

T00021SE  
Revision 14  
BOEING  
787-8  
787-9  
October 03, 2014

**TYPE CERTIFICATE DATA SHEET T00021SE**

This data sheet, which is part of Type Certificate No. T00021SE, prescribes conditions and limitations under which the product for which the type certificate was issued meets the airworthiness requirements of the Federal Aviation Regulations.

Type Certificate Holder:     The Boeing Company  
  1901 Oakesdale Avenue SW  
  Renton, WA 98057-2623

**I - 787-8, Transport Category, Approved August 26, 2011**

Engines:                         2 Rolls-Royce plc Turbofan Engines; Models: Trent 1000-A, Trent 1000-A2, Trent 1000-C, Trent 1000-C2, Trent 1000-D, Trent 1000-D2, Trent 1000-E, Trent 1000-G, Trent 1000-G2, Trent 1000-H, or Trent 1000-H2 (Engine Type Certificate No. E00076EN)  
  2 General Electric Turbofan Engines; Models: GEnx-1B64, GEnx-1B64/P1, GEnx-1B64/P2, GEnx-1B67, GEnx-1B67/P1, GEnx-1B67/P2, GEnx-1B70, GEnx-1B70/P1, GEnx-1B70/P2, GEnx-1B70/75/P1 or GEnx-1B70/75/P2  
  (Engine Type Certificate No. E00078NE)

Authorization for engine intermix is contained in the appropriate FAA approved Airplane Flight Manual

Fuel:                             Rolls-Royce plc Turbofan Engines:  
  Fuels conforming to:  
  ASTM D-1655 grades Jet-A and Jet A-1  
  MIL-DTL-5624 grade JP-5  
  MIL-DTL-83133 grade JP-8  
  GOST 10227-86 grade TS-1  
  are acceptable. Fuels produced to other specifications and having properties meeting the requirements of the above specifications are acceptable. The fuel and any fuel additives must conform to the relevant Engine Operating Instructions.

General Electric Turbofan Engines (also, see Note 9):  
Fuels conforming to:  
ASTM D-1655 grades Jet-A and Jet A-1  
MIL-DTL-5624 grade JP-5  
MIL-DTL-83133 grade JP-8  
GOST 10227-86 grade TS-1  
are acceptable. Fuels produced to other specifications and having properties meeting the requirements of the above specifications are acceptable. The fuel and any fuel additives must conform to the relevant Engine Operating Instructions.

Engine Limits:

Static thrust lb, standard day, sea level

	Takeoff (see Note 10 for operating limits)	Maximum continuous
RR Trent 1000-A (See Note 7 for ICAO env comp) (see Note 11 for Applicability)	69,194	64,722
RR Trent 1000-C (See Note 7 for ICAO env comp) (see Note 12 for Applicability)	74,511	69,523
RR Trent 1000-D (See Note 7 for ICAO env comp) (see Note 12 for Applicability)	74,511	69,523

Page No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Rev. No.	14	14	14	11	10	1	14	14	12	12	9	14	14	14	14

**I - 787-8 (cont'd)**

Engine Limits (cont'd):

	Takeoff (see Note 10 for operating limits)	Maximum continuous
RR Trent 1000-E (See Note 7 for ICAO env comp) (see Note 12 for Applicability)	59,631	58,866
RR Trent 1000-G (See Note 7 for ICAO env comp) (see Note 12 for Applicability)	72,066	64,722
RR Trent 1000-H (See Note 7 for ICAO env comp) (see Note 12 for Applicability)	63,897	58,866
RR Trent 1000 - A2 (See Note 14 for ICAO env comp)	69,194	64,722
RR Trent 1000 - C2 (See Note 14 for ICAO env comp)	74,511	69,523
RR Trent 1000 - D2 (See Note 14 for ICAO env comp)	74,511	69,523
RR Trent 1000 - G2 (See Note 14 for ICAO env comp)	72,066	64,722
RR Trent 1000 - H2 (See Note 14 for ICAO env comp)	63,897	58,866
GEnx-1B64 (See Note 7 for ICAO env comp) (see Note 13 for applicable BOM)	67,000	61,500
GEnx-1B67 (See Note 7 for ICAO env comp) (see Note 15 for applicable BOM)	69,400	61,500
GEnx-1B70 (See Note 7 for ICAO env comp) (see Note 15 for applicable BOM)	72,300	66,500
GEnx-1B64/P1 (See Note 7 for ICAO env comp) (see Note 16 for applicable BOM)	67,000	61,500
GEnx-1B67/P1 (See Note 7 for ICAO env comp) (see Note 16 for applicable BOM)	69,400	61,500
GEnx-1B70/P1 (See Note 7 for ICAO env comp) (see Note 16 for applicable BOM)	72,300	66,500
GEnx-1B70/75/P1 (See Note 7 for ICAO env comp) (see Note 16, 17 for applicable BOM)	72,300	66,500
GEnx-1B64/P2 (See Note 14 for ICAO env comp) (see Note 18 for applicable BOM)	67,000	61,500
GEnx-1B67/P2 (See Note 14 for ICAO env comp) (see Note 18 for applicable BOM)	69,400	61,500
GEnx-1B70/P2 (See Note 14 for ICAO env comp) (see Note 18 for applicable BOM)	72,300	66,500
GEnx-1B70/75/P2 (See Note 14 for ICAO env comp) (see Note 18,19 for applicable BOM)	72,300	66,500

For engine operating limits see the applicable Engine Type Certificate Data Sheet or the FAA approved Airplane Flight Manual.

(See Note 2 for AFM reference)

Airspeed Limits:

VMO/MMO = 350KEAS / 360KIAS / 0.90M.

For other airspeed limits, see the appropriate FAA-approved Airplane Flight Manual.

CG Range:

See the appropriate FAA-approved Airplane Flight Manual.

Empty Weight C.G.:

None

Maximum Weights:

See the appropriate FAA-approved Airplane Flight Manual.

