



TYPE-CERTIFICATE DATA SHEET

No. IM.E.002

for
GE90 Series Engines

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

For Models:

GE90-76B

GE90-77B

GE90-85B

GE90-90B

GE90-94B

GE90-110B1

GE90-113B

GE90-115B



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I. General**1. Type/ Model**

Type	Models
GE90	GE90-76B
	GE90-77B
	GE90-85B
	GE90-90B
	GE90-94B
	GE90-110B1
	GE90-113B
	GE90-115B

2. Type Certificate Holder

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

3. Manufacturer

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

4. Date of Application

Models	Application Date (*)
GE90-76B, GE90-85B	24 January 1992
GE90-90B	14 November 1995
GE90-77B	10 April 1996
GE90-94B	14 December 1999
GE90-113B, GE90-115B	02 January 2001
GE90-110B1	08 May 2002

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



5. EASA Type Certification Date

Models	Certification Date (*)
GE90-76B, GE90-85B	03 November 1995
GE90-77B, GE90-90B	23 January 1997
GE90-94B	08 November 2000
GE90-110B1, GE90-113B, GE90-115B	18 December 2003

(*) 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 DGAC-France Type Certificates issued following the JAA recommendation.

II. Certification Basis**1. State of Design Authority Certification Basis**

Models	State of Design Authority Certification Basis
All	See FAA TCDS E0049EN

2. Reference Date for determining the applicable airworthiness requirements

Models	Reference Date for Applicable Airworthiness Requirements
All	as previously defined by JAA

3. EASA Certification Basis**3.1. Airworthiness Standards**

Models	EASA Airworthiness Standards
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	JAR-E Change 8 (dated 4 May 1990) plus Orange Paper E/91/1 (dated 27 May 1991, which embodied NPA-E-8, E-14, and E-15)
GE90-110B1, GE90-113B, GE90-115B	JAR-E Change 10 (dated 15 August 1999)



3.2. Special Conditions (SC)

Models	Special Conditions
GE90-76B, GE90-77B, GE90-85B, GE90-90B	SC1: JAR-E800 Bird Ingestion: Special condition based on the new identified 2.5 lb medium bird and 8 lb large bird threats. SC2: JAR-E790 Ingestion of Rain and Hail: Special condition based on the new identified rain and hail threats.
GE90-94B	SC 1: JAR-E 800 Bird Ingestion: Special condition based on the NPAE-20 dated 3 December 1999. SC2: JAR-E 790 Inclement weather: Special condition requesting compliance with JAR-E 790 Chg. 10.
GE90-110B1, GE90-113B, GE90-115B	SC1: Medium and large Birds Ingestion SC2: Programmable Logic device SC3: Fan Blade Containment

3.3. Equivalent Safety Findings

Models	Equivalent Safety Findings
GE90-76B	JAR-E 740 (d)(1) - Time to accelerate from 10% to 95% T/O thrust JAR-E 840(a)(1)(2) or (3) - Rotor Integrity JAR-E 640(b)(1) - Static Pressure Tests JAR-E 740(f) - Speed limitations at Maximum Continuous rating JAR-E 740 (f)(4)(iii) - 60s transient Take off EGT JAR-E-890 and E650 (b)(2) Thrust Reverser Tests
GE90-77B, GE90-85B, GE90-90B	JAR-E 740 (d)(1) - Time to accelerate from 10% to 95% T/O thrust JAR-E 840(a)(1)(2) or (3) - Rotor Integrity JAR-E 640(b)(1) - Static Pressure Tests JAR-E-890 and E650 (b)(2) Thrust Reverser Tests
GE90-94B	JAR-E 740 (d)(1) - Time to accelerate from 10% to 95% T/O thrust JAR-E 840(a)(1)(2) or (3) - Rotor Integrity JAR-E 640(b)(1) - Static Pressure Tests JAR-E-890 - Thrust Reverser Tests JAR-E 780 - Tests in Ice Forming Conditions
GE90-110B1, GE90-113B, GE90-115B	JAR-E 800(b)(3) - "Additional assessment", as of Special Condition 1 JAR-E 840 & JAR-E 850 - HPT Stage 2 Disk Rotor Integrity Compliance



