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Flight Standardization Board (FSB) Report

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Manufacturer
Boeing

Type Certificate Data Sheet (TCDS)	TCDS Identifier	Marketing Name	Pilot Type Rating
T00021SE	787-8	Boeing 787	B-787
T00021SE	787-9	Boeing 787	B-787

Approved By: Seattle AEG
Federal Aviation Administration
Seattle Aircraft Evaluation Group
1601 Lind Avenue SW
Renton, WA 98057-3356

Office Telephone: 425-917-6600
Office FAX: (425) 917-6638
Office Email: 7-anm-sea-aeg@faa.gov

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1. RECORD OF REVISIONS

Revision Number	Sections(s)	Page(s) Affected	Date
0 (Original)	All	All	08/25/2011
1	All	All	02/17/2012
2	All	All	12/01/2012
3	All	All	07/18/2014
4	5,6	9,13,14	04/13/2017
5	All	All	03/09/2018

2. INTRODUCTION

Aircraft Evaluation Groups (AEGs) are responsible for working with aircraft manufacturers and modifiers, during the development and FAA certification of new and modified aircraft to determine: 1) the pilot type rating, 2) flightcrew member training, checking, and currency requirements, and 3) operational suitability.

This report lists those determinations for use by: 1) FAA employees who approve training programs, 2) FAA employees and designees who certify airmen, and 3) aircraft operators and training providers, to assist them in developing their flightcrew member training, checking and currency.

3. HIGHLIGHTS OF CHANGE

The purpose of this revision is to simplify the Master Differences Requirements (MDR) table and change the report into the new standardized template.

4. BACKGROUND

The Seattle AEG formed a Flight Standardization Board (FSB) that evaluated the B-787 as defined in FAA Type Certificate Data Sheet (TCDS) # T00021SE. The evaluation was conducted using the methods described in FAA Advisory Circular (AC) 120-53, Guidance for Conducting and Use of Flight Standardization Board Evaluations.

5. ACRONYMS

- AC Advisory Circular
- ACS Airman Certification Standards
- AEG Aircraft Evaluation Group
- AFDS Autopilot Flight Director System
- AFM Airplane Flight Manual
- AV Audiovisual Presentation
- ECL Electronic Checklist
- EGPWS Enhanced Ground Proximity Warning System
- EICAS Engine Indicating and Crew Alerting System
- FAA Federal Aviation Administration

- FFS Full Flight Simulator
- FMS Flight Management System
- FSB Flight Standardization Board
- FSTD Flight Simulation Training Device
- FTD Flight Training Device
- GBAS Ground Based Augmentation System
- GE General Electric©
- GLS GBAS Landing System
- GPS Global Positioning System
- HF High Frequency
- HUD Heads Up Display
- ICBI Interactive Computer Based instruction
- ILS Instrument Landing System
- MCP Mode Control Panel
- MDR Master Differences Requirements
- ND Navigation Display
- PA Passenger Address
- PFD Primary Flight Display
- PTS Practical Test Standards
- PTT Part Task Trainer
- SATCOM Satellite Communication
- SU Stand Up Instruction
- TAC Thrust Asymmetry Compensation
- TCBI Tutorial Computer Based Instruction
- TCDS Type Certificate Data Sheet
- TCP Tuning Control Panel
- VHF Very High Frequency
- 14 CFR Title 14 Code of Federal Regulations

6. DEFINITIONS

These definitions are for the purposes of this report only.

6.1.Base Aircraft. An aircraft identified for use as a reference to compare differences with another aircraft.

6.2.Current. A crewmember meets all requirements to operate the aircraft under the applicable operating part.

6.3.Differences Tables. Describe the differences between a pair of related aircraft, and the minimum levels operators must use to conduct differences training and checking of crewmembers. Difference levels range from A to E.

6.4.Master Differences Requirements (MDR). Specifies the highest training and checking difference levels between a pair of related aircraft derived from the Differences Tables.