Model

787-8

Eligible Serial Numbers

34422-34425, 34485, 34486, 34488, 34490, 34493, 34494, 34496, 34497, 34502, 34506-34509, 34511, 34512, 34514-34516, 34520, 34521, 34743-34750, 34752, 34785, 34786, 34788, 34789, 34795, 34796, 34821-34840, 34842, 34844, 34846, 34847, 34850, 34923-34932, 34938-34941, 34943-34945, 35257-35260, 35303-35315, 35316, 35319, 35510, 35511, 35938-35942, 36040, 36042, 36227-36232, 36233, 36273-36289, 36400, 36424, 36427, 36428, 37227, 37894, 37983, 38055, 38319-38333, 38466, 38471-38473, 38476, 38477, 38480, 38484, 38609-38615, 38619, 40053, 40059, 40695, 40748-40750, 40899, 41538, 42224, 42243-42249

**I - 787-8 (cont'd)****PERTINENT DATA**

Minimum Crew: Two (2): pilot and copilot

Maximum Passengers: The maximum number of passengers approved for emergency evacuation is:  
 381 with four pairs of exits in an (A, A, A, A) exit arrangement,  
 355 with four pairs of exits in a (C, A, A, A) exit arrangement,  
 330 with four pairs of exits in an (A, A, C, A) exit arrangement, and  
 300 with four pairs of exits in a (C, A, C, A) exit arrangement.  
 Maximum passenger capacity may be further limited by Environmental Control System ventilation per occupant requirement defined in 25.831(a).

Max. Baggage/Cargo: See appropriate FAA-approved Weight and Balance Manual. (See Note 1 for W&B ref)

Fuel and Oil Capacities: See appropriate FAA-approved Weight and Balance Manual. (See Note 1 for W&B ref)

Maximum Operating Altitude: 43,100 feet

Certification Basis: 14 CFR Part 25, Airworthiness Standards, through Amendment 25-119 and Amendments 25-120, 25-124, 25-125 and 25-128 with exceptions as noted below.

<u>Section No.</u>	<u>Title</u>	<u>At Amdt. 25-</u>
25.1309	For Cargo Fire Protection Systems	119

Amendment 25-118 was not published and therefore has no applicability.

14 CFR Part 26, Continued Airworthiness and Safety Improvements, through Amendment 26-5, for §§ 26.11, 26.21, 26.37, 26.43, and 26.45:

14 CFR Part 34, Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered, through Amendment 34-5. The certification basis for emissions also includes compliance to the International Civil Aviation Organization (ICAO) 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.e.3 for NO<sub>x</sub> (also known as CAE P/8), and Part II Chapter 2 for fuel venting, which have been demonstrated.

14 CFR Part 36, Noise Standards: Aircraft Type Certification and Airworthiness Certification, through Amendment 36-28. The certification basis for noise also includes compliance to ICAO Annex 16, Volume I, Amendment 9.

The Following Optional Design Regulations have been complied with:

Ditching: 14 CFR §§ 25.801, 25.1411(d), (e), (f), (g) and 25.1415

Ice Protection: 14 CFR § 25.1419

ETOPS: The 787-8 has been evaluated in accordance with the type design requirements of 14 CFR § 25.3(b)(2) and 25.1535 and found suitable for greater than 180- minute ETOPS operations when operated and maintained in accordance with Boeing Document No. D021Z002-01, "Model 787 ETOPS Configuration, Maintenance, and Procedures." This finding does not constitute approval to conduct ETOPS

Exemptions from 14 CFR Part 25:

- Grant of Exemption, § 25.562(b)(2), Relief from floor warpage testing requirements for flightdeck seats on the Boeing Model 787 series airplanes; **Exemption No. 9486**, September 11, 2007.
- Grant of Exemption, § 25.809(a), Relief from the requirement that flightcrew emergency exits have a means to view outside conditions under all lighting situations for the Boeing Model 787 series airplanes; **Exemption No. 10114**, August 11, 2010.
- Time Limited Grant of Exemption, § 25.809(a), Relief for a limited number of the Boeing Model 787 series airplanes from the requirement that passenger emergency exits have a means to view outside conditions under all lighting situations; **Exemption No. 10235**, April 8, 2011, and **Exemption No. 10235A**, May 01, 2013.

**I - 787-8 (cont'd)**Exemptions from 14 CFR Part 25 (cont'd):

4. Partial Grant of Exemption, § 25.841(a)(2)(i)(ii), Relief for the Boeing Model 787 series airplanes from the requirement that, during a decompression caused by failures of the engines, airplane cabin pressure altitude not exceed 25,000 feet for more than 2 minutes or exceed 40,000 feet for any duration; **Exemption No. 8857**, March 30, 2007.
5. Time Limited Grant of Exemption, § 25.1309(c), Temporary relief from the requirement to provide indication of anticipated fuel system contamination to the flightcrew of Boeing Model 787-8 airplanes powered by Rolls-Royce Trent 1000 engines; **Exemption No. 10199**, January 28, 2011, and **Exemption No. 10199A**, August 18, 2011, **Exemption No. 10199B**, June 30, 2014.
6. Grant of Exemption, § 25.1447(c)(1), Relief from the requirement for passenger oxygen masks to be automatically presented before the cabin pressure altitude exceeds 15,000 feet for the Boeing Model 787 series airplanes; **Exemption No. 9801**, December 12, 2008.
7. Time Limited Grant of Exemption, §§ 25.1305(c)(6) and 25.1309(c), Temporary relief from the requirements to provide indication of impending bypass of the engine oil fuel cooled oil coolers and to provide indication of impending bypass on the main fuel filters of multiple engines, for the Boeing Model 787-8 airplanes powered by General Electric GENx-1B, or subsequent variants of the engine; **Exemption No. 10268 (corrected copy)**, May 24, 2011, and **Exemption No. 10268A**, August 15, 2011, **Exemption No. 10268B**, June 30, 2014.
8. GRANT OF EXEMPTION Section 25.853(d) which requires that certain interior components of airplanes with passenger capacities of 20 or more meet the flammability test requirements of parts IV and V (heat release and smoke emission) of appendix F of 14 CFR part 25; **Exemption 10868, September 12, 2013 and 10868A, November 5, 2013**
9. GRANT OF EXEMPTION Section 25.813(e), Amendment 25-116 – No door may be installed between any passenger seats that is occupyable for takeoff and landing and any passenger emergency exit, such that the door crosses any egress path (including aisles, crossaisles and passageways); **Exemption 10879, October 18, 2013**

