

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM JAPAN CIVIL AVIATION BUREAU TYPE APPROVAL DATA SHEET No. 611	TADS NUMBER 611 REVISION: 4 DATE: July 12, 2024 General Electric MODEL: GE90 Series Engines (GE90-90B, GE90-94B, GE90-115B and GE90-110B1)
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Engines of models described herein conforming with this data sheet, (which is part of Type Approval Number 611) and other approved data on file with the Japan Civil Aviation Bureau, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Japan Civil Aeronautics Law and Regulations, provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other instructions.

TYPE APPROVAL (TA) HOLDER General Electric Company
 GE Aviation
 1 Neumann Way
 Cincinnati, OH45215-6310 U.S.A.

MODEL	GE90-90B	GE90-94B	GE90-115B	GE90-110B1
TYPE	Dual rotor, axial flow, high bypass ratio turbofan. The 10-stage high-pressure compressor is driven by a 2-stage high-pressure turbine. The single stage fan and 3-stage low-pressure compressor are driven by a 6-stage low-pressure turbine.		Dual rotor, axial flow, high bypass ratio turbofan. The 9-stage high-pressure compressor is driven by a 2-stage high-pressure turbine. The single stage fan and 4-stage low-pressure compressor are driven by a 6-stage low-pressure turbine.	
RATINGS				
Maximum continuous at sea Level, static thrust, lb	90,580	--	110,000	--
Takeoff (5 min see NOTE 16) at sea level, static thrust, lb	94,000	97,300	115,540	110,760
Flat rating ambient temperature				
Takeoff	86°F/30°C	--	86°F/30°C	92°F/33°C
Maximum continuous	77°F/25°C	--	77°F/25°C	77°F/25°C
Components (GE P/Ns)				
Hydro-mechanical Control Unit	1693M75 1851M65	1851M65	1962M80	--
Full Authority Digital Engine Control Hardware & Software	---	1959M87	---	---
Hardware(See NOTE 21)	1959M87 1838M16	1838M16	1962M67	--
Software(See NOTE 21)	1853M99	1853M99	2041M27	--
Configuration Type Box	320-839-501-0 320-892-201-0 320-846-701-0 320-892-601-0 320-915-201-0 320-921-501-0	320-921-501-0	390-850-001-0 390-851-001-0 390-850-002-0 390-851-002-0	-- -- -- --

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LEGEND: “—” INDICATES “SAME as preceding model”, “---” NOT APPLICABLE

MODEL(Continued)	GE90-90B	GE90-94B	GE90-115B	GE90-110B1
FADEC Rating Plug	320-834-001-0	320-834-301-0	390-800-001-0 390-805-001-0 390-805-011-0 390-805-021-0	390-801-011-0 390-803-001-0 390-803-011-0 390-803-021-0
Main Fuel Pump	1689M10	--	2042M69	--
IGNITION SYSTEM				
Two ignition units GE P/N	9238M66	--	--	--
Two ignition plugs GE P/N	1754M84	--	--	--
PRINCIPAL DIMENSIONS (in)				
Length (Fan spinner to nozzle center body)	286.9	--	286.67	--
Width (maximum envelope)	152.4	--	148.38	--
Height (maximum envelope)	155.6	--	154.56	--
WEIGHT (DRY)	17,400	--	19,316	--
Includes basic engine, basic engine accessories, and optional equipment as listed in the manufacture's engine specifications.				
CENTER OF GRAVITY LOCATIONS (in)				
(Engine only)				
Station (axial)	227.5±1.5	--	219.2±1.5	--
Waterline	99.9±0.5	--	100.14±0.5	--
Buttline	100.4±0.5	--	100.28±0.5	--
FUEL	See NOTE 7 for approved fuels.			
OIL	Type 2 oils conforming to GE90 specification D50TF1 or the latest revisions are authorized. For approved brand of oils refer to GE90 Service Bulletin 79-001.			