- 6.5.Mixed Fleet Flying.** The operation of a base aircraft and one or more related aircraft for which credit may be taken for training, checking, and currency events.
- 6.6.Operational Evaluation.** An AEG process to determine pilot type rating, minimum crewmember training, checking and currency requirements, and unique or special airman certification requirements (e.g., specific flight characteristics, no-flap landing).
- 6.7.Operational Suitability.** An AEG determination that an aircraft or system may be used in the National Airspace System (NAS) and meets the applicable operational regulations (e.g., 14 CFR parts 91, 121, 133, 135).
- 6.8.Qualified.** A crewmember holds the appropriate airman certificate and ratings as required by the applicable operating part.
- 6.9.Related Aircraft.** Any two or more aircraft of the same make with either the same or different type certificates that have been demonstrated and determined by the Administrator to have commonality.
- 6.10. Seat Dependent Tasks.** Maneuvers or procedures using controls that are accessible or operable from only one flightcrew member seat.
- 6.11. Special Emphasis Area.** A training requirement unique to the aircraft, based on a system, procedure, or maneuver, which requires additional highlighting during training. It may also require additional training time, specialized training devices or training equipment.
- 6.12. Specific Flight Characteristics.** A maneuver or procedure with unique handling or performance characteristics that the FSB has determined must be checked.

7. PILOT TYPE RATING

- 7.1.Type Rating.** The Boeing 787 type rating designation is B-787
- 7.2.Common Type Ratings.** In accordance with the provisions of FAA Order 8900.1 and AC 120-53B, the B-787 and the B-777 are separate type ratings that have been determined to have commonality.
- 7.3.Military equivalent designations.** Military aircraft that qualify for the B-787 can be found on the faa.gov website under Licenses and Certificates, Airmen Certification, Online Services, Aircraft Type Rating Designators. This webpage is kept up to date and can be found at http://www.faa.gov/licenses_certificates/airmen_certification/.

8. RELATED AIRCRAFT

8.1.Related Aircraft on same TCDS.

The B-787-8 has been evaluated by the AEG as related to the B-787-9.
The B-787-9 has been evaluated by the AEG as related to the B-787-8.

8.2.Related Aircraft on different TCDS. The B-787 is related to the B-777.
The B-787 has been evaluated by the AEG as related to the B-777.
The B-777 has been evaluated by the AEG as related to the B-787.

9. PILOT TRAINING

9.1.Airman Experience

Airmen receiving initial B-787 training should have previous operational experience in multi-engine transport turbojet aircraft, new generation avionics, high altitude operations, HUD, ECL, and Flight Management Systems (FMS). Pilots without this experience may require additional training.

Airmen receiving differences, upgrade, or transition B-787 training are assumed to have previous experience in multi-engine transport turbojet aircraft, new generation avionics, high altitude operations, HUD, ECL, and Flight Management Systems (FMS). Pilots without this experience may require additional training.

9.2.Special Emphasis Areas

Pilots must receive special emphasis on the following areas during initial ground training:

- Electronic Checklist (ECL) - Paper QRH back-up for the Electronic Checklist should also be trained.
- Electronic Flight Bag (EFB) – refer to the current version of the Boeing Class 3 Electronic Flight Bag FSB report
- Head Up Display (HUD)
- Tuning Control Panel (TCP)
- Display Management
- Engine variants (GE or Rolls Royce) if in the same fleet - pilots should be exposed to the alternate EICAS presentations by means of photos, drawings, or graphic media which would assure proper display interpretation and use by the flight deck crew

Pilots must receive special emphasis on, and perform the following areas during flight training:

- Flight Control Modes—This item must be included in initial and recurrent training.
- Envelope Protection—Aircraft response to bank angle indications and protection, thrust asymmetry protection, enhanced underspeed (stall) and overspeed protection. This item to be included in initial training.
- Fly by wire speed stability characteristics and aircraft trimming. This item to be included in initial training.
- Automatic Landings—Applicable if an operator conducts automatic landings in the B-787. This item to be included in initial training and recurrent training.

9.3.Specific Flight Characteristics

Maneuvers/Procedures required to be checked as referenced in the ATP and Type Rating PTS or ACS, as applicable, and/or Appendix F of part 121.
There are no specific flight characteristics.

9.4.Seat Dependent Tasks

There are no seat dependent tasks.

9.5.Regulatory Training Requirements Which Are Not Applicable to the B-787

Part 121, Appendix E

Tuck and Mach buffet. Demonstration of the aircraft's overspeed protection capabilities is an acceptable substitute.

9.6.Flight Simulation Training Devices (FSTD)

There are no specific systems, procedures, or maneuvers that are unique to the B-787 that require a specific FSTD for training.