3.4. Deviations

None

3.5. Elect to Comply

Models	Elect to Comply
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	None
GE90-110B1, GE90-113B, GE90-115B	JAR-E 640 Pressure Loads as of amendment 11 JAR-E 840 Rotor Integrity as of amendment 11 JAR-E 510 Safety Analysis as of amendment 12

3.6. Environmental Protection

Models	Environmental Protection Requirements
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	CS 34.2 in accordance with Amendment 7 of ICAO Annex 16 Volume II. Compliance with the NOx regulation of ICAO Annex 16, Volume II, Part III, Chapter 2, paragraph 2.3.2
GE90-113B	CS-34 Amendment 3 as implemented by ED Decision 2019/014/R (29 th July 2019); ICAO Annex 16 Volume II, Amendment 9 (1 st January 2018) as implemented into EU legislation 11 th September 2018; NOx levels in compliance with Part III, Chapter 2, paragraph 2.3.2 e) (CAEP/8) of the above mentioned Annex. Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2 (CAEP/10) of the above mentioned Annex
GE90-110B1, GE90-115B	CS-34 Amendment 4 as implemented by ED Decision 2021/011/R (applicable 25 July 2021), ICAO Annex 16 Volume II, Amendment 10 applicable 1 January 2021 as implemented into EU legislation 27 April 2021 . NOx standard in accordance with ICAO Annex 16 Volume II, Part III, Chapter 2, § 2.3.2 e) (CAEP/8). Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2.1. nvPM mass and number emissions in compliance with Part III, Chapter 4, paragraph 4.2.2.2 a) 1) and 4.2.2.2 b) 1) (CAEP/11 In-Production standard).



III. Technical Characteristics

1. Type Design Definition

Models	Type Design Definition
All	As defined by the applicable and approved Model List.

2. Description

Models	Description (*)
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B GE90-110B1, GE90-113B, GE90-115B	Dual rotor, axial flow, high bypass ratio turbofan. The 10-stage [9-stage] high pressure compressor is driven by a 2-stage high pressure turbine. The single stage fan and 3-stage [4-stage] low pressure compressor are driven by a 6-stage low pressure turbine. The engine includes the starter and the engine mount and does not include the thrust reverser.

(*) [xxx]: Applicable to GE90-110B1, GE90-113B, GE90-115B

3. Equipment

See III. 1. Type Design Definition.

See also Note 1.

4. Dimensions

Models	Dimensions mm (in.)		
	Overall Length Fan Spinner to Nozzle Center Body	Overall Width Maximum Envelope	Overall Height Maximum Envelope
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	7283 (286.9)	3871 (152.4)	3952 (155.6)
GE90-110B1, GE90-113B, GE90-115B	7281 (286.7)	3769 (148.4)	3926 (154.6)



5. Dry Weight

See Note 1.

Models	Dry Weight kg (lbs)
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	7892 kg (17400 lbs)
GE90-110B1, GE90-113B, GE90-115B	8761 kg (19316 lbs)

6. Ratings

See Notes 2 and 3.

Models	Sea Level Static Thrust			
	Take-off (5 minutes) - see Note 3 - daN (lbf)	Flat Rating Ambient Temperature °C (°F)	Maximum Continuous daN (lbf)	Flat Rating Ambient Temperature °C (°F)
GE90-76B	36062 (81070)	32.8 (91)	33553 (75430)	25 (77)
GE90-77B	36342 (81700)	32.8 (91)	33553 (75430)	25 (77)
GE90-85B	39531 (88870)	30 (86)	36133 (81230)	25 (77)
GE90-90B	41813 (94000)	30 (86)	40292 (90580)	25 (77)
GE90-94B	43281 (97300)	30 (86)	40292 (90580)	25 (77)
GE90-110B1	49268 (110760)	33 (92)	48930 (110000)	25 (77)
GE90-113B	50501 (113530)	30 (86)	48930 (110000)	25 (77)
GE90-115B	51395 (115540)	30 (86)	48930 (110000)	25 (77)

7. Control System

The engine is equipped with a Full Authority Digital Engine Control (FADEC) system.

