

| I. MODELS (cont.) | GENx-1B54 | GENx-1B58 | GENx-1B64 | GENx-1B67 | GENx-1B70 | GENx-2B67 |
|--|------------------|------------|------------|------------|------------|------------------|
| COMPONENTS (GE P/Ns) | | | | | | |
| Fuel Metering Unit | 2122M20 | -- | -- | -- | -- | -- |
| Full Authority Digital Engine Control (FADEC) Hardware | 2121M82 | -- | -- | -- | -- | 2124M70 |
| FADEC Software | 2124M23 | -- | -- | -- | -- | 2124M22 |
| Configuration Box | 2121M99 | -- | -- | -- | -- | -- |
| FADEC Rating Plug | 2125M31P62 | 2125M31P08 | 2125M31P68 | 2125M31P20 | 2125M31P74 | 2125M31P20 |
| Fuel Pump | 2122M22 | -- | -- | -- | -- | -- |
| IGNITION SYSTEM | | | | | | |
| Two ignition exciters GE P/N | 2121M94 | -- | -- | -- | -- | 2139M52 |
| Two igniter plugs GE P/N | 1754M84 | -- | -- | -- | -- | -- |
| PRINCIPAL DIMENSIONS (in) | | | | | | |
| Length (Fan spinner to nozzle centerbody) | 194.9 in | -- | -- | -- | -- | 176 in |
| Width (maximum envelope) | 139.1 in | -- | -- | -- | -- | 126 in |
| Height (maximum envelope) | 137.2 in | -- | -- | -- | -- | 127 in |
| WEIGHT (DRY) | | | | | | |
| Includes basic engine, basic engine accessories, and optional equipment as listed in the manufacturer's engine specifications. | 13,505 lbs | -- | -- | -- | -- | 12,222 lbs |
| CENTER OF GRAVITY LOCATIONS (in) | | | | | | |
| (Engine only) | | | | | | |
| Station (axial) | 217.03 ± 0.5 in. | -- | -- | -- | -- | 217.74 ± 2.0 in. |
| Waterline | 99.87 ± 0.5 in. | -- | -- | -- | -- | 98.43 ± 0.5 in. |
| Buttline | 100.70 ± 0.5 in. | -- | -- | -- | -- | 99.87 ± 0.5 in. |

| | |
|-------------------|---|
| I. MODELS (cont.) | ALL |
| FUEL | See NOTE 7 for approved fuels. |
| OIL | Refer to GENx-1B Service Bulletin 79-0001 and GENx-2B Service Bulletin 79-0001 and its latest revision for detailed information pertaining to Type 2 oils. This Service Bulletin covers the approved oils conforming to General Electric Specification D50TF1 or the latest revisions are authorized. |

CERTIFICATION BASIS

GENx-1B54, -1B58, -1B64, -1B67, and -1B70 • 14 CFR Part 33, effective February 1, 1965, as amended by 33-1 through 33-21 and amendment 33-23 section 33.76.

- Fuel Venting and Exhaust Emissions Standards, 14 CFR Part 34, effective September 10, 1990, as amended by 34-1 through 34-4.
- GENx-1B Fan Blade Special Condition (33-006-SC)
- Equivalent Level of Safety (ELOS) Findings:
 - o ELOS No. 8040-ELOS-08-NE02 to 14 CFR §33.87(a) & (b)
 - Applicable to engines with high pressure turbine stage 1 blade part number 2305M26P03 and/or combustor fuel nozzle part numbers 2255M88P09, 2255M88P10, and 2256M66P10.
 - o ELOS No. 8040-ELOS-08-NE03 to 14 CFR §33.27(c)
 - o ELOS No. 8040-ELOS-08-NE04 to 14 CFR §33.90
 - Applicable to engines with combustor chamber part numbers 2257M40G03/G04.
 - o ELOS No. 8040-ELOS-08-NE05 to 14 CFR §33.77
 - o ELOS No. 8040-ELOS-10-NE03 to 14 CFR §33.68(a)