CERTIFICATION BASIS	1. Airworthiness Standards (1) GE90-90B The Civil Aeronautics Regulations Annex 1: "Standards of Strength, Structure and Performance to Ensure the Safety of Aircraft and its Equipment" Part 7, Engines of the TAIKUSEI-SHINSA-YORYO [(JCAB Airworthiness Inspection Manual) established on October 20, 1966 by Ku-Ken No.381], including amendments of Ku-Ki No.1400 dated April 17, 1995. And para 5-9-3-4, Koku-Ku-Ki No.5026 dated April 7, 2011. Note: Above standards to be applied are equivalent to 14 CFR Part 33, including Amendment 33-1 through Amendment 33-15; para 33.71(c)(4), amendment 33-27. (2)GE90-94B The Civil Aeronautics Regulations Annex 1: "Standards of Strength, Structure and Performance to Ensure the Safety of Aircraft and its Equipment" Part 7, Engines of the TAIKUSEI-SHINSA-YORYO [(JCAB Airworthiness Inspection Manual) established on October 20, 1966 by Ku-Ken No.381], including amendments of Ku-Ki No.1400 dated April 17, 1995; Para 5-13A and 5-13B, Ku-Ki No.1348 dated February 28, 2001; Para 5-9-3-4, Koku-Ku-Ki No.5026 dated April 7, 2011. Note: Above standards to be applied are equivalent to 14 CFR Part 33, including Amendment 33-1 through Amendment 33-15; and para 33.77 and 33.78, amendment 33-19; and para 33.71(c)(4), amendment 33-27.
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Certification Basis (continued)	(3)GE90-115B and GE90-110B1 The Civil Aeronautics Regulations Annex 1: “Standards of Strength, Structure and Performance to Ensure the Safety of Aircraft and its Equipment” Part 7, Engines of the TAIKUSEI-SHINSA-YORYO [(JCAB Airworthiness Inspection Manual) established on October 20, 1966 by Ku-Ken No.381], including amendments of Koku-Ku-Ki No.558 dated August 29, 2003. And para 5-9-3-4, Koku-Ku-Ki No.5026 dated April 7, 2011. Note: Above standards to be applied are equivalent to 14 CFR Part 33, including Amendment 33-1 through Amendment 33-20; para 33.71(c)(4), amendment 33-27. 2. Special Condition (all models) Fan Blade Out Engine Test: SC-33-ANE-08-NE 3. Equivalent Level of safety (1) GE90-94B 14 CFR Part 33 Paragraph 33.68(b): No. 8040-ELOS-00-NE-01 (2)GE90-115B and GE90-110B1 14 CFR Part 33 Paragraph 33.27(c)(2)(v): GE90-2015-MT-07-P-1 14 CFR Part 33 Paragraph 33.27(c): GE90-2016-MT-03-P2 4. Exemption (GE90-115B and GE90-110B1) 14 CFR Part 33 Paragraph 33.73(b): No. 7953 5. Environmental requirement GE90-90B and GE90-94B The Civil Aeronautics Regulations Annex 3 Chapter 2 (equivalent to ICAO Annex 16, Volume II, Part III) GE90-115B and GE90-110B1 The Civil Aeronautics Regulations Annex 3 Chapter 2 (equivalent to ICAO Annex 16, Volume II, Part III, Amendment 10, amended on January 1, 2021)
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MODEL	Application date to FAA	FAA Type Certificate Issued/Revised	Application date to JCAB	JCAB Type Approval Issued/Revised
GE90-90B	Aug. 10, 1994	Jul. 02, 1996	Feb. 01, 2002	Jul. 5, 2002
GE90-94B	Mar 05, 1999	Jun. 09, 2000	Feb. 01, 2002	Jul. 5, 2002
GE90-115B	Jun. 27, 2000	Jul. 30, 2003	Feb 28, 2023	Jul 12, 2024
GE90-110B1	Jan. 09, 2002	Jul. 30, 2003	Feb 28, 2023	Jul 12, 2024