Configuration Type Box and FADEC Rating Plug P/N – See Note 5

Models	Configuration Type Box	Models	FADEC Rating Plug
GE90-76B, GE90-77B, GE90-85B, GE90-90B	320-837-701-0	GE90-76B	320-833-701-0
	320-839-501-0	GE90-77B	320-833-901-0
	320-892-101-0	GE90-85B	320-833-801-0
	320-892-201-0		320-834-201-0
	320-846-701-0	GE90-90B	320-834-001-0
	320-892-601-0	GE90-110B1	G01 - 390-801-011-0
	320-915-201-0		G02 - 390-803-001-0
320-921-501-0	G03 - 390-803-011-0		
GE90-94B	320-921-501-0	GE90-113B	G04 - 390-803-021-0
GE90-110B1	390-801-011-0		G01 - 390-802-001-0
	390-803-001-0		G02 - 390-804-001-0



	390-803-011-0 390-803-021-0		G03 - 390-803-011-0 G04 - 390-803-021-0
GE90-113B, GE90-115B	390-850-001-0 390-851-001-0 390-850-002-0 390-851-002-0	GE90-115B	G01 - 390-800-001-0 G02 - 390-805-001-0 G03 - 390-805-011-0 G04 - 390-805-021-0

FADEC Hardware (H/W) and Software (S/W) P/N - See Note 5

Models	H/W and S/W	H/W	S/W
GE90-76B	1838M16	1959M87 1838M16	1853M99
GE90-76B, GE90-77B, GE90-85B, GE90-90B	n/a	1959M87 1838M16	1853M99
GE90-94B	1959M87	1838M16	1853M99
GE90-110B1, GE90-113B, GE90-115B	n/a	1962M67	2041M27

8. Fluids (Fuel, Oil)

Fuel: Refer to FAA TCDS E00049EN.

Oil: Refer to FAA TCDS E00049EN.

9. Aircraft Accessory Drives

Models	Drive Pad	Rotation Facing Gearbox Pad	Gear Ratio to Core Speed	Horse-power Cont. Pad Rating kW (HP)	Shear Torque Nm (in.lb)	Max Overhung Moment Nm (in.lb)
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	IDG (120 KVA)	CCW*	0.7947	181.3 (243)	1130 - 1187 (10000-10500)	226.0 (2000)
	Hydraulic Pump	CCW	0.3783	63.5 (85)	480 - 548 (4250-4850)	26.0 (230)
	VSCF/PMG Generator	CCW	2.4126	43.3 (58)	395 - 508** (3500-4500)	45.2 (400)
GE90-110B1, GE90-113B, GE90-115B	IDG (120 KVA)	CCW*	0.7947	181.3 (243)	1187 max (10500 max)	226.0 (2000)
	Hydraulic Pump	CCW	0.3783	63.5 (85)	480 - 548 (4250-4850)	26.0 (230)
	VSCF/PMG Generator	CCW	2.4126	43.3 (58)	141.2 max (1250 max)	45.2 (400)



All	IDG Overload Limits	226.8 KVA (304 HP) for 5 minutes per 1000 hours of operation 302.9 KVA (406 HP) for 5 seconds per 1000 hours of operation 373.0 KVA (500 HP) electrical fault
	VSCF/PMG Overload limits	64.9 KVA (87 HP) for 5 minutes per 1000 hours of operation 86.5 KVA (116 HP) for 5 seconds per 1000 hours of operation 95.5 KVA (128 HP) electrical fault

* Counter Clockwise

** Shear torque capability is a function of operator requirement. Consult GE for installed capability.

Notes:

"KVA" stands for "1000 Volt Amperes".