9.7.Training Equipment

There are no specific systems or procedures that are unique to the B-787 that require specific training equipment.

9.8.Differences Training Between Related Aircraft

Pilots must receive differences training between the B-787-8 and B-787-9. The level of training is specified in Appendix 3, Differences Tables.

Pilots must receive differences training between the B-787 and B-777. The level of training is specified in Appendix 3, Differences Tables.

10. PILOT CHECKING

10.1. Landing from a No Flap or Non Standard Flap Approach.

The probability of flap extension failure on the B-787 is extremely remote due to system design. Therefore, demonstration of a partial flap approach and landing during pilot certification or a §§ 61.58 proficiency check, 91.1065 competency check, 121.441 proficiency check, 125.287 competency check, or 135.293 competency check is required.

Refer to Order 8900.1, Volume 5 when the test or check is conducted in an aircraft versus an FFS.

10.2. Specific Flight Characteristics.

Maneuvers/Procedures required to be checked as referenced in the ATP and Type Rating PTS or ACS, as applicable, and/or Appendix F of part 121.

There are no specific flight characteristics.

10.3. Seat Dependent Tasks.

There are no seat dependent tasks.

10.4. Other Checking Items

- a) Proficiency with manual and automatic flight. Initial and recurrent checking.
- b) FMS operation and FMS failures. Initial and recurrent checking.
- c) Use and knowledge of map displays, raw data, flight director, and Autopilot Flight Director System (AFDS) should be demonstrated, particularly during instrument approaches. All types of checking.
- d) FMS/Global Positioning Satellite (GPS) navigation (departures and approaches) proficiency if these type operations are approved for the operator. Initial and recurrent checking.
- e) ECL during normal and non-normal procedures. All types of checking.
- f) Proper management of speed and attitude stability functionality of flight controls in normal operations. Initial and recurrent checking.
- g) Proper use and knowledge of the Look Ahead Terrain Function of the enhanced ground proximity warning system (EGPWS) (if installed). Initial and recurrent checking.
- h) Proper use and knowledge of the Predictive wind shear system (if installed). All types of checking.
- i) Proper use of the HUD to include all phases of flight. All types of checking.
- j) Proper use of the EFB. Initial and recurrent checking.

10.5. Flight Simulation Training Devices (FSTD).

There are no specific systems, procedures, or maneuvers that are unique to the B-787 that require a specific FSTD for checking.

10.6. Equipment.

There are no specific systems or procedures that are unique to the B-787 that require specific equipment.

10.7. Differences Checking Between Related Aircraft.

There are no differences checking required between the B-787-8 and the B-787-9.

Pilots must receive difference checking between the B-787 and B-777. The level of checking is specified in Appendix 3 Differences Tables.

Alternating B-777 and B-787 Proficiency Checks. For mixed fleet flying between B-777 and B-787 aircraft, Proficiency Checks should alternate for pilots in command (PICs) and other flightcrew members. The preflight and equipment examination portion of initial and recurrent proficiency checks should address each aircraft operated by the flight crewmember in mixed fleet flying.

11. PILOT CURRENCY.

There are no additional currency requirements for the B-787 other than those already specified in parts 61, 121, 125, and 135.

11.1. Differences Currency Between Related Aircraft.

There are no differences currency requirements between the B-787-8 and B-787-9.

There are no differences currency requirements for Part 121 Mixed Fleet Flying (MFF) of the B-787 aircraft and B-777 aircraft. Takeoff and landing credit may be permitted between B-787 and B-777 variations. Takeoffs and landings performed in one aircraft variation are equivalent to those performed in the other aircraft variation.

12. OPERATIONAL SUITABILITY.

The B-787 is operationally suitable for operations under parts 91, 121, 125, and 135. The FSB determined operational compliance by conducting an evaluation of a B-787-8 and B-787-9 aircraft. The list of operating rules evaluated is on file at the Seattle AEG.

13. MISCELLANEOUS

13.1. Forward Observer Seat.

The B-787 center forward and right forward observer seats as installed by TC T00021SE have been evaluated and determined to meet requirements of §§ 121.581(a), 125.317(b), 135.75(b) and Advisory Circular (AC) 120-83. The forward center observer seat is identified as the primary forward observer seat.