IMPORT REQUIREMENT	To be considered eligible for installation on Japan registered aircraft, each engine to be exported to the Japan shall be accompanied by certificate of airworthiness for export or certifying statement, endorsed by the exporting cognizant civil airworthiness authority, which contains the following language: (1) This engine conforms to its JCAB type design (Type Approval No. 611-4) and is in a condition for safe operation. (2) This engine has been subjected by the manufacturer to a final operational check and is in a proper state of airworthiness.
PRODUCTION BASIS	FAA Production Certificate Number 108

NOTES

NOTE 1. **MAXIMUM PERMISSIBLE ENGINE ROTOR SPEEDS****GE90-90B/-94B****GE90-115B/-110B1**

Low pressure rotor (N1)

2,465 RPM
(109.0 percent)*2,602 RPM
(110.5 percent)***

High pressure rotor (N2)

10,918 RPM
(117 percent)**11,292 RPM
(121 percent)**

* 100 percent N1 is 2,261.5 RPM

** 100 percent N2 is 9,332.0 RPM

*** 100 percent N1 is 2,355.0 RPM

NOTE 2. **MAXIMUM PERMISSIBLE TEMPERATURES**
Indicated turbine exhaust gas temperature (T49)**GE90-90/-94B****GE90-115B/-110B1**

Takeoff (5 minute see NOTE 16)

1,885°F (1,030°C)

1,994°F (1,090°C)***

Maximum Continuous

1,859°F (1,015°C)

1,922°F (1,050°C)

Ground starts (manual or auto)

1,382°F (750°C)**

1,382°F (750°C)

Inflight starts (manual or auto)

1,517°F (825°C)

1,517°F (825°C)

**40 seconds start EGT exceedance limit for -94B only

1,517°F (825°C)

***30 seconds maximum transient

2,003°F (1,095°C)

Oil temperature limits

Continuous

255°F (124°C)

270°F (132°C)

Transient

275°F (135°C)

290°F (143°C)

NOTE 3. **FUEL AND OIL PRESSURE LIMITS****FUEL PRESSURE LIMITS AT THE ENGINE PUMP INLET**

Maximum allowable fuel pressure is 70 psig. Minimum allowable fuel pressure under normal operating conditions (fully operational aircraft fuel system) is 5.0 psia. At altitude of 38,000 feet and below, transitory excursions of 15 seconds or less to a minimum fuel pressure of 3.5 psia are allowable provided the average fuel pressure remains above 4.5 psia.

OIL PRESSURE LIMITS**LOW PRESSURE**

The limit is 10.0 psid (69 kPa diff.). (See NOTE 14)

NOTE 4. **ACCESSORY DRIVE PROVISIONS****GE90-90B/-94B**

DRIVE PAD	Rotation Facing Gearbox Pad	Gear Ratio To Core Speed	Horsepower Continuous Pad Rating HP (kW)	Shear Torque in-lb (N-m)	Maximum Overhung Moment in-lb (N-m)
IDG (120 kVA)	CCW (*)	0.7947	243 (181.3)	10,000 – 10,500 (1,130 – 1,187)	2,000 (226.0)
Hydraulic Pump	CCW	0.3783	85 (63.5)	4,250 – 4,850 (480 - 548)	230 (26.0)
VSCF/PMG Generator (20/30 kVA)	CCW	2.4126	58 (43.3)	3,500 – 4,500** (395 - 508)**	400 (45.2)
IDG Overload Limits		304 HP (226.8 kVA) for 5 minutes per 1,000 hours of operation 406 HP (302.9 kVA) for 5 seconds per 1,000 hours of operation 500 HP (373.0 kVA) electrical fault			
VSCF/PMG Overload limits		87 HP (64.9 kVA) for 5 minutes per 1,000 hours of operation 116 HP (86.5 kVA) for 5 seconds per 1,000 hours of operation 128 HP (95.5 kVA) electrical fault			
		(*) Counter Clockwise (**) Shear torque capability is a function of operator requirement. Consult GE Aviation for installed capability. 100 percent core speed is 9,332 RPM			

NOTE 4. ACCESSORY DRIVE PROVISIONS (continued)

