TYPE-CERTIFICATE DATA SHEET

EASA.IM.E.007

for
CF6-80E1 series engines

Type Certificate Holder
General Electric Company
GE Aviation
1 Neumann Way
Cincinnati, OH 45215-6301
USA

For Models:

CF6-80E1A1
CF6-80E1A2
CF6-80E1A3
CF6-80E1A4
CF6-80E1A4/B

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I. General

1. Type/ Model

Type	Models
CF6-80E1	CF6-80E1A1
	CF6-80E1A2
	CF6-80E1A3
	CF6-80E1A4
	CF6-80E1A4/B

2. Type Certificate Holder

General Electric Company
GE Aviation
1 Neumann Way
Cincinnati, OH 45215-6301
USA

3. Manufacturer

General Electric Company
GE Aviation
1 Neumann Way
Cincinnati, OH 45215-6310
USA

4. Date of Application

Models	Application Date (*)
CF6-80E1A1	11 July 1991
CF6-80E1A2	11 July 1991
CF6-80E1A3	27 July 1999
CF6-80E1A4	23 May 1994
CF6-80E1A4/B	07 January 2004

(*) Application to the Joint Aviation Authorities (JAA)

5. EASA Type Certification Date

Models	Certification Date (*)
CF6-80E1A1	20 October 1993
CF6-80E1A2	20 October 1993
CF6-80E1A3	19 November 2001
CF6-80E1A4	20 August 1998
CF6-80E1A4/B	14 June 2004

(*) The EASA Type Certificate for these engines is granted in accordance with article 2 paragraph 3 (a) of EU Commission Regulation (EC) 1702/2003, and based on:
- The JAA recommendation and/or,
- The UK-CAA and/or DGAC-France Type Certificates issued following the JAA recommendation.

II. Certification Basis

1. State of Design Authority Certification Basis

See FAA TCDS E41NE.

2. Reference Date for determining the applicable airworthiness requirements

25 May 1990 (JAA Validation Reference Date).

3. EASA Certification Basis

3.1. Airworthiness Standards

Models	EASA Airworthiness Standards
CF6-80E1A1, CF6-80E1A2, CF6-80E1A4	JAR-E change 8 dated 4 May 1990
CF6-80E1A3, CF6-80E1A4/B	JAR-E change 8 dated 4 May 1990 plus JAR-E 530 (a),(f),(g),(h) and JAR-E 850 from JAR-E change 9

3.2. Special Conditions (SC)

Models	Special Conditions
CF6-80E1A1, CF6-80E1A2, CF6-80E1A4	• PC338-1: Ingestion of Rain and Hail • Interim Policy INT/POL/E/2: Medium and Large Bird Ingestion
CF6-80E1A3	• JAR-E790 change 10: Ingestion of Rain and Hail • Interim Policy INT/POL/E/2: Medium and Large Bird Ingestion
CF6-80E1A4/B	• JAR-E790 change 10: Ingestion of Rain and Hail • JAR-E 540 & 800 change 11: Medium and Large Bird Ingestion

3.3. Equivalent Safety Findings (ESF)

- JAR-E640(b)(1): Static Pressure Tests
- JAR-E890(b)(1): Thrust Reverser Endurance Tests
- JAR-E740(f): Speed Limitations at Maximum Continuous Rating

Models	Equivalent Safety Findings
CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4, CF6-80E1A4/B	• JAR-E640(b)(1): Static Pressure Tests • JAR-E890(b)(1): Thrust Reverser Endurance Tests • JAR-E740(f): Speed Limitations at Maximum Continuous Rating

3.4. Deviations

None

3.5. Environmental Protection

Models	Environmental Protection Requirements
CF6-80E1A1	CS-34 as issued by Decision No. 2003/3/RM of the Executive Director of the Agency dated 17 October 2003; ICAO Annex 16 Volume II, Third Edition, Amendment 7 applicable 17 November 2011: • NOx levels in compliance with Part III, Chapter 2, paragraph 2.3.2 d) (CAEP/6)
CF6-80E1A2, CF6-80E1A3, CF6-80E1A4, CF6-80E1A4/B	CS-34 Amendment 3 as implemented by ED Decision 2019/014/R (29 July 2019); ICAO Annex 16 Volume II, Fourth Edition, Amendment 9 applicable 01 January 2018 as implemented into EU legislation 11 September 2018; • NOx levels in compliance with Part III, Chapter 2, paragraph 2.3.2 d) (CAEP/6), • Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2 (CAEP/10)

III. Technical Characteristics

1. Type Design Definition

As defined by the applicable CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4 or CF6-80E1A4/B Model List.