13.2. Landing Minima Categories.

Reference 14 CFR section 97.3 - The B-787-8 and B-787-9 is considered Category C aircraft for the purposes of determining "straight-in landing weather minima."

13.3. Emergency Evacuation.

A full scale emergency evacuation was successfully completed on the B-787 by Boeing. The demonstration complied with § 121.291(a).

13.4. Normal Landing Flaps.

The B-787 (all variations) normal "final landing flap setting" per § 91.126(c) are Flap settings 25 and 30.

13.5. Aircraft Proving Tests.

Proving tests in accordance with §§ 135.145, 121.163 are appropriate when the B-787 is new to an operator.

13.6. Flight Crew Rest Facilities (part 117)/Flight Crew Sleeping Quarters (part 121, subpart R).

The B-787 overhead flight crew rest as installed by TC 00021SE has been evaluated and determined to meet requirements of part 117 and 121 through Advisory (AC) 117-1 and AC 121-31 respectively.

APPENDIX 1 DIFFERENCES LEGEND

Training Differences Legend

Differences Level	Type	Training Method Examples	Conditions
A	Self-instruction	<ul style="list-style-type: none"> • Operating manual revision (HO) • Flight crew operating bulletin (HO) 	<ul style="list-style-type: none"> • Crew has already demonstrated understanding on base aircraft (e.g., updated version of engine). • Minor or no procedural changes required. • No safety impact if information is not reviewed or is forgotten (e.g., different engine vibration damping mount). • Once called to attention of crew, the difference is self-evident.
B	Aided instruction	<ul style="list-style-type: none"> • Audiovisual presentation (AV) • Tutorial computer based instruction (TCBI) • Stand-up instruction (SU) 	<ul style="list-style-type: none"> • Systems are functionally similar. • Crew understanding required. • Issues need emphasis. • Standard methods of presentation required.
C	Systems Devices	<ul style="list-style-type: none"> • Interactive (full-task) computer based instruction (ICBI) • Cockpit procedures trainers (CPT) • Part task trainers (PTT) • Level 4 or 5 flight training device (FTD 4-5) 	<ul style="list-style-type: none"> • Training can only be accomplished through systems training devices. • Training objectives focus on mastering individual systems, procedures, or tasks versus highly integrated flight operations or “real-time” operations. • Training devices are required to assure attainment or retention of crew skills to accomplish more complex tasks usually related to aircraft systems.
D	Maneuvers Devices	<ul style="list-style-type: none"> • Level 6 or 7 flight training device (FTD 6-7) • Level A or B full flight simulator (FFS A-B) 	<ul style="list-style-type: none"> • Training can only be accomplished in flight maneuver devices in a real-time environment. • Training requires mastery of interrelated skills versus individual skills. • Motion, visual, control loading, and specific environmental conditions may be required.
E	Level C/D FFS or Aircraft	<ul style="list-style-type: none"> • Level C or D full flight simulator (FFS C-D) • Aircraft (ACFT) 	<ul style="list-style-type: none"> • Motion, visual, control loading, audio, and specific environmental conditions are required. • Significant full task differences that require a high fidelity environment. • Usually correlates with significant differences in handling qualities.

Checking Differences Legend

Differences Level	Checking Method Examples	Conditions
A	None	None
B	<ul style="list-style-type: none"> • Oral or written exam • Tutorial computer based instruction self-test (TCBI) 	<ul style="list-style-type: none"> • Individual systems or related groups of systems.
C	<ul style="list-style-type: none"> • Interactive (full-task) computer based instruction (ICBI) • Cockpit procedures trainers (CPT) • Part task trainers (PTT) • Level 4 or 5 flight training device (FTD 4-5) 	<ul style="list-style-type: none"> • Checking can only be accomplished using systems devices. • Checking objectives focus on mastering individual systems, procedures, or tasks.
D	<ul style="list-style-type: none"> • Level 6 or 7 flight training device (FTD 6-7) • Level A or B full flight simulator (FFS A-B) 	<ul style="list-style-type: none"> • Checking can only be accomplished in flight maneuver devices in a real-time environment. • Checking requires mastery of interrelated skills versus individual skills. • Motion, visual, control loading, and specific environmental conditions may be required.
E	<ul style="list-style-type: none"> • Level C or D full flight simulator (FFS C-D) • Aircraft (ACFT) 	<ul style="list-style-type: none"> • Significant full task differences that require a high fidelity environment.