GE90-115B/-110B1

DRIVE PAD	Rotation Facing Gearbox Pad	Gear Ratio To Core Speed	Horsepower Continuous Pad Rating HP (kW)	Shear Torque in-lb (N-m)	Maximum Overhung Moment in-lb (N-m)
IDG (120 kVA)	CCW (*)	0.7947	243 (181.3)	10,500 max (1,187 max)	2,000 (226.0)
Hydraulic Pump	CCW	0.3783	85 (63.5)	4,250 – 4,850 (480 - 548)	230 (26.0)
VSCF/PMG Generator (20/30 kVA)	CCW	2.4126	58 (43.3)	1,250 max (141.2 max)	400 (45.2)
IDG Overload Limits	304 HP (226.8 kVA) for 5 minutes per 1,000 hours of operation 406 HP (302.9 kVA) for 5 seconds per 1,000 hours of operation 500 HP (373.0 kVA) electrical fault				
VSCF/PMG Overload limits	87 HP (64.9 kVA) for 5 minutes per 1,000 hours of operation 116 HP (86.5 kVA) for 5 seconds per 1,000 hours of operation 128 HP (95.5 kVA) electrical fault				
		(*) Counter Clockwise 100 percent core speed is 9,332 RPM			

NOTE 5. Engine ratings are based on calibrated test stand performance under the following conditions:

1. Sea level static, standard pressure(14.696 psia), 59°F
2. No customer bleed or customer horsepower extraction
3. Ideal inlet, 100% ram recovery
4. Production aircraft flight cowlings
5. Production instrumentation
6. Fuel lower heating value of 18,400 BTU#

NOTE 6. **MAXIMUM PERMISSIBLE AIR BLEED EXTRACTION**

Allowable Bleed Limits (Percent)

GE90-90B/-94B	Stage 4	Stage 7	Stage 10	Maximum Allowable
Below 23 Percent N1K	7.8	1.8	13.6	15.4
23 to 31 Percent N1K	7.6	1.6	12.8	14.4
31 to 57.4 Percent N1K	7.4	1.3	12.6	13.9
57.4 to 80 Percent N1K	7.2	1.3	12.6	13.9
80 to 96.8 Percent N1K	7.0	1.3	6.5	8.3
Above 96.8 Percent N1K	6.5	1.3	6.5	7.8

GE90-115B/-110B1	Stage 4	Stage 7	Stage 9	Maximum Allowable
Below 27 Percent N1K	7.6	1.5	11.2	12.7
At 51 Percent N1K	7.6	1.5	11.5	13.0
At 80 Percent N1K	7.6	1.5	12.0	13.5
At 88 Percent N1K	7.6	1.5	11.0	12.5
At 93 Percent N1K	7.6	1.5	8.0	9.1
Above 93 Percent N1K	7.6	1.5	7.3	9.1

NOTE 7. **Fuel**

Approved fuels must conform to GE Specification D50TF2. Certain fuels such as those produced to PRC Specification RP3 meet the requirements of D50TF2 by means of the Specification. The engine will operate with a mixture of fuels or additives conforming to GE Specification D50TF2.

NOTE 8. Life limits established for critical rotating components for:

GE90-90B/-94B are published in Chapter 5 of the GE90 Engine Manual, GEK 100700.

GE90-115B-110B1 are published in Chapter 5 of the GE90-100 Engine Manual, GEK 109993.

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

NOTE 10. Not Applicable

NOTE 11. For ground operation in icing conditions the following procedures must be observed.

GE90-90B/-94B

During ground operations (including taxi-in and taxi-out) in icing conditions, the pilot must perform one of the following shed procedures:

- (a) Run up the engines momentarily to a minimum of 50% N1 at intervals not to exceed 15 minutes, or
- (b) For operation at ambient conditions of -6°C(-23°F) and above, and at airport altitude up to 3,048 meters (10,000 ft), perform the following at intervals not to exceed 60 minutes:
 - 1) Increase throttle to a minimum of 55% N1
 - 2) Dwell at the specified N1 for 20 seconds minimum
 - 3) Decelerate to idle or proceed with normal takeoff procedure.