Equivalent Levels of Safety (ELOS) are identified as:

PS06-0496-SF-7	§ 25.675	ELOS for Seal Krueger Flap Stops
TC6918SE-T-A-9	§§ 25.341, 25.343, 25.345, 25.371, 25.373, 25.391	ELOS for Gust and Continuous Turbulence Design Loads
TC6918SE-T-A-10	§ 25.335(b)	ELOS for Design Airspeeds
TC6918SE-T-A-11	§§ 25.391, 25.393, 25.415	ELOS Finding for the Ground Gust Requirements
TC6918SE-T-A-12	§ 25.331(c)	ELOS for Symmetric Maneuvering Conditions
TC6918SE-T-A-13	§ 25.629	ELOS for Aeroelastic Stability
PS08-0670-C-1	§ 25.853(a)	ELOS Finding for Adhesives Used in Interior Panel Joint Potting Applications
TC6918SE-T-CS-1	§ 25.810(a)(1)(ii)	ELOS Finding for Escape Slide Inflation Times
TC6918SE-T-CS-2	§ 25.811(f)	ELOS Finding for Emergency Exit Markings and Door Sill Reflectance
PS07-0585-CS-10	§§ 25.811(d), 25.811(g), 25.812(b)(1)(i), and 25.812(b)(1)(ii)	ELOS Finding for Graphical Exit Signs
TC6918SE-T-CS-12	§ 25.791(a)	Lighted “No Smoking” Signs in Lieu of Placards
TC6918SE-T-CS-14	§§ 25.853 and 25.856(b)	ELOS Finding Associated to Post-Crash Fire Survivability
PS07-0585-CS-18	§ 25.811(e)(4)(i), (ii), and (iii)	ELOS Finding for the Passenger Door Operational Arrow Location and Color
PS06-0413-CS-25	§ 25.783(e)(2)	ELOS Finding for Passenger and Large Cargo Door Indication

**I - 787-8 (cont'd)**Equivalent Levels of Safety (ELOS) (cont'd):

PS09-0987-CS-28	§§ 25.562 and 25.785	ELOS Finding on Dynamic Test Requirements for Single Occupant Side-Facing Seats
PS12-1032-CS-31	§§ 25.562 and 25.785	ELOS Dynamic Test Requirements for Single Occupant Oblique Seats with Inflatable Restraints
PS12-1033-C-32	§§ 25.562 and 25.785	ELOS Dynamic Test Requirements for Single Occupant Side-Facing Seats
TC6918SE-T-ES-5	§ 25.831(g)	ELOS for Acceptable High Temperature Physiological Environment During Failure Conditions
TC6918SE-T-ES-16	§ 25.1443(c)	ELOS Finding for the Passenger Oxygen System
TC6918SE-T-ES-18	§25.1441(c)	ELOS Finding for Pulse Oxygen System for Passenger
TC6918SE-T-ES-19	§ 25.841(b)(6)	ELOS Finding on Cabin Altitude Warning System for Operations into High Altitude Airports
TC6918SE-T-ES-20	§ 25.1443(d)	ELOS Finding for Portable Pulse Oxygen System
TC6918SE-T-F-4	§ 25.1517	ELOS Finding for Rough Air Speed ( $V_{RA}$ )
TC6918SE-T-F-6	§ 25.107(e)(1)(iv)	ELOS Finding for Minimum Unstick ( $V_{MU}$ ) Speed Margin
TC6918SE-T-F-14	§ 25.677(b)	ELOS Finding for Trim Displays
TC6918SE-T-F-17	§ 25.255	ELOS Finding for Out-of-Trim Characteristics
PS06-0496-F-18	§ 25.1555	ELOS Engine and APU Fire Handle Design
PS06-0413-F-20	§§ 25.1325(e)	ELOS Finding for the Standby Air Data System
PS05-0177-P-2	§ 25.981(b)(2)	ELOS Finding for the Fuel Tank Flammability Rule (FTFR).
TC6918SE-T-P-2	§§ 25.933(a)(1)(i) and 25.933(a)(1)(ii)	ELOS Finding for Flight Critical Thrust Reverser
TC6918SE-T-P-3	§25.1182(a)	ELOS Finding for Fire Safety Requirements for the Aft Strut Fairing Compartment
TC6918SE-T-G-8	§§ 25.1529, 25.1729, Appendix H25.4 To Part 25	ELOS Finding for formatting of Boeing ICA Manuals – Airworthiness Limitations on Models 787
TC6918SE-T-P-13R1	§§ E25.1, F25.1 and G25.1	ELOS Finding for the Auxiliary Power Unit (APU) Installation
TC6918SE-T-P-17	§ 25.934	ELOS Finding for the Engine and Thrust Reverser System Testing
TC6918SE-T-P-19	§§ 25.1023(b) and 25.1121(c)	ELOS Finding for Auxiliary Power System
TC6918SE-T-P-20	§§ 25.997 and 25.1305(c)(6)	ELOS Finding for Warning Means for Engine Fuel Filter Contamination
TC6918SE-T-P-27	§ 25.1145(a)	Engine Igniter Flight-deck Switch Configuration
PS06-0414-P-34	§§ 25.1181(b), 25.1182 25.1183(a)	ELOS Finding for Fire Safety Requirements for GENx-1B
TC6918SE-T-SA-7	§§ 25.1301, 25.1309 and 25.1310	ELOS Finding for use of ARAC Recommended Revision
TC6918SE-T-SA-10	§ 25.1459(a)(2)	ELOS Finding for Flight Recorders
TC6918SE-T-SA-11	§ 25.1303(c)(1)	ELOS Finding for Overspeed Aural Warning
TC6918SE-T-SA-29	§ 25.1333(a)	ELOS Finding for Instrument Systems
TC6918SE-T-SE-14	§ 25.1351(b)(5)	ELOS Finding for the Flight Control Electronics DC Power System