APPENDIX 2 MASTER DIFFERENCES REQUIREMENTS (MDR) TABLE

These are the minimum levels of training and checking required, derived from the highest level in the Differences Tables in Appendix 3. Differences levels are arranged as training/checking.

Related Aircraft ↓	Base Aircraft →	B-787-8	B-787-9
B-777-200 (B-777-200 series, B-777-200LR series, B-777F series)		D/D	D/D
B-777-300 (B-777-300 series, B-777-300ER series)		D/D	D/D
B-787-8		Not applicable	A/A
B-787-9		A/A	Not applicable

APPENDIX 3 DIFFERENCES TABLES

This Design Differences table, from the 777-300ER to the 787-8 and 787-9, was proposed by Boeing and validated by the FSB. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
TO RELATED AIRCRAFT: 787-8, 787-9	DIMENSIONS	787-8 - Length = 186 feet 1 inches (56.74 meters) - Height = 55 feet 6 inches (16.92 meters) - Wing Span = 197 feet 4 inches (60.12 meters) - Nose gear to main gear = 74 feet 9 inches (22.80 meters) 787-9 - Length = 206 feet 1 inches (62.82 meters) - Height = 55 feet 10 inches (17.02 meters) - Wing Span = 207 feet 10 inches (63.3 meters) - Nose gear to main gear = 84 feet 9 inches (25.80 meters)	No	No	A	A

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	FLIGHT DECK	FLIGHT DECK ARRANGEMENT - PFD/ND format, large displays PILOT'S FIELD OF VIEW: - Pilot eye height (above ground) - Minor differences Flight deck overhead hatch. Non-opening number two windows	No	No	A	A
	CABIN	787 max passenger capacity is variable by customer choice	No	No	A	A
	CARGO	BULK CARGO - Left side	No	No	A	A
	ENGINES	Rolls Royce Trent 1000 General Electric GEN X	No	Yes	A	A
	LIMITATIONS	WEIGHT/CG DIFFERENCE - Size/type/system limitations VMO/MMO Flap Placard Speeds	No	Yes	A	A

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	21-AIR CONDITIONING	CONTROLS AND INDICATORS - Panel layout PACKS: - Electric compressors ALTERNATE VENTILATION: - New Function EQUIPMENT COOLING - Forward and Aft System - Smoke EICAS message CARGO HEAT SYSTEM: - Switch types - Automated functions	No	Yes	B	B

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	22-AUTOFLIGHT	MODE CONTROL PANEL - MCP 2 line windows (Speed, Heading, and Altitude) Future uplink feature - Integrated Approach Navigation - Bank limit selector AFDS FLIGHT MODE ANNUCIATIONS: - Same except addition of Integrated Approach Navigation and GLS AUTOMATIC FLIGHT APPROACH AND LANDING: - Same except addition of Integrated Approach Navigation and GLS	No	Yes	B	B

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	23- COMMUNICATIONS	CONTROLS AND INDICATORS: - New Tuning Control Panel (TCP) VHF, HF, PA, CABIN/FLIGHT AND SERVICE INTERPHONE - Control resides in Tuning Control Panel (TCP) SATCOM - Control resides in Tuning Control Panel (TCP) AUDIO CONTROL PANEL - Same except PA MIC switch function	No	Yes	B	B

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	24-ELECTRICAL POWER	ELECTRICAL CONTROL PANEL - System architecture – functionally equivalent - No bus tie switches - Additional Engine Generator and Drive Disconnect switches - Additional APU Generator switch - Additional external power switches AC ELECTRICAL - Four Engine Starter Generators - Two APU Starter Generators - No backup generators AC ELECTRICAL POWER DISTRIBUTION - No flight instrument transfer busses DC ELECTRICAL - System architecture – functionally equivalent BATTERY/STANDBY POWER SYSTEM - System architecture – functionally equivalent AUTOLAND - System architecture – functionally equivalent	No	Yes	B	B