2. Description

Dual Rotor, axial flow, annular combustion chamber, high bypass turbofan. The 14-stage high pressure compressor is driven by a 2-stage high pressure turbine. The integrated fan and low pressure compressor are driven by a 5-stage low pressure turbine. Dual Channel Full Authority Digital Electronic Engine Control Unit (FADEC). See Note 8.

3. Equipment

Approved Equipment are included in Item III. 1. Type Design Definition.

4. Dimensions

Models	**Dimensions** mm (in.)		
	Overall Length	**Overall Width**	**Overall Height**
CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4, CF6-80E1A4/B	4277.6 (168.41)	2898.9 (114.13)	2873.5 (113.13)

5. Dry Weight

Models	**Dry Weight** (*) kg (lbs)
CF6-80E1A1, CF6-80E1A2, CF6-80E1A3 CF6-80E1A4, CF6-80E1A4/B	5091.62 kg (11225 lbs)

(*) Includes all basic engine accessories and optional equipment as listed in the manufacturer's engine specifications.

See Note 1.

6. Ratings

Models	**Thrust** kN (lbf)	
	Take-off (5 minutes)	**Maximum Continuous**
CF6-80E1A1	281.539 (63290)	258.096 (58020)
CF6-80E1A2	287.055 (64530)	268.683 (60400)
CF6-80E1A3	304.848 (68530)	268.683 (60400)
CF6-80E1A4	297.465 (66870)	268.683 (60400)
CF6-80E1A4/B	304.848 (68530)	268.683 (60400)

See Notes 2, 3 and 4.

7. Control System

The engine is equipped with a Full Authority Digital Engine Control (FADEC) consisting primarily of a dual channel Electronic Control Unit (ECU), a Hydro Mechanical Unit (HMU), an ECU Rating Plug and a Main Fuel Pump. Refer to the Installation Manual GEK99381 for unit part numbers.

8. Fluids (Fuel, Oil, Additives)

8.1 Fuel:

The approved fuels and additives must conform to GE Specification D50TF2. The latest revision of the specification will apply.

8.2 Oil:

The engine oil must be a synthetic type conforming to GE Specification D50TF1, Class B. For approved brands of oil refer to Service Bulletin 79-001.

9. Aircraft Accessory Drives

For all engine models:

Drive Pad	Rotation Facing Gearbox Pad	Gear Ratio to Core Speed	Horsepower Continuous Pad Rating	Shear Torque**	Maximum Overhung Moment**
Starter	CCW	0.9564	949.07 (8400)**	1898.1 (16800)	45.2 (400)
IDG	CCW	0.8026	160.3 (215)*	1197 (10594)	226.0 (2000)
Hydraulic Pump	CCW	0.378	31.3 (42)*	565.0 (5000)	45.2 (400)

CCW = Counter Clockwise
* Units: kW (hp)
** Units: Torque Nm (lb-in)

IDG Overload Limits: 135 kVA electrical load (234.9 hp) 424 Nm (3750 lb-in) for 5 minutes in the accessory gearbox life.
180 kVA electrical load (313.2 hp) 565 Nm (5000 lb-in) for 5 seconds in the accessory gearbox life.

10. Maximum Permissible Air Bleed Extraction

For all engine models, the bleed extraction is as follows:

Bleed Location	Percent
Stage 8, Compressor airflow, normal	7.2
Stage 11	1.5
Compressor Discharge	
▪ Steady State at Takeoff Rating	5.0
▪ Steady State at or below maximum continuous	10.0
▪ Acceleration above 80% N2	7.0
▪ Steady State or Acceleration at or below 80% N2	10.0

IV. Operating Limitations

1. Temperature Limits

1.1 Exhaust Gas Temperature (EGT), °C (°F):

	Exhaust Gas Temperature °C (°F)			
Models	**Take-off (5 minutes)**	**Maximum Continuous**	**Starting Maximum Transient (40 sec)**	**Starting (Ground) Max (no time limit)**
CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4, CF6-80E1A4/B	975 (1787)	940 (1724)	870 (1598)	750 (1382)

See Notes 5 and 10.

1.2 Oil Temperature, °C (°F):

	Maximum Oil Temperature °C (°F)	
Models	**Continuous Operation**	**Transient (15 minutes maximum)**
CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4, CF6-80E1A4/B	160 (320)	175 (347)

1.3 Fuel Temperature

For all engine models:
Starting Temperature Limit is the minimum temperature that is related to a fuel viscosity of not more than 0.000012 m^2/s (12 centistokes), to a maximun temperature of 55°C (131°F).
The starting temperature applies to ground and air starts.

