

**MINISTÉRIO DA AERONÁUTICA
DEPARTAMENTO DE PESQUISAS E DESENVOLVIMENTO
CENTRO TÉCNICO AEROESPACIAL**

TYPE CERTIFICATE DATA SHEET Nº EM-9811

Type Certificate Holder:

GENERAL ELECTRIC COMPANY - AIRCRAFT ENGINE GROUP
1 Neumann Way
Cincinnati, OH 45215-6310
USA

EM-9811-01

Sheet 01
GENERAL ELETRIC

CF6-80E1A1
CF6-80E1A2
CF6-80E1A3
CF6-80E1A4

April 2002

Engines of models described herein conforming with this data sheet, which is part of Type Certificate No. 9811, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Brazilian Aeronautical Regulations provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other instructions.

MODEL CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4.

TYPE Dual rotor, axial flow, annular combustor, high bypass turbofan. The 14-stage high pressure compressor is driven by a 2-stage high pressure turbine and the integrated fan and low pressure compressor are driven by a 5-stage low pressure turbine.

RATINGS	CF6-80E1A1	CF6-80E1A2	CF6-80E1A3	CF6-80E1A4
Maximum continuous at sea level, static thrust, kg (lb).	26 317(58 020)	27 397(60 400)	--	--
Takeoff (5 min, see NOTE 18) at sea level, static thrust, kg(lb)	28 708(63 290)	29 270(64 530)	31 084(68 530)	30 332(66 870)
Flat rating ambient temperature: Takeoff	30°C (86°F)	--	--	--
Maximum continuous	25°C (77°F)	--	--	--

-- same as preceeding

		CF6-80E1A1	CF6-80E1A2	CF6-80E1A3	CF6-80E1A4	
COMPONENTS (GE P/NS)	Hydro-mechanical Control Unit	1521M74	--	--	--	
	Electronic Control Unit (ECU)	1799M99P01	--	#	#	
		1799M99P03	--	#	#	
		1799M99P04	--	#	#	
		1799M99P05	--	#	#	
		1799M99P06	--	#	#	
		1799M99P07	--	#	#	
		1799M99P08	--	#	1799M99P08	
		1799M99P09	--	#	1799M99P09	
		1799M99P10	--	#	1799M99P10	
		1799M99P11	--	#	1799M99P11	
		1799M99P12	--	--	--	
		1851M74P01	--	#	#	
		1851M74P02	--	#	1851M74P02	
		1851M74P03	--	#	1851M74P03	
		1851M74P04	--	#	1851M74P04	
		1851M74P05	--	#	1851M74P05	
		1851M80P01	--	#	#	
		1851M80P02	--	1851M80P02	1851M80P02	
		1851M80P03	--	#	1851M80P03	
		1851M80P04	--	#	1851M80P04	
		1851M80P05	--	--	--	
		1960M84P01	--	#	1960M84P01	
		1960M84P02	--	#	1960M84P02	
		1960M84P03	--	--	--	
		ECU rating plug	1753M83P35	1753M83P44	1753M83P60	1753M83P25
		Main fuel pump	1752M18	--	--	--
	PRINCIPAL DIMENSIONS	Length (Fan spinner to outer LTP flange face), cm (in)	428 (168.41)	--	--	--
		Width (maximum envelope), cm (in)	289 (114.13)	--	--	--
		Height (maximum envelope), cm (in)	287 (113.13)	--	--	--

		CF6-80E1A1	CF6-80E1A2	CF6-80E1A3	CF6-80E1A4
FUEL TYPE		See NOTE 7	--	--	--
OIL LUBRICATION		See NOTE 14	--	--	--
TEMPERATURE LIMITS		See NOTE 2	--	--	--
PRESSURE LIMITS		See NOTE 3	--	--	--
WEIGHT (DRY)	Includes all basic engine accessories, and optional equipment as listed in the manufacturer's engine specifications, kg (lb).	5 092 (11 225)	--	--	--
CENTER OF GRAVITY	Engine only, cm (in) : Station	555,7 ± 5,1 (218.80 ± 2.0)	--	--	--
	Waterline	250,7 ± 2,5 (98.70 ± 1.0)	--	--	--
	Buttline	253,5 ± 2,5 (99.80 ± 1.0)	--	--	--
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 FAA (or a third country authority, in case of used engine imported from such country) 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. The CTA Type Design corresponds to the FAA approved Type Design, as stated in CTA Report V.33-0683-0 dated 19 April, 2002 or further revisions.				
CERTIFICATION BASIS			Application	Issued TC	
	RBHA 33 (FAR Part 33 effective February 1, 1965, including Amendments 33-1 to and including 33-12) :	CF6-80E1A1, A2.	7 July 1998	21 Oct. 1998	
	RBHA 33 (FAR Part 33, effective February 1, 1965, including Amendments 33-1 to and including 33-12 and FAR 33.28, Amendment 15) :	CF6-80E1A4.	--	--	
	--	CF6-80E1A3.	16 Nov. 2001	19 April 2002	

-- same as preceding

not applicable

PRODUCTION BASIS

FAA Production Certificate No. 108 for engines produced by the General Electric Company in the United States. In addition, CF6-80E1 series engines and parts thereof produced in Europe are eligible in accordance with the following: Societe National d'Etude et de Construction de Moteurs d'Aviation (SNECMA)

Production agreement No. 6.3592 between General Electric and SNECMA dated April 19, 1983, for complete engines and modules.