See GE90 Operating Instructions Manual GEK 100703.

GE90-115B/-110B1

During ground operations (including taxi-in and taxi-out) in icing conditions, the engine must be run up momentarily to a minimum of 50% N1 at intervals not to exceed 60 minutes. See GE90-100 Operating Instructions Manual GEK 109994.

Note: For possible variations in engine acceleration times in icing conditions see the GE90-100 Installation Manual GEK 109995.

NOTE 12. All 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.

All GE90 engines with configuration type box part 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 6,066 RPM for in-flight operation during icing conditions.

All GE90 engines with configuration type box part number 320-921-501-0 have a minimum permissible N2 of 6,310 RPM for in-flight operation during icing conditions.

All GE90 engines with configuration type box part numbers 390-850-001-0 and 390-851-001-0 have a minimum permissible N1 of 730 RPM for in-flight operation during icing conditions

NOTE 13. Demonstration of compliance to §33.68, Induction System Icing is installation specific to the B777-200LR/300ER and B777 Freighter airplane for the GE90-115B/-110B1 model engines. Installation of these model engines on different airplane models or types will require a separate evaluation and finding of compliance to §33.68.

NOTE 14. During "negative-G" operation only, it is permissible to operate below minimum oil pressure of 10 psid (69.0 kPa diff) for a maximum of 15 seconds.

See GE90 Operating Instructions Manual, GEK 100703, for GE90-90B/-94B

See GE90-100 Operating Instructions Manual, GEK 109994, for GE90-115B/-110B1.

NOTE 15. THESE MODELS INCORPORATE THE FOLLOWING GENERAL CHARACTERISTICS

ENGINE MODEL

GE90-76B

GE90-77B

GE90-85B

GE90-90B

GE90-94B

CHARACTERISTICS

Basic Model

Same as GE90-76B except improved HPT/LPT flowpath and higher thrust ratings. Corresponding Rating Plug changes.

Same as GE90-76B except higher thrust ratings. Corresponding Rating Plug changes.

Same as GE90-77B except higher thrust ratings. Corresponding Rating Plug changes.

Same as GE90-90B except 3D aero HPC and higher thrust ratings. Corresponding rating plug changes.

NOTE 15. THESE MODELS INCORPORATE THE FOLLOWING GENERAL CHARACTERISTICS (continued)

GE90-110B1	Differs primarily from basic model in FAN, LPC, HPC, HPT and LPT hardware, higher takeoff thrust rating with increased speed, and temperature limitations. Corresponding rating plug changes. See NOTE 22.
GE90-113B	Same as GE90-110B1 except higher thrust ratings. Corresponding rating plug changes.
GE90-115B	Same as GE90-113B1 except higher thrust ratings. Corresponding rating plug changes.

NOTE 16. The normal 5-minute takeoff time limit may be extended to 10 minutes for engine out contingency.

NOTE 17. TIME LIMITED DISPATCH CRITERIA

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

For the GE90-90B/-94B see General Electric Document GEK 103084 and the Airworthiness Limitation Section of the GE90 Engine Manual, GEK 100700, which defines the various configurations and maximum operating intervals.

For the GE90-115B/-110B1 the requirements are defined in the Airworthiness Limitations Section of the GE90-100 Engine Manual GEK 109993.

NOTE 18. For approval of repair of fan blade composite material in the root section of the fan blade up to the inner annulus flow path line see the Airworthiness Limitation Section of GE90 Engine Manual GEK100700 for the GE90-90B/-94B and GE90-100 Engine Manual GEK 109993 for the GE90-110B1/-115B.

NOTE 19. Deleted

NOTE 20. Reserved

NOTE 21. 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.