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	25-EQUIPMENT/ FURNISHING	FLIGHT DECK GENERAL ARRANGEMENT: - Non-opening number two windows - Flight deck door controls to aisle stand and alerting EICAS - Flight Deck Overhead hatch - C/Bs panels location – Main display system	No	Yes	A	A
	25-EMERGENCY EVACUATION	EMERGENCY EVACUATION PANEL - Same functions – Integrated aisle stand panel	No	No	A	A
	26-FIRE PROTECTION	APU FIRE CONTROLS AND INDICATORS: - Same panel/location - More automation CARGO FIRE CONTROLS AND INDICATORS: - Same panel/location - Additional automation for composite structure protection	No	Yes	A	A

	<p>27-FLIGHT CONTROLS</p>	<p>FLIGHT CONTROL SYSTEMS</p> <ul style="list-style-type: none"> - Roll - Roll rate command – same handling - Yaw - Yaw rate command – same handling <p>FLIGHT ENVELOPE PROTECTION:</p> <ul style="list-style-type: none"> - Enhanced Stall Protection (ESP) <p>STABILIZER TRIM:</p> <ul style="list-style-type: none"> - Electrical back-up trim control - Electrically actuated <p>TRIM INDICATORS:</p> <ul style="list-style-type: none"> - Indicator location on primary EICAS display - Aileron trim eliminated <p>THRUST ASYMMETRY COMPENSATION:</p> <ul style="list-style-type: none"> - No TAC Switch – available full time - Embedded in flight control law - Yaw rate based <p>FLAP LOAD RELIEF</p> <ul style="list-style-type: none"> - Functionally equivalent but different threshold sensing <p>ALTERNATE FLAP OPERATION</p> <ul style="list-style-type: none"> - Alternate mode – minor differences <p>CRUISE FLAPS SYSTEM</p> <ul style="list-style-type: none"> - New performance enhancement system with EICAS message 	No	Yes	A	A
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FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	28-FUEL	FUEL TANKS: - Fuel Tank Capacities differ - Fuel tank inerting system CONTROLS AND INDICATORS: - Panel layout – minor differences - One Crossfeed - Fuel balance switch FUEL PUMPS: Center tank pump operation – minor differences	No	Yes	B	B
	29 –HYDRAULIC POWER	CONTROLS AND INDICATORS: - Panel layout HYDRAULIC SYSTEMS: - 5000 psi	No	Yes	A	A
	30- ICE AND RAIN	WIPER PANEL - Same panel location - Washer switches WING ANTI-ICE - Electric heater blankets	No	Yes	A	A

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	31- FLIGHT INSTRUMENT DISPLAYS	EFIS CONTROL PANEL PFD/ND CONTROLS - Map switches moved to soft controls - minor - ND mode selector – rotary control display selection - ND range selector -.5 – 1280 NM DISPLAY SELECT PANEL - Panel layout - four DSPs - Synoptic soft switches – software menu - EICAS display position switch PFD/MFD SELECTOR - PFD/MFD functionally similar to INBD DSPL selector - Different location INSTRUMENT SOURCE SELECTORS - Air data/attitude different switch type - NAV switch eliminated - DSPL CTRL switch eliminated CURSOR CONTROL - Minor differences - additional rotary control DISPLAY FORMATS:	No	Yes	C	C

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
		<ul style="list-style-type: none"> - Enhanced large format capabilities - Clock integrated in display format - Airport map - Vertical Situation Display (VSD) STANDBY FLIGHT INSTRUMENTS - Same instrument minor relocation 				
	31- FLIGHT INSTRUMENT DISPLAYS	HEAD UP DISPLAY (HUD): <ul style="list-style-type: none"> - Dual installation 	No	Yes	D	D

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	32-LANDING GEAR	MAIN GEAR: - Twin tandem bogie assembly (4 wheels) - No aft axle steering NOSE WHEEL STEERING TILLER: - Steer by wire - Functionally equivalent - Nose gear cutout switch BRAKES: - System operation – functionally equivalent - Electric brakes - Battery indication vs. accumulator	No	Yes	A	A

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	34 –NAVIGATION	CONTROL DISPLAY UNIT - Display based CDU - Cursor Controls - Message/Help window FLIGHT MANAGEMENT SYSTEM - Added design features INERTIAL REFERENCE SYSTEM - Air data system separate TRANSPONDER PANEL - Control integrated into the Tuning Control WEATHER RADAR CONTROL PANEL - Control integrated into the Tuning Control Alternate NAV - Function in Tuning Control Panel (TCP)	No	Yes	B	B
	36-PNEUMATIC	BLEED AIR CONTROL PANEL - Overhead Panel	No	No	A	A
	49- APU	SYSTEM OPERATION - Bleed Air and electric power - Air Turbine Starter	No	No	A	A