GENx-2B67

- 14 CFR Part 33, effective February 1, 1965, as amended by 33-1 through 33-21, and amendment 33-23 section 33.76.
- Fuel Venting and Exhaust Emissions Standards, 14 CFR Part 34, effective September 10, 1990, as amended by 34-1 through 34-4.
- GENx-2B Fan Blade Special Condition (33-007-SC)
- Equivalent Level of Safety (ELOS) Findings:
 - o ELOS No. 8040-ELOS-09-NE01 to 14 CFR §33.27 (c)
 - o ELOS No. 8040-ELOS-09-NE02 to 14 CFR §33.77 (c) and (e)
 - o ELOS No. 8040-ELOS-10-NE02 to 14 CFR §33.78

TYPE CERTIFICATE E00078NE

| MODELS | APPLICATION DATE | ISSUE/AMMENDED |
|-----------|------------------|----------------|
| GENx-1B54 | Dec. 13, 2004 | March 31, 2008 |
| GENx-1B58 | May 24, 2005 | March 31, 2008 |
| GENx-1B64 | Dec. 13, 2004 | March 31, 2008 |
| GENx-1B67 | May 24, 2005 | March 31, 2008 |
| GENx-1B70 | Dec. 13, 2004 | March 31, 2008 |
| GENx-2B67 | Feb. 28, 2006 | July 22, 2010 |

PRODUCTION BASIS

Production Certificate No. 108

| |
|--------------|
| NOTES |
|--------------|

NOTE 1.

MAXIMUM PERMISSIBLE ENGINE ROTOR SPEEDS

| | | |
|---------------------------------------|---------------------------------------|------------|
| | GEnx-1B54, -1B58, -1B64, -1B67, -1B70 | |
| Low pressure rotor (N1) | | 2,726 RPM |
| High pressure rotor (N2) | | 13,425 RPM |
| * Note: 100 percent N1 is 2,560 RPM | | |
| ** Note: 100 percent N2 is 11,377 RPM | | |

| | | |
|---------------------------------------|-----------|------------|
| | GEnx-2B67 | |
| Low pressure rotor (N1) | | 3,026 RPM |
| High pressure rotor (N2) | | 13,425 RPM |
| * Note: 100 percent N1 is 2,835 RPM | | |
| ** Note: 100 percent N2 is 11,377 RPM | | |

NOTE 2.

MAXIMUM PERMISSIBLE TEMPERATURES

| | | |
|--|--|---|
| Indicated turbine exhaust gas temperature (T49) | | GEnx-1B54, -1B58, -1B64, -1B67, -1B70 (see NOTE 5) |
| Takeoff 5 minutes (see NOTE 1) | | 1,895°F (1,035°C) |
| 30 seconds Maximum Transient | | 1,904°F (1,040°C) |
| Maximum Continuous | | 1,841°F (1,005°C) |
| | | |
| Ground starts (manual or auto) | | 1,379°F (750°C) |
| Inflight starts (manual or auto) | | 1,607°F (875°C) |
| | | |
| Oil temperature limits | | |
| Continuous | | 320°F (160°C) |
| Transient (15 minutes) | | 350°F (177°C) |
| | | |
| Indicated turbine exhaust gas temperature (T49) | | GEnx-2B67 (see NOTE 5) |
| Takeoff 5 minute (see NOTE 1) | | 1,940°F (1,060°C) |
| 30 seconds Maximum Transient | | 1,949°F (1,065°C) |
| Maximum Continuous | | 1,886°F (1,030°C) |
| | | |
| Ground starts (manual or auto) | | 1,379°F (750°C) |
| Inflight starts (manual or auto) | | 1,607°F (875°C) |
| | | |
| Oil temperature limits | | |
| Continuous | | 320°F (160°C) |
| Transient (15 minutes) | | 350°F (177°C) |

NOTE 3.