NOTE 22. An exemption to §21.19(a) was granted and issued in Washington, DC, on August 26, 2002, for the GE90-115B/-110B1 engine models. This exemption allowed GEAE to amend Type Certificate No.E00049EN to add these models rather than apply for a new type certificate for those engines, subject to the following conditions and limitations:

1. GEAE must comply with §21.17 as if it was a new type certificate.
2. GEAE must conduct a large flocking bird test as part of compliance with §33.76, Bird Ingestion.
3. GEAE must include an engine test to demonstrate compliance to §33.90, Initial Maintenance Inspection.
4. An applicant installing the GE90-115B/-110B1 engine models into aircraft must comply with all of the applicable airworthiness standards for a new type certificated engine, including applicable aircraft special conditions.

NOTE 23. Demonstration of compliance to §33.73(b), Power or Thrust Response is installation specific to the B777-200LR/300ER and B777 Freighter airplanes for the GE90-115B/-110B1 model engines. Installation of these model engines on different airplane models or type well require a separate evaluation and finding of compliance to §33.73(b).

NOTE 24. The engine oil tank filler cap of GE90-90B/-94B and GE90-110B1/-115B engine model meet the requirement of §33.71(c)(4)

NOTE 25. The Civil Aeronautics Regulations Annex 3 Chapter 1 and Chapter 2 have been complied with for GE90-94B.

Fuel Venting Emissions Standards: Chapter 1.
Smoke Number(SN) Emissions Standards: Chapter 2-1-1.
Carbon Monoxide(CO) Emissions Standards: Chapter 2-1-2-1.
Hydrocarbons(HC) Emissions Standards: Chapter 2-1-2-1.
Oxides of Nitrogen(NOx) Emissions Standards: Chapter 2-1-2-2.

The engine manufacturer has declared that the ICAO emissions standards identified in Annex 16, Volume II, Third Edition, Part III, Chapter 2, Section 2.2.2 for SN, Section 2.3.2 for CO and HC, Section 2.3.2.d.3 for NOx (also known as CAEP/6), and Part II Chapter 2 for fuel venting have also been demonstrated.

For the environmental requirement of aircraft, the standard of Annex 3 Chapter 1 (Standards for the fuel venting from aircraft engines) is applied.

If the engine itself is designed to prevent fuel venting, it will be recognized in the aircraft evaluation.

The Civil Aeronautics Regulations Annex 3 Chapter 1 and Chapter 2 have been complied with for GE90-110B1 and GE90-115B.

Fuel Venting Emissions Standards: Chapter 1.
Smoke Number(SN) Emissions Standards: Chapter 2-1-1.
Carbon Monoxide(CO) Emissions Standards: Chapter 2-1-2-1.
Hydrocarbons(HC) Emissions Standards: Chapter 2-1-2-1.
Oxides of Nitrogen(NOx) Emissions Standards: Chapter 2-1-2-2.
non-volatile Particulate Matter (nvPM) Mass Concentration Emission Standards: Chapter 2-1-2-3.
nvPM Mass and Number Emission Standards: Chapter 2-1-2-3.

The engine manufacturer has declared that the ICAO emissions standards identified in Annex 16, Volume II, Fourth Edition, Amendment 10, effective July 20, 2020, have also been demonstrated for the following:

- Part II, Chapter 2 for Fuel Venting
- Part III, Chapter 2, Section 2.2.2 for Smoke number,
- Part III, Chapter 2, Section 2.3.2 for Carbon monoxide and Hydrocarbons,
- Part III, Chapter 2, Section 2.3.2.d for Oxides of Nitrogen (also known as CAEP/6),
- Part III, Chapter 4, Section 4.2.2.1 for nvPM Mass Concentration (also known as CAEP/10), and
- Part III, Chapter 4, Section 4.2.2.2 for nvPM Mass and Number (also known as CAEP/11)

For the environmental requirement of aircraft, the standard of Annex 3 Chapter 1 (Standards for the fuel venting from aircraft engines) is applied.

If the engine itself is designed to prevent fuel venting, it will be recognized in the aircraft evaluation.

NOTE J1. This Type Approval Data Sheet (TADS) is based on FAA TCDS No. E00049EN Rev.21 dated 11 June, 2024.

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