**I - 787-8 (cont'd)**Equivalent Levels of Safety (ELOS) (cont'd):

TC6918SE-T-SF-1	§ 25.671(c)(2)	ELOS Finding for Flight Control System Failure Criteria
TC6918SE-T-SF-5	§ 25.777(e)	ELOS Finding on the Wing Flap Control Lever

Special Conditions with respect to the following subjects apply to the Model 787-8:

<u>SC No.,</u>	<u>Subject</u>
25-348-SC	Composite Wing and Fuel Tank Structure—Fire Protection Requirements
25-354A-SC	Interaction of Systems and Structures, Electronic Flight Control System-Control Surface Awareness, High Intensity Radiated Fields (HIRF) Protection, Limit Engine Torque Loads for Sudden Engine Stoppage, and Design Roll Maneuver Requirement
25-355-SC	Reinforced Flightdeck Bulkhead
25-356-SC	Systems and Data Networks Security-Isolation or Protection From Unauthorized Passenger Domain Systems Access
25-357-SC	Systems and Data Networks Security-Protection of Airplane Systems and Data Networks from Unauthorized External Access
25-359-SC	Lithium Ion Battery Installation
25-360-SC	Composite Fuselage In-Flight Fire/Flammability Resistance
25-362-SC	Crashworthiness Emergency Landing Conditions
25-363-SC	Tire Debris Penetration of Fuel Tank Structure
25-365-SC	Operation Without Normal Electrical Power
25-370-SC	Seats With Non-Traditional, Large, Non-Metallic Panels
25-414-SC	Lightning Protection of Fuel Tank Structure to Prevent Fuel Tank Vapor Ignition
25-418-SC	Overhead Flight Crew Rest Compartment Occupiable during Taxi, Takeoff, and Landing
25-419-SC	Overhead Crew Rest Compartment
25-431-SC	Seats with Inflatable Lapbelts
25-458-SC	Single-place Side-facing Seats with Inflatable Lapbelts

**II. 787-9, Transport Category, Approved June 05, 2014**

Engines: 2 Rolls-Royce plc Turbofan Engines; Models: Trent 1000-J2,  
Trent 1000-A2, Trent 1000-K2 (Engine Type Certificate No. E00076EN)  
2 General Electric Turbofan Engines; GENx-1B74/75/P2  
(Engine Type Certificate No. E00078NE)

Authorization for engine intermix is contained in the appropriate FAA approved Airplane Flight Manual

Fuel: Rolls-Royce plc Turbofan  
Fuels conforming to:  
ASTM D-1655 grades Jet-A and Jet A-1  
MIL-DTL-5624 grade JP-5  
MIL-DTL-83133 grade JP-8  
GOST 10227-86 grade TS-1  
are acceptable. Fuels produced to other specifications and having properties meeting the requirements of the above specifications are acceptable. The fuel and any fuel additives must conform to the relevant Engine Operating Instructions.

General Electric Turbofan Engines (also, see Note 9):

Fuels conforming to:  
ASTM D-1655 grades Jet-A and Jet A-1  
MIL-DTL-5624 grade JP-5  
MIL-DTL-83133 grade JP-8  
GOST 10227-86 grade TS-1  
are acceptable. Fuels produced to other specifications and having properties meeting the requirements of the above specifications are acceptable. The fuel and any fuel additives must conform to the relevant Engine Operating Instructions

**Engine Limits:**

	Static thrust lb, standard day, sea level	
	Takeoff (see Note 10 for operating limits)	Maximum continuous
RR Trent 1000-J2 (See Note 14 for ICAO env comp)	78,129	71,818
RR Trent 1000-A2 (See Note 14 for ICAO env comp)	69,194	64,722
RR Trent 1000-K2 (See Note 14 for ICAO env comp)	78,129	71,818
GENx-1B74/75/P2 (See Note 14 for ICAO env comp) (see Note 18 for applicable BOM)	76,700	68,600

For engine operating limits see the applicable Engine Type Certificate Data Sheet or the FAA approved Airplane Flight Manual.

(See Note 2 for AFM ref)

Airspeed Limits: VMO/MMO = 350KEAS / 360KIAS / 0.90M.  
For other airspeed limits, see the appropriate FAA-approved Airplane Flight Manual.

CG Range: See the appropriate FAA-approved Airplane Flight Manual.

Empty Weight C.G.: None

Maximum Weights: See the appropriate FAA-approved Airplane Flight Manual.

Model Serial Number

787-9 34334, 34335, 34522, 34524, 36401

**PERTINENT DATA**

Minimum Crew: Two (2): pilot and copilot

**II - 787-9 (cont'd)**

Maximum Passengers: The maximum number of passengers approved for emergency evacuation is:  
 420 with four pairs of exits in an (A, A, A, A) exit arrangement,  
 355 with four pairs of exits in a (C, A, A, A) exit arrangement,  
 355 with four pairs of exits in an (A, A, C, A) exit arrangement, and  
 300 with four pairs of exits in a (C, A, C, A) exit arrangement.

Maximum passenger capacity may be further limited by Environmental Control System ventilation per occupant requirement defined in 25.831(a).

Max. Baggage/Cargo: See appropriate FAA-approved Weight and Balance Manual. (See Note 1 for W&B ref)

Fuel and Oil Capacities: See appropriate FAA-approved Weight and Balance Manual. (See Note 1 for W&B ref)

Max Operating Altitude: 43,100 feet

Certification Basis: 14 CFR Part 25, Airworthiness Standards, Amendment 25-1 through 25-128, with exceptions as noted below.