Identification plates for CF6-80E1A1 and CF6-80E1A2 engines manufactured by SNECMA shall contain the following information:

1. Manufacturer (SNECMA, France)
2. Model
3. Serial number (Numbers 811-XXX are assigned to engines manufactured by SNECMA)
4. Type Certificate Number E41 NE
5. Import Type Certificate No. M-IM.

Each individually imported engine must be accompanied by an airworthiness approval tag, JAA Form F1, issued by SNECMA on behalf of Director Generale de l'Aviation Civile (DGAC) under production certificate number P03 or a "Certificate de Navigabilite pour Exportation" delivered by the DGAC.

NOTES

NOTE 1 Maximum permissible engine rotor speeds - CF6-80E (all Models)

Low pressure rotor (N1)	3 835 (115.5%)
High pressure rotor (N2)	11 105 (113.0%)

NOTE 2 Maximum permissible temperatures:

Turbine exhaust gas temperature (T49) Indicated :	Takeoff (5 min.)	975°C (1 787°F) (See NOTE 10)
	Maximum Continuous	940°C (1 724°F) (See NOTE 10)
	Starting (max. transient for 40 sec.)	870°C (1 598°F)
	Starting (ground) (max. - no time limit)	750°C (1 382°F)

Refer to CF6-80E1 Operating Instruction GEK 99382 for time temperature envelope.

Oil (all models) :	Continuous operation	160°C (320°F)
	Transient (15 minutes max)	175°C (347°F)

NOTE 3 Fuel and Oil pressure limits:

Fuel pressure limits at engine pump inlet in Ground Starting, Air Starting, and Operation extends from a minimum fuel pressure of greater than or equal to 34.5 kPa (5.0 psi) absolute above the true vapor fuel pressure to a maximum of 468 kPa gauge (68 psig) (relative to the atmosphere) with vapor/liquid ratio of zero at all conditions.

Low Oil pressure limits: 69 kPa (10.0 psid) minimum
 103,4 kPa diff. (15.0 psid) at 55% N2
 241,5 kPa diff. (35.0 psid) at 110% N2

During negative-g operation only, it is permissible to operate below minimum oil pressure 69kPa(10 psid indicated) for a maximum of 30 seconds. See CF6-80E1 Operating Instruction, GEK 99 382, Section 6.

NOTE 4 Accessory drive provisions for CF6-80E1A1/ A2/ A3/ A4 :

Drive Pad	Rotation Facing Gearbox Pad	Gear Ratio to Core Speed	Horse Power Continuous Pad Rating, hp (kW)	Shear Torque N.m (lb.in)	Static Overhung Moment N.m (lb.in)
Starter	CCW	0,9564	949,07 (8 400)	1 898 (16 800)	45,2 (400)
IDG	CCW	0,8026	160,3 (215)	1 197 (10 594)	226 (2 000)
Hydraulic Pump (two)	CCW	0,3780	31,3 (42)	565 (5 000)	45,2 (400)
IDG Overload Limits	a. 135 KVA electrical load (234.9 hp) 3 750 lb in. (424 N.m) for 5 minutes in the accessory gearbox life. b. 180 KVA electrical load (313.2 hp) 5 000 lb in. (565 N.m) for 5 seconds in the accessory gearbox life.				

NOTE 5 Engine ratings are defined under the following conditions:

CF6-80E1 (all models),

- a. Fan inlet air at 15°C (59°F) and 760 mmHg abs (29.92 in HG abs), zero humidity.
- b. Ideal engine inlet (100% bellmouth recovery).
- c. No external bleed or accessory drive power for aircraft accessories.
- d. Turbine temperature and engine rotor speed limits not exceeded.

Along with the following flight exhaust system definition:

CF6-80E1A1/ A2/ A3/ A4,

- ES-CF6-4G01 (position 1)
- ES-CF6-4G02 (position 2)
- ES-CF6-4G03 (position 1)
- ES-CF6-4G04 (position 2)

NOTE 6 Maximum permissible air bleed extraction:

Bleed Location	CF6-80E1 All Models (Percent)
Stage 8, compressor airflow, normal	7,2
Stage 11	1,5
Compressor discharge	
Steady state at take-off rating	5,0
Steady-State at or below maximum continuous	10,0
Acceleration above 80% N2	7,0
Steady-State or acceleration	
Operation at 80% N2 or below	10,0

NOTE 7 Fuel : Approved fuels must conform to GE Specification D50TF2. The latest revision of the specification will apply.