FROM BASE AIRCRAFT: 777-300ER TO RELATED AIRCRAFT: 787-8, 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	52-DOORS	8 entry doors – minor differences	No	No	A	A
	70-POWER PLANT	ENGINES: - GE90-115B - engine type design	No	Yes	A	A
	73- ENGINE FUEL AND CONTROL	EEC SYSTEM - Functionally equivalent	No	No	A	A
	77- ENGINE INDICATING	INDICATORS - Minor differences for each engine manufacturer	No	Yes	B	B
	80 STARTING	CONTROLS AND INDICATORS - Panel layout - System operation - Pneumatic starter	No	Yes	B	B

This Design Differences table, from the 787-8 and 787-9 to the 777-300ER, was proposed by Boeing and validated by the FSB. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	GENERAL	LONG RANGE	No	No	A	A
	DIMENSIONS	777-300ER Length = 242 feet 4 inches (73.9 meters) Height = 60 feet 10 inches (18.54 meters) Wing Span = 212 feet 7 inches (64.8 meters) Nose gear to main gear = 102 feet 5 inches (31.2 meters)	No	No	A	A
	FLIGHT DECK	FLIGHT DECK ARRANGEMENT - PFD/ND format, smaller displays PILOT'S FIELD OF VIEW: - Pilot eye height (above ground) - minor differences Number two windows on flight deck open	No	No	A	A
	CABIN	777 max passenger capacity is variable by customer choice	No	No	A	A
	CARGO	BULK CARGO - Right side	No	No	A	A

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ENGINES	General Electric Model GE90-115B	No	Yes	A	A
	LIMITATIONS	WEIGHT/CG DIFFERENCE - Size/type/system limitations VMO/MMO Flap placard speeds differ	No	Yes	A	A
	21 – AIR CONDITIONING	CONTROLS AND INDICATORS - Panel layout PACKS: - Engine Bleed Air ALTERNATE VENTILATION: - N/A EQUIPMENT COOLING: - Forward System Only CARGO HEAT SYSTEM: - Switch types - Automated functions	No	Yes	B	B

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	22 – AUTOFLIGHT	MODE CONTROL PANEL - MCP single windows (speed, heading, and altitude) - Bank limit selector AFDS FLIGHT MODE ANNUCIATIONS: - Same except no Integrated Approach Navigation or GLS AUTOMATIC FLIGHT APPROACH AND LANDING: - Same except no Integrated Approach Navigation or GLS	No	Yes	B	B
	23 – COMMUNICATIONS	CONTROLS AND INDICATORS: - Radio Tuning Panel VHF, HF, SATCOM, PA, CABIN/FLIGHT AND SERVICE INTERPHONE - Controlled by audio control panel - Tuning on radio control panel (VHF and HF) AUDIO CONTROL PANEL - Same except PA MIC switch function	No	Yes	B	B

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	24 – ELECTRICAL	ELECTRICAL CONTROL PANEL - System architecture – functionally equivalent - Bus tie switches - One Engine Generator and Drive Disconnect switch per engine - One APU Generator switch - Two external power switches AC ELECTRICAL - Two Engine Starter Generators - One APU Starter Generators - Two backup generators AC ELECTRICAL POWER DISTRIBUTION - Two flight instrument transfer busses DC ELECTRICAL - System architecture – functionally equivalent BATTERY/STANDBY POWER SYSTEM - System architecture – functionally equivalent AUTOLAND - System architecture – functionally equivalent	No	Yes	B	B

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	25-EQUIPMENT/ FURNISHING	FLIGHT DECK GENERAL ARRANGEMENT: - Two opening number two windows - Flight deck access system switch to flight deck side door post - C/Bs panels location – overhead panel	No	Yes	A	A
	25-EMERGENCY EVACUATION	EMERGENCY EVACUATION PANEL - Same functions – Integrated aisle stand panel	No	No	A	A
	26-FIRE PROTECTION	APU FIRE CONTROLS AND INDICATORS: - Same panel/location - Less automation CARGO FIRE CONTROLS AND INDICATORS: - Same panel/location	No	Yes	A	A