<u>Section No.</u>	<u>Title</u>	<u>At Amdt. 25-</u>
25.107	Takeoff Speeds	135
25.795(b)(1)	Security considerations	N/A
25.795(c)(2)	Security considerations	N/A
25.795(c)(3)(i)	Security considerations	N/A
25.125(b)(2)(ii)(B)	Landing	108
25.1317	remains at FAA Special Condition 25-354A-SC for the Integrated Standby Flight Display (ISFD)	

14 CFR Part 26, Based on 14 CFR §21.101(g) for changes made to TCs applicable provisions of 14 CFR part 26 are included in the certification basis. For any future 14 CFR part 26 amendments, the holder of this TC must demonstrate compliance with the applicable sections.

Compliance has been found for the following regulations through Amendment 26-5, for §§ 26.21, 26.37, 26.43, and 26.45

14 CFR Part 34, Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered, through Amendment 34-5. The certification basis for emissions also includes compliance to the International Civil Aviation Organization (ICAO) 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.e.3 for NO<sub>x</sub> (also known as CAE P/8), and Part II Chapter 2 for fuel venting, which have been demonstrated.

14 CFR Part 36, Noise Standards: Aircraft Type Certification and Airworthiness Certification, through Amendment 36-28. The certification basis for noise also includes compliance to ICAO Annex 16, Volume I, Chapter 4, Amendment 9, (5<sup>th</sup> Edition).

The Following Optional Design Regulations have been complied with:

Ditching: 14 CFR §§ 25.801, 25.1411(d), (e), (f), (g) and 25.1415

Ice Protection: 14 CFR § 25.1419

ETOPS: The 787-9 has been evaluated in accordance with the type design requirements of 14 CFR § 25.3(b)(2) and 25.1535 and found suitable for greater than 180- minute ETOPS operations when operated and maintained in accordance with Boeing Document No. D021Z002-01, "Model 787 ETOPS Configuration, Maintenance, and Procedures." This finding does not constitute approval to conduct ETOPS.

Exemptions from 14 CFR Part 25:

- Grant of Exemption, § 25.562(b)(2), Relief from floor warpage testing requirements for flightdeck seats on the Boeing Model 787 series airplanes; **Exemption No. 9486**, September 11, 2007.
- Grant of Exemption, § 25.809(a), Relief from the requirement that flightcrew emergency exits have a means to view outside conditions under all lighting situations for the Boeing Model 787 series airplanes; **Exemption No. 10114**, August 11, 2010.

**II - 787-9 (cont'd)**Exemptions from 14 CFR Part 25 (cont'd):

3. Partial Grant of Exemption, § 25.841(a)(2)(i)(ii), Relief from the requirement that the airplane must be designed so that occupants will not be exposed to a cabin pressure altitude that exceeds the following after decompression from any failure condition not shown to be extremely improbable:
  - (i) Twenty-five thousand (25,000) feet for more than 2 minutes; or
  - (ii) Forty thousand (40,000) feet for any duration for the Boeing Company's Model 787-9 airplanes. **Exemption No. 10962**, March 3, 2014
4. Grant of Exemption, § 25.1447(c)(1), Relief from the requirement for passenger oxygen masks to be automatically presented before the cabin pressure altitude exceeds 15,000 feet for the Boeing Model 787 series airplanes; **Exemption No. 9801**, December 12, 2008.
5. Time Limited Grant of Exemption §25.1301(a)(1), Relief from the requirements that the airplane must function properly when installed be designed appropriate to its intended function for Ram Air Turbine (RAT) Generator Control Unit (GCU) on the Boeing model 787-9 airplane and Time Limited Grant of Exemption §25.1301(a)(4), §25.1309(a) and §25.1309(b)(2), Relief from the requirements that Systems and equipment must function properly when installed; Systems and equipment must perform intended function and Hazardous effects must be improbable for the Altitude-Select knob on the Boeing model 787-9 Autoflight Mode Control Panel; **Exemption No. 11002**, June 12, 2014.
6. Grant of Exemption, § 25.853(d) and condition 1 of Special Condition No. 25-370-SC relief from the flammability requirements for large surface areas on seats in the Boeing Model 787-9 series airplanes; **Exemption No. 10868A**, November 5, 2013

Equivalent Levels of Safety (ELOS) are identified as:

TC6918SE-T-A-9	§§ 25.341, 25.343, 25.345, 25.371, 25.373, 25.391	Gust and Continuous Turbulence Design Loads
TC6918SE-T-A-10	§ 25.335(b)	Design Airspeeds
TC6918SE-T-A-11	§§ 25.391, 25.393, 25.415	Ground Gust Requirements
TC6918SE-T-A-12	§ 25.331(c)	Symmetric Maneuvering Conditions
TC6918SE-T-A-13	§§ 25.629, 25.671(c)(2)	Aeroelastic Stability
TC6918SE-T-CS-1	§ 25.810(a)(1)(ii)	Escape Slide Inflation Times
TC6918SE-T-CS-2	§ 25.811(f)	Emergency Exit Markings and Door Sill Reflectance
PS07-0585-CS-10	§§ 25.811(d) and (g), 25.812(b)(1)(i) and (b)(1)(ii)	Graphical Exit Signs
TC6918SE-T-CS-12	§ 25.791	Lighted "No smoking" Signs in Lieu of Placards
TC6918SE-T-CS-14	§ 25.856(b)	Fuselage Post-Crash Fire Survivability
PS07-0585-CS-18	§ 25.811(e)(4)(i), (ii) and (iii)	Passenger Door Operational Arrow Location and Color
PS06-0413-CS-25	§ 25.783(e)(2)	Passenger and Large Cargo Door Indication
PS13-0679-CS-33	§ Sec. 21.21	Critical Casting Factor Requirements for Model 787 Series Aircraft
TC6918SE-T-ES-5	§ 25.831(g)	Acceptable High Temperature Physiological Environment During Failure Conditions
TC6918SE-T-ES-16	§ 25.1443(c)	Passenger Oxygen System
TC6918SE-T-ES-18	§ 25.1441(c)	Pulse Oxygen System for Passengers
TC6918SE-T-ES-19	§ 25.841(b)(6)	Cabin Altitude Warning Systems for Operation into High Altitude Airports
TC6918SE-T-ES-20	§ 25.1443(d)	Portable Pulse Oxygen System
TC6918SE-T-F-4	§ 25.1517	Rough Air Speed ( $V_{RA}$ )
TC6918SE-T-F-14	§ 25.677(b)	Trim Displays