100% core speed is 9,332 RPM

10. Maximum Permissible Air Bleed Extraction

		Allowable Bleed Limits (Percent)			
		Stage 4	Stage 7	Stage 10	Total
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	Below 23% N1K	7.8	1.8	13.6	15.4
	23% to 31% N1K	7.6	1.6	12.8	14.4
	31% to 57.4% N1K	7.4	1.3	12.6	13.9
	57.4% to 80% N1K	7.2	1.3	12.6	13.9
	80% to 96.8% N1K	7.0	1.3	6.5	8.3
	Above 96.8% N1K	6.5	1.3	6.5	7.8
GE90-110B1, GE90-113B, GE90-115B	Below 27% N1K	7.6	1.5	11.2	12.7
	At 51% N1K	7.6	1.5	11.5	13.0
	At 80% N1K	7.6	1.5	12.0	13.5
	At 88% N1K	7.6	1.5	11.0	12.5
	At 93% N1K	7.6	1.5	8.0	9.1
	Above 93% N1K	7.6	1.5	7.3	9.1

"N1K" is defined as $N1/\sqrt{T_{amb}/T_{288K}}$

IV. Operating Limitations

1. Temperature Limits

Models	Maximum Indicated Exhaust Gas Temperature – T49 °C (°F)				
	Take-off (5 minutes) - see Note 3 -	Take-off Maximum Transient ⁽¹⁾	Maximum Continuous	Maximum Starting On Ground	Maximum Starting In Flight
GE90-76B See Note 5	975 (1787)	980 (1795)	925 (1697)	750 (1382)	825 (1517)
GE90-77B, GE90-85B, GE90-90B GE90-94B	1030 (1885)	n/a	1015 (1859)	750 (1382) ⁽²⁾	825 (1517)
GE90-110B1,	1090 (1994)	1095 (2003)	1050 (1922)	750 (1382)	825 (1517)



GE90-113B, GE90-115B					
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EGT is measured at the inlet of the LP Turbine; CTB is Configuration Type Box

⁽¹⁾ Maximum transient for 60 seconds for GE90-76B, and 30 seconds for GE90-110B1, GE90-113B and GE90-115B

⁽²⁾ 40 seconds start EGT exceedance is 825°C (1517°F) for the GE90-94B

Oil Temperatures:

Models	Maximum Oil Temperature °C (°F)	
	Continuous Operation	Transient (15 minutes maximum)
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	124 (255)	135 (275)
GE90-110B1, GE90-113B, GE90-115B	132 (270)	143 (290)

2. Speed Limits

Models	Maximum Permissible Speed rpm (%)			
	Low Pressure Rotor (N1)		High Pressure Spool (N2)	
	Take-off (5 minutes) - see Note 3 -	Maximum Continuous	Take-off (5 minutes) - see Note 3 -	Maximum Continuous
GE90-76B	2465 (109.0)	n/a - see Note 12 -	10705 (114.7)	n/a - see Note 12 -
GE90-77B, GE90-85B, GE90-90B, GE90-94B	2465 (109.0)	2465 (109.0)	10918 (117.0)	10918 (117.0)
GE90-110B1, GE90-113B, GE90-115B	2602 (110.5)	2602 (110.5)	11292 (121.0)	11292 (121.0)

(1) 100% N1 = 2261.5 rpm for GE90-76B, GE90-77B, GE90-85B, GE90-90B and GE90-94B

100% N1 = 2355.0 rpm for GE90-110B1, GE90-113B and GE90-115B

(2) 100% N2 = 9332.0 rpm for all models

3. Torque Limits

Not applicable

4. Pressure Limits

Fuel Pressure Limits at Engine Pump Inlet:

Maximum allowable fuel pressure is 482.6 kPa (70 psig). Minimum allowable fuel pressure under normal operating conditions (fully operational aircraft fuel system) is 34.5 kPa (5.0 psia). At altitudes of 11582 m (38,000 feet) and below, transitory excursions of 15 seconds or less to a minimum fuel



pressure of 20.7 kPa (3.5 psia) are allowable provided the average fuel pressure remains above 27.6 kPa (4.5 psia).

Oil Pressure Limits:

Low Pressure (differential): 69 kPa (10.0 psid).

See also Note 4.

5. Time Limited Dispatch (TLD)

The GE90 series engines are approved for Time Limited Dispatch (TLD).