Operating Temperature Limit (other than starting) is a temperature as low as 3°C (5.4°F) above the fuel freezing point to be no lower than -54°C (-65.2°F), and a maximum temperature limit of 55°C (131°F).

2. Speed Limits

	Maximum Permissible Rotor Speeds rpm (%)	
Models	**Low Pressure Rotor (N1)**	**High Pressure Rotor (N2)**
CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4, CF6-80E1A4/B	3835 (115.5)	11105 (113.0)

3. Pressure Limits

3.1 Fuel Pressure Limits at Engine Pump Inlet

For all engine models:
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 vapour fuel pressure to a maximum of 468 kPa gauge (68 psig) (relative to the atmosphere) with vapour/liquid ratio of zero at all conditions.

3.2 Oil Pressure Limits

For all engine models:
Low Pressure (differential): 69 kPa (10 psi) minimum
103.4 kPa (15.0 psi) at 55% N2
241.5 kPa (35.0 psi) at 110% N2

Operation is permitted below the minimum oil pressure of 69 kPa differential (10 psi differential) for a maximum of 30 seconds under “negative g” condition. See CF6-80E1 Operating Instructions, GEK 99382, Section 6.

4. Installation Assumptions

The installation assumptions are quoted in the Engine Installation Manual GEK99381.

5. Dispatch Limitations

Criteria pertaining to the dispatch and maintenance requirements for engine control systems are specified in GEAE Document GEK 100737 which defines the various configurations and maximum operating intervals.

V. Operating and Service Instructions

Engine Installation Manual	GEK 99381
Engine Operating Instructions	GEK 99382
Engine Maintenance Manual	GEK 99377
Engine Manual (Overhaul)	GEK 99376
Service Bulletins	As issued for each engine model

VI. Notes

1. Dry weight includes basic engine accessories and optional equipment as listed in the manufacturer's engine specification.

2. The engine ratings are based on dry sea-level static ICAO Standard Atmospheric Conditions, no installation effects, no customer bleed, no power extraction, and unity ram recovery. The engine ratings specified are the minimum guaranteed and are based on calibrated stand performance with the inlet, exhaust, and nacelle configured as specified in the Installation Manual GEK 99381.

3. Take off rating is limited to a continuous period of not more than 5 minutes except in the event of a power unit having failed or been shut down when a continuous period of not more than 10 minutes is allowed.

4. Take-off thrust is flat rated up to an ambient temperature of 30°C (86°F). Maximum Continuous thrust is flat rated up to an ambient temperature of 25°C (77°F).

5. The time temperature limits are specified in the Specific Operating Instructions GEK 99382.

6. Overhaul of CF6-80E1 (all variants) engine components is not permitted until component manuals become available.

7. For inflight operation during icing conditions, the minimum idle permissible in flight corresponds to N2 (high pressure) = 6555 rpm.

8. These variants incorporate the following general characteristics: See Note 10 for additional information.

CF6-80E1A1	Basic model
CF6-80E1A2	Same as CF6-80E1A1 except for higher Take off and Maximum Continuous thrust ratings. Corresponding Rating Plug changes. For CF6-80E1A2 engines with enhanced high pressure turbine (HPT) blades actual EGT redline is 1050°C. Enhanced blades are defined as Stage 1 HPT blades with TBC and Stage 2 HPT blades of DSR 142 material. Engine rating and configuration are provided by the Rating Plug and Identification Plug, respectively.
CF6-80E1A4	Same as CF6-80E1A1/A2 baseline except higher take-off thrust rating and actual EGT redline increased 1045°C. Includes forged mount. Corresponding Rating Plug and Identification Plug changes. For CF6-80E1A4 engines ECU Software Version E.1.L or later (Post SB 73-0042), actual EGT redline is increased to 1050°C. Corresponding Identification Plug (Post SB 73-0043) changes. For CF6-80E1A4 engines with ECU Software Version E.1.O or later (Post SB 73-0091) and specific hardware identified in SB 73-0073, actual take-off EGT redline is increased to 1060°C. Includes the R88DT HPT, R80 Stage 1 low pressure turbine

nozzle, and other minor engine changes. Corresponding Identification Plug (Post SB 73-0073) changes.

CF6-80E1A3 Same as CF6-80E1A4 except higher thrust rating and actual EGT redline increased to 1060°C. Includes the RD88 HPT and new Stage 1 low pressure turbine nozzle. Corresponding ECU software, Rating Plug and Identification Plug changes.