**II - 787-9 (cont'd)**Equivalent Levels of Safety (ELOS) (cont'd):

TC6918SE-T-F-17	§ 25.255	Out of Trim Characteristics
PS06-0496-F-18	§ 25.1555(d)(1)	Engine and APU Fire Handle Design
PS06-0496-F-21	§ 25.1325(e)	Standby Air Data System
PS06-0496-F-22	§ 25.123(a) and (b)	Speeds for En Route Flight Paths
TC6918SE-T-G-8	§§ 25.1529, 25.1729, Appendix H25.4(a) and (b)	Formatting of Boeing Instructions for Continued Airworthiness Manuals - Airworthiness Limitations
PS05-0177-P-2	§§ 25.981(b)(2)	Fuel Tank Flammability Reduction Rule
TC6918SE-T-P-2	§ 25.933(a)(1)(i) and (a)(1)(ii)	Flight Critical Thrust Reverser
TC6918SE-T-P-3	§ 25.1182(a)	Fire Safety Requirements for the Aft Strut Fairing Compartment
TC6918SE-T-P-13R1	Part 25 subpart E, F & G	Auxiliary Power Unit (APU) Installation
TC6918SE-T-P-17	§ 25.934	Engine and Thrust Reverser System Testing
TC6918SE-T-P-19	§§ 25.1023(b), 25.1121(c)	Auxiliary Power System
TC6918SE-T-P-20	§§ 25.997 and 25.1305(c)(6)	Warning Means for Engine Fuel Filter Contamination
TC6918SE-T-P-27	§ 25.1145(a)	Engine Igniter Flightdeck Switch Configuration
TC6918SE-T-SA-10	§ 25.1459(a)(2)	Flight Recorders
TC6918SE-T-SA-11	§ 25.1303(c)(1)	Overspeed Aural Warning
TC6918SE-T-SA-29	§ 25.1333(a)	Instrument Systems
PS06-0496-T-SA-31	§§ 25.1301, 25.1309, and 25.1310	Use of ARAC Recommended Revision
TC6918SE-T-SE-14	§ 25.1351(b)(5)	Flight Control Electronics DC Power System
PS06-0496-T-SE-15	§ 25.1317(b)	High Intensity Radiated Fields (HIRF)
TC6918SE-T-SF-1	§ 25.671(c)(2)	Flight Control System Failure Criteria
TC6918SE-T-SF-5	§ 25.777(e)	Wing Flap Control Lever
PS06-0496-SF-7	§ 25.675	Seal Krueger Flap Stops

Special Conditions with respect to the following subjects apply to the Model 787-9:

<u>Special Condition</u>	<u>Subject</u>
25-348-SC	Composite Wing and Fuel Tank Structure—Fire Protection Requirements
25-354A-SC	Interaction of Systems and Structures, Electronic Flight Control System-Control Surface Awareness, High Intensity Radiated Fields (HIRF) Protection, Limit Engine Torque Loads for Sudden Engine Stoppage, and Design Roll Maneuver Requirement
25-356-SC	Systems and Data Networks Security-Isolation or Protection From Unauthorized Passenger Domain Systems Access
25-357-SC	Systems and Data Networks Security-Protection of Airplane Systems and Data Networks from Unauthorized External Access
25-359-SC	Lithium Ion Battery Installation
25-360-SC	Composite Fuselage In-Flight Fire/Flammability Resistance
25-362-SC	Crashworthiness Emergency Landing Conditions
25-363-SC	Tire Debris Penetration of Fuel Tank Structure
25-365-SC	Operation Without Normal Electrical Power
25-370-SC	Seats with Non-Traditional, Large, Non-Metallic Panels

**II - 787-9 (cont'd)**

Special Conditions with respect to the following subjects apply to the Model 787-9 (cont'd):

25-414-SC	Lightning Protection of Fuel Tank Structure to Prevent Fuel Tank Vapor Ignition
25-418-SC	Overhead Flight Crew Rest Compartment Occupiable during Taxi, Takeoff, and Landing
25-419-SC	Overhead Crew Rest Compartment
25-431-SC	Seats With Inflatable Lapbelts
25-458-SC	Single-place Side-facing Seats with Inflatable Lapbelts
25-552-SC	Dynamic Test Requirements for Multiple Occupant Side-Facing Seats with Inflatable Restraints

**THE FOLLOWING INFORMATION AND NOTES APPLY TO ALL MODELS UNLESS OTHERWISE NOTED****ADDITIONAL DESIGN REQUIREMENTS AND CONDITIONS:**

The following design details or information must be maintained to ensure that an unsafe design condition is not present:

**In-flight Engine Restart**

The Boeing Model 787 engines incorporate numerous technological advances intended to increase efficiency and reliability. However, some of these features have the potential to decrease engine in-flight starting performance relative to the engines envisioned when the applicable sections of 14 CFR Part 25 were promulgated. The following criteria for engine in-flight starting performance must be met to ensure that the level of safety intended by §§ 25.903(e) and 25.1351(d) is maintained on airplanes powered by current technology engines.

1. Appropriate procedures for restarting the engines in the following cases must be provided in the airplane flight manual (AFM):
  - a. a fuel cut during climb after the takeoff phase (defined as the flight phase from start of the takeoff roll to 1500 feet above the runway altitude),
  - b. loss of all alternating current (AC) power in combination with an all engine flameout, and
  - c. all engine flame-out at or below 20,000 feet.