FUEL AND OIL PRESSURE LIMITS

FUEL PRESSURE LIMITS AT THE ENGINE PUMP INLET

The limit is from minimum fuel pressures of not less than true vapor pressure plus 5.0 psi to a maximum of 70 psig.

For the GEnx-1B, on the 787 aircraft, the minimum fuel pressure limit is extended down to minimum fuel pressure of 3.5 psia and maximum vapor-to-liquid ratio (v/l) of 0.45 for up to 60 minutes followed by up to 600 minutes with minimum fuel pressure of 3.5 psia and a maximum vapor-to-liquid ratio (v/l) of 0.28.

OIL PRESSURE LIMITS

See Figure 8-1 of GEnx-1B Operating Instructions GEK 112857 and GEnx-2B Operating Instructions GEK 114113 for definition of minimum and maximum oil pressures.

NOTE 4.

GEnx ACCESSORY DRIVE CHARACTERISTICS

GEnx-1B54, -1B58, -1B64, -1B67, &-1B70

| Accessory | Defined By | Rotation (Facing Gearbox Pad) | Gear Ratio To Core Rotor | Drive Shaft (RPM) | Maximum Weight LB (KG) | Maximum Overhung Moment IN-LB (N-m) | Shear Torque IN-LB (N-m) | Continuous Pad Rating HP In flight Dual Engine | Overload [HP] |
|----------------|-------------------------------|-------------------------------|--------------------------|-------------------|------------------------|-------------------------------------|-----------------------------|--|---------------|
| VFSG 1 | ICNR - GE-BE059 | CCW | 1.1331 | 12,891.30 | 234.4 (106.3) WET | 1,718 (194.4) | 19,596-20,220 (2,214-2,285) | 692 (total for both VFSG's) | See Comment A |
| VFSG 2 | ICNR-GE-BE060 | CCW | 1.1331 | 12,891.30 | 234.4 (106.3) WET | 1,718 (194.4) | 19,596-20,220 (2,214-2,285) | 692 (total for both VFSG's) | See Comment A |
| Hydraulic Pump | ICNR-GE-BE057 | CCW | 0.4438 | 5,049.10 | 30.3 (13.74) WET | 140 (15.81) WET | 2,625-3,715 (297-420) | See Comment B | 85 [5 sec] |
| Core Turn | 0.5 Square Drive/ Dwg-2305M71 | CCW | 0.6773 | 7,705.60 | N. A. | N. A. | N. A. | N. A. | N. A. |

Comments:

- A. 1,021 HP fault: for 1 second, occurring 0.001 times per operating hour. [single Engine]
869 HP fault for 1 second, occurring 4 times per operating hour. [dual Engine]
- B. 1,150 lbs-inch constant torque to a max of 60 HP for the gearbox design.

NOTE 4. (cont.)

GEnx ACCESSORY DRIVE CHARACTERISTICS (continued)

GEnx-2B67

| ACCESSORY | DEFINED BY | ROTATION (NOTE A) | GEAR RATIO TO CORE ROTOR | DRIVE SHAFT (RPM) | STATIC WEIGHT LB | MAXIMUM OVERHUNG MOMENT IN-LB | SHEAR TORQUE | TORQUE |
|---------------------|-----------------------------------|-------------------|--------------------------|----------------------------------|-------------------|-------------------------------|------------------|---|
| IDG | 747-8 Boeing engine specification | CCW | 0.6933 | 4600 to 9198 | IDG 126.8 QAD 5.6 | 900 | 9000 ± 400 in-lb | (in-lb) 2245 - CONTINUOUS 3575 -TRANSIENT 5250 - MOMENTARY |
| HYDRAULIC PUMP | 747-8 Boeing engine specification | CCW | 0.4438 | 1850 to 3900 | 33 DRY | 140 WET | 3950 ± 300 in-lb | (in-lb) 1103 - CONTINUOUS 1241 - TRANSIENT 1310 - FAILURE |
| AIR TURBINE STARTER | M50TF4062 | CCW | 1.1331 | 58.4 % N2 (5863 RPM) MAX CUT OUT | 49.38 | 300 | 1685 ft-lb | (ft-lb) Cold Day APU Start 617 XBL Start 820 |
| CORE TURN | 0.5 SQUARE DRIVE | CCW | 0.6773 | 7705.6 | N.A. | N.A. | N.A. | N.A. |

NOTES:

- A. Rotation is defined facing the pad.
- B. 100 percent engine core speed is 11,377 rpm.
- C. IDG online speed: 4,600 rpm. Load is removed when input remains 4,450 RPM or less for 150 + 50 ms.