CF6-80E1A4/B Same as CF6-80E1A4 except CF6-80E1A3 Take-off thrust rating available as a thrust bump feature. Maximum Continuous and Maximum Climb thrust are common. Corresponding ECU software, Rating Plug and Identification Plug changes.

9. The engine manufacturer supplies the engine assembled EBU, the exhaust system and engine attach fittings for the CF6-80E1A1, A2, A4, A3 and A4/B engines. The components, approved for installation on CF6-80E1 (all models), are defined in the appropriate engine model lists.

Major components included are:

SYSTEM	KIT NUMBER
Exhaust	ES-CF6-4G01, ES-CF6-4G02
(Including thrust reverser)	ES-CF6-4G03, ES-CF6-4G04
Pneumatic	277-1475
Starter	277-1650
Fuel supply	277-1450
Aft mount	683L241G01 (upper beam) 683L239G01 (lower beam)

10. The Indicated (cockpit) Take-off and Maximum Continuous EGT redline values correspond to actual (measured) gas path temperature based on corrected (shunt) values established for each engine model. These corrections 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 Configuration Plug.

Model	**Takeoff EGT Correction (Shunt)**	**Takeoff EGT Redline Values °C(°F)**		**Maximum Continuous EGT Redline Values °C(°F)**	
		Indicated	**Actual**	**Indicated**	**Actual**
CF6-80E1A1 CF6-80E1A2	60	975 (1787)	1035 (1895)	940 (1724)	998 (1828)
CF6-80E1A2 with SB 72-0186, 73-0042 and 73-0043 *	75	975 (1787)	1050 (1922)	940 (1724)	998 (1828)
CF6-80E1A4	70	975 (1787)	1045 (1913)	940 (1724)	998 (1828)
CF6-80E1A4 with SB 73-0042, 73-0043 *	75	975 (1787)	1050 (1922)	940 (1724)	998 (1828)
CF6-80E1A4 with SB 73-0073 *	85	975 (1787)	1060 (1940)	940 (1724)	1013 (1855)
CF6-80E1A3	85	975 (1787)	1060 (1940)	940 (1724)	1013 (1855)
CF6-80E1A4/B	85	975 (1787)	1060 (1940)	940 (1724)	1013 (1855)

* SB 72-0186 introduced the R88DT HPTR to the CF6-80E1A2 engine model. The R88DT HPTR configuration includes enhanced blades.
SB 73-0042 introduced ECU software version E.1.L to the CF6-80E1A2 and CF6-80E1A4 engine models.

SB 73-0043 introduced the corresponding Identification Plug.
SB 73-0073 identifies appropriate CF6-80E1A3 capable hardware and the Identification Plugs associated with ECU software version E.1.O for the CF6-80E1A4 engine model.

11. The CF6-80E1 engine is approved for use with the GE-Middle River thrust reverser designated ES-CF6-4G03 (engine position 1) and ES-CF6-4G04 (engine position 2).

SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

EASA	European Union Aviation Safety Agency
EGT	Exhaust Gas Temperature
ESF	Equivalent Safety Finding
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
GE	General Electric
HPC/HPT	High Pressure Compressor/Turbine
ICAO	International Civil Aviation Organisation
IDG	Integrated Drive Generator
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirements
LPC/LPT	Low Pressure Compressor/Turbine
SC	Special Condition
TC	Type Certificate
TCDS	Type Certificate Data Sheet

II. Type Certificate Holder Record

n/a

III. Change Record

Issue	Date	Changes	TC issue
Issue 01	14 June 2004	Initial Issue	Initial issue 14 June 2004
Issue 02	25 October 2011	General Electric SP 2007-007, SB 73-0073 (Major Change Approval EASA.IM.E.C.01012)	
Issue 03	22 July 2020	▪ New TCDS template ▪ Update of Environmental Protection Requirements for CF6-80E1A1, CF6-80E1A2, CF6-80E1A3, CF6-80E1A4 and CF6-80E1A4/B to CS-34 in accordance with ICAO Annex 16 Volume II, Third Edition, Amendment 7 for NOx requirements from Part III, Chapter 2, paragraph 2.3.2 d) (CAEP/6) – Ref. Major Change Approval 10042715 dated 14 December 2012 ▪ Update of Environmental Protection Requirements for CF6-80E1A2, CF6-80E1A3, CF6-80E1A4 and CF6-80E1A4/B to CS-34 Amendment 3 in accordance with ICAO Annex 16 Volume II, Fourth Edition, Amendment 9 for non-volatile Particulate Matter emissions (CAEP/10) – Ref. Major Change Approval 10072632 Rev. 1 dated 17 July 2020	

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