**Uncontrollable High Engine Thrust or Power**

Numerous single and anticipated combinations of failures within traditional engine control systems result in losing the normal means to control the magnitude and/or direction of engine thrust (power). For some of these anticipated failure conditions, the flight crew cannot be relied upon to recognize and mitigate the failures before they become hazardous or catastrophic. The following design features are required to ensure an unsafe condition does not exist with regards to the loss of the normal means to control engine thrust (power):

1. Dual channel full authority digital electronic (engine) control (FADEC) which monitors engine conditions to trim fuel flow
2. Thrust control malfunction accommodation to address conditions where fuel metering is not responding to pilot input on the ground, and
3. Redundant mechanical control interface between the flight crew and the FADEC.

**Engine Rotor-Lock Evaluation**

Service experience has shown that some engines are susceptible to a condition known as rotor-lock following an in-flight shut-down from power settings ranging from high power to idle. The engine design must be free from engine rotor lock.

**Fuel Feed System Icing Threats**

Under certain conditions, over a period of low fuel temperatures, ice may accumulate in the airplane fuel feed system and then be fed or released downstream to the engine, and result in failure to achieve a commanded thrust level, and this is considered an unsafe condition. As such, each aircraft/engine and aircraft/auxiliary power system (APS) fuel feed system must either be designed to prevent an accumulation of ice anywhere within the fuel tank and feed system from being released into the engine and APS fuel system, or be designed so no loss of engine thrust occurs due to release of any ice accumulation anywhere within the airplane/engine operating envelope.

**THE FOLLOWING INFORMATION AND NOTES APPLY TO ALL MODELS UNLESS OTHERWISE NOTED (cont'd):****Return Landing Capability**

Examination of takeoff performance capabilities of current and proposed large transport aircraft indicates that requirements other than climb performance should be addressed when considering safe return operations and the need for a fuel jettison system. The 787 fuel jettison system must be installed, and the jettison rate should be such that there is adequate return to landing capability, when considering the following items, in a 30-minute flight with 15 minutes of active fuel jettisoning in conjunction with operational procedures:

1. Exceedence of certificated maximum brake energies;
2. Exceedence of tire speed limits;
3. Controllability (e.g., hydraulic or flight control system failures);
4. Margins to flap placard, or load relief operation speeds in turbulent air;
5. Climb capability, engine inoperative procedure;
6. Landing distances (actual distances, including contaminated runway).

Certification Maintenance Requirements (CMRs): See FAA-approved Certification Maintenance Requirements, document number D011Z009-03-03.

Production Basis: Production Certificate No. 700. (See Note 4 and Note 8 for PC applicability).

Leveling Means: A plumb bob attachment and leveling provision scale are provided in the left main gear wheel well.

Datum: Sta 0.0, located 55.8 in forward of airplane nose (B.S. 55.8).

Mean Aerodynamic Chord (MAC): 246.9 inches

Control Surface Movements: To insure proper operation of the airplane, the movement of the various control surfaces must be carefully controlled by proper rigging of the flight control systems. The airplane must, therefore, be rigged according to the following FAA-approved data in the following Boeing documents:

B787-A-27-11-00-18A-270B-A - Aileron – Rigging  
 B787-A-27-11-00-19A-270B-A - Flaperon – Rigging  
 B787-A-27-31-00-27A-270B-A - Elevator – Rigging  
 B787-A-27-21-00-31A-270B-A - Rudder – Rigging  
 B787-A-27-51-00-28A-270B-A - Trailing Edge Flap System – Rigging  
 B787-A-27-61-00-17A-270B-A - Spoiler – Rigging

787-8 Maximum control surface travel:

<b>Control Surface</b>	<b>Maximum TED/TEL (Deg.)</b>	<b>Maximum TEU/TER (Deg.)</b>
Ailerons	16.94°	-32.20°
Elevators	26.93°	-32.54°
Flaperon	39.26°	-31.61°
Spoilers 6, 7, 8, 9	-13.21°	60.95°
Spoilers 1, 2, 3, 12, 13, 14	-13.24°	60.77°
Spoilers 4, 5, 10, 11	-13.16°	63.00°
Rudder	32.10°	-31.83°
Horizontal Stabilizer	4.25°	-12.75°
Inboard Flaps	41.20°	-2.80°
Outboard Flaps	41.20°	-2.00°
Inboard Slats	23.47°	-0.34°
Outboard Slats	30.16°	-0.40°

**THE FOLLOWING INFORMATION AND NOTES APPLY TO ALL MODELS UNLESS OTHERWISE NOTED (cont'd):**

787-9 Maximum Control Surface Travel:

Control Surface	Maximum TED/TEL (Deg.)	Maximum TEU/TER (Deg.)
Ailerons	16.94°	-32.20°
Elevators	26.93°	-32.54°
Flaperon	39.26°	-31.61°
Spoilers 6, 7, 8, 9	-13.23°	61.15°
Spoilers 1, 2, 3, 12, 13, 14	-13.24°	60.77°
Spoilers 4, 5, 10, 11	-13.40°	62.91°
Rudder	32.40°	-32.00°
Horizontal Stabilizer	4.25°	-12.75°
Inboard Flaps	43.00°	-2.80°
Outboard Flaps	43.00°	-2.00°
Inboard Slats	26.52°	-0.34°
Outboard Slats	31.56°	-0.40°

Trailing Edge Down = TED

Trailing Edge Up = TEU

Trailing Edge Left = TEL

Trailing Edge Right = TER

Degrees = Deg.

Required Equipment

The basic required equipment as prescribed in the applicable airworthiness regulations (see Certification Basis) must be installed in the aircraft for certification.

Service Information:

Boeing Document B787-81205-Z0210-00, "787-8 Structural Repair Manual" and B787-81205-Z0310-00 "787-9 Structural Repair Manual" are FAA-approved; Service Bulletins and other service information, when FAA-approved, will contain a statement declaring FAA approval.