NOTE 5.

ENGINE RATINGS

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 cowling
5. Production instrumentation
6. Fuel lower heating value of 18,400 BTU/lb.

NOTE 6.

MAXIMUM PERMISSABLE BLEED AIR EXTRACTION

GEnx-1B54/1B58/1B64/1B67/1B70 (applicable to engines not equipped with booster anti-ice system)

| | |
|-------------------|-----------------------|
| | Stage 7 - Percent W25 |
| Any Power Setting | 3.3% |

NOTE 6. (cont.) MAXIMUM PERMISSABLE BLEED AIR EXTRACTION (continued)

GENx-1B54/1B58/1B64/1B67/1B70 (applicable to engines equipped with booster anti-ice system)

| Percent Corrected Fan Speed (N1K) | Stage 7 - Percent W25 |
|-----------------------------------|-----------------------|
| 0 to 31.3 | 5.0% |
| 31.3 to 66.4 | 4.7% |
| > 66.4 | 3.3% |

NOTES:

A. 100 percent engine fan speed is 2,560 rpm.

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| %N1K | CDP Bleed Percent W25 | | %N1K | S4 Bleed Percent W25 |
|-------|--------------------------|-----------|-------|-------------------------|
| | T2 > 67F | T2 < 67 F | | |
| | | | 0 | 7.50% |
| 0 | 13 | 13 | 15.9 | 7.50% |
| 81.1 | 13 | 13 | 21.2 | 7.85% |
| 81.1 | 8 | 10 | 75.8 | 7.85% |
| 88.2 | 8 | 10 | 75.8 | 7.65% |
| 88.2 | 8 | 8.5 | 81.1 | 7.65% |
| 91.7 | 8 | 8.5 | 84.7 | 7.85% |
| 91.7 | 8 | 8 | 91.7 | 7.85% |
| 120.0 | 8 | 8 | 108.6 | 6.00% |
| | | | 108.6 | 5.00% |
| | | | 120.0 | 5.00% |

NOTES:

A. 100 percent engine fan speed is 2,815 rpm.

NOTE 7. FUEL

Refer to GENx-1B Service Bulletin 73-0001 and GENx-2B Service Bulletin 73-0001 for detailed information pertaining to fuels and additives. This Service bulletin covers the eligible fuels listed per GE Aviation Specification D50TF2. Eligible fuel classifications are:

Class A – Aviation Kerosene
 Class C – Low Freeze Kerosene
 Class D – High Flash Kerosene
 Class E – Low Flash Kerosene

NOTE: Class B – (Jet B, JP4) is prohibited

NOTE 8. LIFE LIMITS

Life limits established for critical rotating components for GENx-1B54/1B58/1B64/1B67/1B70 are published in Chapter 5 of the GENx Engine Manual, GEK 112851. For the GENx-2B67 life limits are published in Chapter 5 of the GENx Engine Manual GEK 114119.