Criteria pertaining to the dispatch and maintenance requirements for the engine control systems are specified in:

For the GE90-76B, GE90-77B, GE90-85B, GE90-90B and GE90-94B see General Electric Document GEK 103084 and the Airworthiness Limitations Section of the GE90 Engine Manual, which defines the various configurations and maximum operating intervals.

For the GE90-110B1, GE90-113B and GE90-115B the requirements are defined in the Airworthiness Limitations Section of the GE90-100 Engine Manual.

V. Operating and Service Instructions

Manuals	GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	GE90-110B1, GE90-113B, GE90-115B
Engine Installation Manual	GEK 100704	GEK 109995
Engine Operating Instructions	GEK 100703	GEK 109994

Instructions for Continued Airworthiness (ICA)	GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	GE90-110B1, GE90-113B, GE90-115B
Engine Manual *	GEK100700	GEK109993
Illustrated Parts Catalogue	GEK100701-1	GEK110005
Standard Practices Manual	GEK9250	
Service Bulletins (SB)	As published by GE	As published by GE

* The EASA approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the applicable Engine Manual", chapter 5 "Airworthiness Limitations".



VI. Notes

- Note 1:** Dry weight includes basic engine, basic engine accessories and optional equipment as listed in the manufacturer's engine specification.
- Note 2:** Engine ratings are based on calibrated test stand performance under the following conditions:
1. Sea level static, standard pressure (101.3 kPa), 15°C
 2. No customer bleed or customer horsepower extraction
 3. Ideal inlet, 100% ram recovery
 4. Production aircraft flight cowling
 5. Production instrumentation
 6. Fuel lower heating value of 42798 kJ/kg
- Note 3:** The normal 5 minute takeoff time limit may be extended to 10 minutes in the event of one engine inoperative.
- Note 4:** During negative-g operation only, it is permissible to operate below minimum oil pressure (69 kPa, differential pressure (10 psid) indicated) for a maximum of 15 seconds. Refer to Engine Operating Instructions, Section 8.
- Note 5:** Configuration type box and associated hardware and limitations:
- GE90-76B engines with configuration type box number 320-839-501-0 must incorporate the HP/LP turbine hardware and associated changes per GE Service Bulletin 72-169. The FADEC incorporates a 30°C shunt. The corresponding untrimmed T49 are 1005°C (take-off), 1010°C (take-off with 60 second max. transient), and 995°C (max. continuous).
- GE90 engines with configuration type box part numbers 320-892-101-0 or 320-892-201-0 must incorporate the PT25 extended wedge ice shield per GE90 Service Bulletin 77-008 and must incorporate FADEC software P/N 1853M99P06 (version 9.1.9.7 or later), per GE90 Service Bulletin 73-040.
- GE90 models with configuration type box numbers 320-837-701-0, 320-839-501-0, 320-892-101-0, 320-892-201-0, 320-846-701-0, 320-892-601-0, and 320-915-201-0, have a minimum permissible N2 of 6066 RPM for in-flight operation during icing conditions.
- GE 90 models with configuration type box number 320-921-501-0 have a minimum permissible N2 of 6310 RPM for in-flight operation during icing conditions.
- Note 6:** Demonstration of compliance to icing conditions of FAR 33.68 (JAR-E 780) is installation specific to the B777-200LR/300ER and B777 Freighter airplanes for the GE90-110B1/-113B/-115B model engines. Installation of these model engines on different airplane models or types will require a separate evaluation for compliance with icing condition requirements.
- Note 7:** For ground operation in icing conditions, requirements and limitations are specified in the Engine Operating Instructions.
- Note 8:** Life limits established for Engine Critical Parts are published in Chapter 5 of the Engine Manual.



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

Note 10: Demonstration of compliance to thrust response is installation specific to the B777-200LR/300ER and B777 Freighter airplanes for the GE90-110B1/-113B/-115B model engines. Installation of these model engines on different airplane models or types will require a separate evaluation for compliance with thrust response requirements.

