56-3C</u>
. Installation Manual	CFM 2031	- -	CFM 2095
. Operating Instruction	CFMI-TP.OI9	- -	- -
. Maintenance Manual	CFMI-TP.MM6	- -	- -
. Engine Shop Manual	CFMI-TP.SM5	- -	- -

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