The GENx-1B and GENx-2B cyclic life limits are based on a commercial mission cycle, which consists of a start, takeoff, climb, cruise, descent, and landing. Use (or non-use) of a fan reverser for braking during landing does not affect cycle counts. Each of the following constitutes one cycle:

- (1) a flight consisting of a takeoff and landing,
- (2) a touch-and-go landing or simulated touch-and-go landing (no weight on wheels) for pilot training,

- NOTE 9. THRUST SETTING PARAMETER
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. ICING CONDITIONS
For ground operation in icing conditions, requirements, limitations, and notes are specified in GENx-1B54/1B58/1B64/1B67/1B70 Operating Instructions Manual GEK 112857 and GENx-2B67 Operating Instructions GEK 114113.
- NOTE 11 NEGATIVE-G OPERATION
During "negative-G" operation only, it is permissible to operate below minimum oil pressure for a maximum of 15 seconds. See GENx Operating Instructions, GEK 112857, Section 8, for GENx-1B54/1B58/1B64/1B67/1B70 definition of minimum oil pressure. See GENx Operating Instructions, GEK 114113, Section 8, for GENx-2B67 definition of minimum oil pressure.
- NOTE 12. TAKEOFF TIME LIMIT
The normal 5-minute takeoff time limit may be extended to 10 minutes for engine out contingency.
- NOTE 13. TIME LIMITED DISPATCH CRITERIA
Criteria pertaining to the dispatch and maintenance requirements for the engine control systems are specified in:

For the GENx-1B54/1B58/1B64/1B67/1B70 engine models: General Electric Document GEK 112858 and the Airworthiness Limitations Section of the GENx Engine Manual, GEK 112851, which defines the various configurations and maximum operating intervals.

For the GENx-2B67 engine models: General Electric Document GEK 114112 and the Airworthiness Limitations Section of the GENx Engine Manual, GEK 114119, which defines the various configurations and maximum operating intervals.
- NOTE 14 Deleted.
- NOTE 15. FAN BLADE REPAIR
Approval of repairs of the fan blade composite material in the root section of the fan blade up to the inner annulus flow path line must be coordinated with the FAA Engine Certification Office. Substantiation of the repairs must show that compliance to GENx-1B Special Condition No. 33-006-SC or GENx-2B Special Condition No. 33-007-SC is maintained.
- NOTE 16. EMISSIONS
The following engine models manufactured after December 31, 2007 comply with 14 CFR Part 34, effective September 10, 1990, as amended by 34-1 through 34-4.

GENx-1B54, -1B58, -1B64, -1B67, and -1B70
GENx-2B67

Additionally, the engine manufacturer has declared that the ICAO emissions standards of Annex 16, Volume II, Third Edition, (also known as CAEP/6) have been demonstrated. This has not been verified by the FAA. The FAA finds compliance to the Code of Federal Regulations (CFR) and not ICAO standards. See the Certification Basis section of this TCDS for the emissions compliance statement.
- NOTE 17. INDUCTION SYSTEM ICING
Demonstration of compliance to 14 CFR Part 33 Section 33.68, Induction System Icing, is installation specific to the Boeing B787-3, -8, and -9 model(s) aircraft for the GENx-1B54/1B58/1B64/1B67/1B70 engine models and B747-8 for the GENx-2B67 engine models. Installation of these engine models on different airplane models or type will require a separate evaluation and finding of compliance to Section 33.68.

NOTE 18. BIRD INGESTION CAPABILITY

GE successfully conducted a 5.5-pound bird ingestion test that demonstrated additional bird ingestion capability for the GEnx-1B54/1B58/1B64/1B67/1B70 and GEnx-2B67.

NOTE 19. AIRCRAFT MODELS

The GEnx-1B54/1B58/1B64/1B67/1B70 engine models are limited to installation on the Boeing B787-3, -8, and -9 model(s) aircraft only with respect to the installed power response characteristics. The GEnx-2B67 engine model is limited to installation on the Boeing B747-8 model aircraft only with respect to the installed power response characteristics. Any bill-of-material changes that could significantly and adversely affect power response will have to be reassessed.

NOTE 20. COMMERCIAL ENGINES IN MILITARY SERVICE

FAA-certified commercial engines in military service are not necessarily operated or maintained in accordance with the type design certification basis or Federal Aviation Regulations contained in CFR Title 14. Commercial-service use of GEnx series engines or engine parts thereof that have operated in military applications is prohibited unless specific prior FAA (Engine Certification Office, ANE-140) approval is granted.