NOTE 8 Life limits established for critical rotating components and engine case structures are published in the CF6-80E1 Engine Manual, GEK 99376.

NOTE 9 Power setting, power checks and control of engine thrust output in all operations is to be based on GE charts referring to fan speed (N1). Speed sensors are included in the engine assembly for this purpose.

NOTE 10 The indicated (cockpit) take-off and maximum continuous EGT redline for the CF6-80E1 engine models correspond to an actual (measured) gas path temperature based on correction (shunt) values established for each engine model. These corrections, shown in the next table, are made in the Electronic Control Unit (ECU) and controlled by the installed rating plug. The engine configuration input to the ECU is controlled by the installed identification plug.

MODELS		CF6-80E1A1/A2	CF6-80E1A2		CF6-80E1A4	CF6-80E1A4		CF6-80E1A3
			Post SB 72-0186*, Post SB 72-0042** And Post SB 72-0043***			Post SB 72-0042** and Post SB 72-0043***		
Take-off EGT correction (shunt) °C(°F)		60 (140)	75 (167)	70 (158)	75 (167)	85 (185)		
Take-off EGT Redline Value	Indicated	975 (1 787)	--	--	--	--		
	Actual	1 035 (1 895)	1 050 (1 922)	1 045 (1 913)	1050 (1 922)	1060 (1 940)		
Max. Continuous EGT Redline Value	Indicated	940 (1 724)	--	--	--	--		
	Actual	998 (1 828)	--	--	--	1013 (1 855)		

* SB 72-0186 – Introduce the R88DT HPTR to the CF6-80E1A2 engine, including enhanced blades; Stage 1 HPT blades with TBC and Stage 2 HPT blades of DSR142 material.

** SB 72-0042 – Induce the ECU software version E1L to the CF6-80E1A2/ A4 models.

*** SB 72-0043 – Introduce identification plugs associated with the E1L software to the CF6-80E1A2/ A4 models.

NOTE 11 For in-flight operation during icing conditions, the minimum idle permissible in-flight corresponds to N2 (core) = 6 555 rpm.

NOTE 12 The engine manufacturer supplies the engine assembled EBU, the exhaust system, and engine attach fittings for the CF6-80E1A1/ A2/ A3/ A4 engines. The components, approved for installation on CF6-80E1 (all models) in accordance with Federal Aviation Regulation Part 33, are defined in the engine model lists for the CF6-80E1A1/ A2/ A3/ A4. Major components included are:

System	Kit Number
Exhaust	ES-CF6-4G01; ES-CF6-4G02; ES-CF6-4G03; ES-CF6-4G04.
Pneumatic	277-1475
Starter	277-1650
Fuel supply	277-1450
Aft mount	683L241G01 (upper beam); 683L239G01 (lower beam)

NOTE 13 Overhaul of CF6-80E1 (all models) engine components is not authorized until component manuals become available. In the interim, components utilizing new part tolerances may be provided by the manufacturer.

NOTE 14 Synthetic lubricating oil type conforming to GE Specification D50TF1, Class B. The latest revision of the specification will apply. GE Service Bulletin 79-001 lists approved brand oils.

NOTE 15 Criteria pertaining to the dispatch and maintenance requirements for engine control systems are specified in GE Document No. GEK 100737, which define the various configurations and maximum operating intervals.

NOTE 16 These models incorporate the following general characteristics:

CF6-80E1A1: Basic Model

CF6-80E1A2: Same as CF6-80E1A1 except higher take-off thrust rating. Corresponding rating plug changes.
For CF6-80E1A2 with the R88DT HPTR (Post SB 72-0186) actual EGT redline : see NOTE 10
Corresponding ECU software (Post SB 72-0042) and identification plug changes (Post SB 72-0043).

CF6-80E1A4: Same as CF6-80E1A1/ A2 except higher thrust rating and actual EGT redline increased to 1 045°C (1 913°F), see NOTE 10. Includes forged forward mount. Corresponding identification plug changes (SB 72-0043).
For ECU software version E1L or latter (Post SB 72-0042), actual EGT redline: See NOTE 10.

CF6-80E1A3: Same as CF6-80E1A4 except higher thrust rating and actual EGT redline, see NOTE 10. Includes the R88DT HPT and new stage 1 LPT nozzle. Corresponding ECU software, rating plug and identification plug change.

NOTE 17 The normal 5 minute take-off rating may be extended to 10 minutes for engine out contingency.

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