Note 1

A current weight and balance report, including a list of equipment included in the certificated empty weight and loading instructions when necessary, must be provided for each aircraft at the time of original certification. This is in accordance with 14 CFR 25.29

Note 2

Airplane operation must be in accordance with the FAA-approved Airplane Flight Manual, Boeing Document D631Z003. All placards required by either the FAA-approved Flight Manual, the applicable operating rules, or the Certification Basis must be installed in the airplane in accordance with 14 CFR 25.1541 through 25.1563.

Note 3

In accordance with 14 CFR 25.571, 25.981, 25.1529 (and 25.1729 for 787-9), the FAA has accepted the Boeing Model 787 Instructions for Continued Airworthiness in Section 9 of the 787 Maintenance Planning Data, Boeing Document D011Z009-03 and sub-tier documents. Each operator must incorporate into their airline's FAA-approved maintenance program the applicable items from the following FAA-approved documents:

D011Z009-03-01, 787 Airworthiness Limitations (AWLs). Contains required structural inspections and the retirement times for structural safe-life and life-limited parts. Also contains required retirement times for systems life-limited parts and other systems limitations.

**THE FOLLOWING INFORMATION AND NOTES APPLY TO ALL MODELS UNLESS OTHERWISE****NOTED (cont'd):**

- D011Z009-03-02, 787 Airworthiness Limitations (AWLs) – Line Number Specific. Existing structures AWLs that were impacted by airplane production non-conformances may result in airplane specific revised inspection requirements and/or inspection intervals.
- D011Z009-03-03, 787 Certification Maintenance Requirements (CMRs). Required periodic tasks to specific Systems installations.
- D011Z009-03-04, 787 Special Compliance Items (SCIs) /Airworthiness Limitations. This document lists and provides instructions for Airworthiness Limitation Instructions (ALIs) and Critical Design Configuration Control Limitations (CDCCLs) required to comply with 14 CFR Part 25.981.
- Note 4 The following Aircraft Serial Numbers were produced under the Type Certification only:  
787-8:  
34486, 34832, 36277, 36278, 36281, 36282, 36283, 36284, 40693, 40694, & 40695  
787-9:  
34334, 34522, 35422, 41988, 41989
- Note 5 Installations using quick release hardware to install commodities such as galleys, closets, lavatories and stowage bins in adaptable zones in the passenger cabin shall be shown compliant to 25.561(c)(2).
- Note 6 The models 787-8 and 787-9 have been approved to operate in “Reduced Vertical Separation Minimum” (RVSM) airspace. Continued airworthiness and operational approval aspects of RVSM must be constructed according to FAA document 91-RVSM Change 2, dated 19 February 2004 titled “Approval of Aircraft and Operators for Flight in Airspace Above Flight Level (FL) 290 Where a 1,000 Foot Vertical Separation Minimum is Applied.”
- Note 7 EASA has found the model 787-8 and 787-9 to be compliant with the International Civil Aviation Organization (ICAO) Annex 16, Volume II, Amendment 6, for Emissions, and with the ICAO Annex 16, Volume I, Amendment 9, Chapter 4, for Noise.
- Note 8 Production Certificate No. 700 was amended to include the 787-8 and 787-9 and issued. Boeing is authorized to issue airworthiness certificates under the Organization Delegation Authorization (ODA) Procedures of 14 CFR part 183, subpart D, and FAA Order 8100.15.
- Note 9 Boeing and GE have determined that the GENx engines on these 787-8 aircraft intermittently emit a sometimes clearly visible fuel vapor fog after shutdown, as a result of a small quantity of fuel being released from the engine’s fuel system. These emissions do not present a safety issue or appreciable environmental impact. Boeing and GE will modify the design of the aircraft and engines by December 31, 2012 to completely eliminate this fuel venting on new aircraft. Boeing has included an airworthiness limitation in the instructions for continued airworthiness for the affected aircraft requiring incorporation of the modified design by December 31, 2014.
- Note 10 See the FAA approved Flight Manual for engine ratings and operating limits. The normal 5 minute takeoff time limit may be extended to 10 minutes for engine out contingency if permitted by the Limitations Section of the FAA approved Airplane Flight Manual.
- Note 11 Applicable to Trent 1000-A Engines with or without M/SB 72-G319 incorporated.
- Note 12 Applicable only to Trent 1000-C, Trent 1000-D, Trent 1000-E, Trent 1000-G and Trent 1000-H Engines with M/SB 72-G319 incorporated.
- Note 13 Applicable to Bill of Materials for GENx-1B64G03 or GENx-1B64G04

**THE FOLLOWING INFORMATION AND NOTES APPLY TO ALL MODELS UNLESS OTHERWISE****NOTED (cont'd):**

- Note 14 EASA has found the model 787-8 and 787-9 to be compliant with the International Civil Aviation Organization (ICAO) Annex 16, Volume II, Amendment 7, for Emissions , and with the ICAO Annex 16, Volume I, Amendment 9, Chapter 4, for Noise.
- Note 15 Applicable to Bill of Materials for GENx-1B70G03 or GENx-1B70G04
- Note 16 Applicable to Bill of Materials for GENx-1B64/P1G01, GENx-1B67/P1G01, GENx-1B70/P1G01 and GENx-1B70/75/P1G01 respectively.
- Note 17 Same as GENx-1B70/P1 except for extended takeoff flat rating ambient temperature (101.8°F/38.8°C at sea level).
- Note 18 Applicable to Bill of Materials for GENx-1B64/P2G01 or GENx-1B64/P2G02, GENx-1B67/P2G01 or GENx-1B67/P2G02, GENx-1B70/P2G01 or GENx-1B70/P2G02, GENx-1B70/75/P2G01 or GENx-1B70/75/P2G02 and GENx-1B74/75/P2G01 or GENx-1B74/75/P2G02 respectively.
- Note 19 Same as GENx-1B70/P2 except for extended takeoff flat rating ambient temperature (101.8°F/38.8°C at sea level).

....END...