Note 11: The GE90 variants incorporate the following general characteristics:

Models	Characteristics
GE90-76B	Basic Model
GE90-77B	Same as GE90-76B except for improved HPT/LPT flowpath and higher take-off thrust rating. Rating plug change.
GE90-85B	Same as GE90-76B except for higher thrust ratings. Rating plug change.
GE90-90B	Same as GE90-77B except for higher thrust ratings. Rating plug change.
GE90-94B	Same as GE90-90B except for improved 3D Aero HPC and higher thrust ratings. Rating plug change.
GE90-110B1	Differs primarily from basic model in Fan, LPC, HPC, HPT and LPT hardware. Higher take-off thrust rating with increased rotor speeds and temperature limitations. Rating plug change.
GE90-113B	Same as GE90-110B1 except for higher thrust ratings. Rating plug change.
GE90-115B	Same as GE90-110B1 except for higher thrust ratings. Rating plug change.

- The GE90-75B model has been deleted from the FAA TC on 24 July 1995.
- The GE90-92B model has been deleted from the FAA TC on 26 June 2000.

Note 12: GE90-76B model : according to the Equivalent Safety Finding in II.3.3, there are no limits for maximum continuous N1 and N2 speeds. For information purpose only : the values demonstrated during the FAR 33.87 (JAR-E 740) test were N1 = 2390 rpm and N2 = 10590 rpm.

Note 13: The engine is approved for use with the following Boeing thrust reverser part number:

Models	Boeing Thrust Reverser P/N
GE90-76B, GE90-77B, GE90-85B, GE90-90B, GE90-94B	315W1000
GE90-110B1, GE90-113B, GE90-115B	315W1298-1 Left Engine Left Hand 315W1298-2 Left Engine Right Hand 315W1298-3 Right Engine Left Hand 315W1298-4 Right Engine Right Hand

Note 14: The loads resulting from a fan blade release at the inner flow path line are specified in the Engine Installation Manual. The loads for a fan blade release at the outer most retention groove have been determined and are available from GE.

Note 15: For approval of repairs of fan blade composite material in the root section of the fan blade up to the inner annulus flow path line, see the Airworthiness Limitations Section of the applicable Engine Manual.



Note 16: The FADEC unit P/N originally defined both hardware and software. The hardware and software are now defined by separate P/Ns. The engine should be equipped with a FADEC defined either by the combined P/N or by the hardware and the software P/Ns.

SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

CS-E	Certification Specifications for Engines
EASA	European Union Aviation Safety Agency
EGT	Exhaust Gas Temperature
ESF	Equivalent Safety Finding
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FADEC	Full Authority Digital Engine Control
GE	General Electric
HPC/HPT	High Pressure Compressor/Turbine
H/W	Hardware
ICAO	International Civil Aviation Organisation
IDG	Integrated Drive Generator
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirements
LPC/LPT	Low Pressure Compressor/Turbine
PMG	Permanent Magnet Generator
P/N	Part Number
SC	Special Condition
S/W	Software
TC	Type Certificate
TCDS	Type Certificate Data Sheet
TLD	Time Limited Dispatch
VSCF	Variable Speed Constant Frequency

II. Type Certificate Holder Record

Not applicable



III. Change Record

Issue	Date	Changes	TC issue
Issue 02	16 March 2004	First TCDS issued by EASA	16 March 2004
Issue 03	15 November 2017	<ul style="list-style-type: none"> ▪ New TCDS template ▪ Addition of ESF “HPT Stage 2 Disk Rotor Integrity Compliance” for the GE90-110B1/-113B/-115B ▪ Update of Environmental Protection Requirements ▪ Miscellaneous updates in line with FAA TCDS E0049EN 	
Issue 04	18 December 2019	<ul style="list-style-type: none"> ▪ Update of Environmental Protection Requirements for GE90-110B1, GE90-113B and GE90-115B to CS-34 Amendment 3 in compliance with ICAO Annex 16 Volume II for NOx levels (CAEP/8) and nvPM mass concentration levels (CAEP/10) – Ref. Major Change Approval 10072095 	
Issue 05	05 March 2023	Record of nvPM emissions compliance with CAEP/11 Standard (EASA Major Change Approval 10081414)	

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