	27 –FLIGHT CONTROLS	<p>PRIMARY FLIGHT CONTROL SURFACES</p> <ul style="list-style-type: none"> - Roll: different mix same roll effect <p>FLIGHT CONTROL SYSTEMS</p> <ul style="list-style-type: none"> - Roll - Roll rate command – same handling - Yaw - Yaw rate command – same handling <p>FLIGHT ENVELOPE PROTECTION:</p> <ul style="list-style-type: none"> - Functionally equivalent <p>STABILIZER TRIM:</p> <ul style="list-style-type: none"> - Alternate pitch trim levers <p>TRIM INDICATORS:</p> <ul style="list-style-type: none"> - Pitch trim on Control Stand - Aileron trim on control wheel/column - Rudder trim on aft aisle stand <p>THRUST ASYMMETRY COMPENSATION:</p> <ul style="list-style-type: none"> - TAC Switch on overhead panel - Engine thrust based FLAP <p>LOAD RELIEF</p> <ul style="list-style-type: none"> - Functionally equivalent but different threshold sensing <p>ALTERNATE FLAP OPERATION</p> <ul style="list-style-type: none"> - Alternate mode – minor differences <p>CRUISE FLAPS SYSTEM</p> <ul style="list-style-type: none"> - None 	No	Yes	A	A
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FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	28 - FUEL	FUEL TANKS: - Fuel Tank Capacities differ - No Nitrogen generating system (NGS) CONTROLS AND INDICATORS: - Panel layout – minor differences - Two Crossfeed - No fuel balance switch FUEL PUMPS: - Center tank pump operation – minor differences	No	Yes	B	B
	29 –HYDRAULIC POWER	CONTROLS AND INDICATORS: - Panel layout HYDRAULIC SYSTEMS: - 3000 psi CENTER HYDRAULIC SYSTEM - Two air-driven demand pumps - Two electric pumps	No	Yes	A	A
	30-ICE AND RAIN	WIPER PANEL - Same panel location - Washer switches WING ANTI-ICE - Bleed air heats three midwing leading edge slats on each wing	No	Yes	A	A

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	31- FLIGHT INSTRUMENT DISPLAYS	EFIS CONTROL PANEL PFD/ND CONTROLS - Map switches on EFIS panel - ND mode selector – EFIS control panel - ND range selector – 10 - 640 NM DISPLAY SELECT PANEL (DSP) - Panel layout - One DSP INBOARD DISPLAY CONTROLS - functionally similar to PFD/MFD selector - Different location INSTRUMENT SOURCE SELECTORS - Air data/attitude different switch type - NAV switch - DSPL CTRL switch CURSOR CONTROL - Minor differences - no rotary control DISPLAY FORMATS: - Smaller format capabilities	No	Yes	C	C

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
		<ul style="list-style-type: none"> - Clock on left and right forward panels - Airport map on EFB - No Vertical Situation Display (VSD) STANDBY FLIGHT INSTRUMENTS - Same instrument minor relocation 				
	31- FLIGHT INSTRUMENT DISPLAYS	HEAD UP DISPLAY (HUD): <ul style="list-style-type: none"> - None 	No	No	A	A
	32 – LANDING GEAR	MAIN GEAR: <ul style="list-style-type: none"> - Each gear has six wheels in tandem pairs - Has aft axle steering NOSE WHEEL STEERING TILLER: <ul style="list-style-type: none"> - Hydraulic powered - Functionally equivalent BRAKES: <ul style="list-style-type: none"> - System operation – functionally equivalent - Hydraulic brakes - Brake accumulator pressure indicator 	No	Yes	A	A

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	34 - NAVIGATION	CONTROL DISPLAY UNIT - Conventional CDU FLIGHT MANAGEMENT SYSTEM - Functionally equivalent AIR DATA INERTIAL REFERENCE SYSTEM (ADIRU) - One ADIRU, one SAARU, eight air data modules TRANSPONDER PANEL - On aft aisle stand WEATHER RADAR CONTROL PANEL - On aft aisle stand Alternate NAV - CDUs can be used if both FMCs fail	No	Yes	B	B
	36-PNEUMATIC	BLEED AIR CONTROL PANEL - Overhead panel	No	No	A	A
	49 - APU	SYSTEM OPERATION - Bleed Air and electric power - Air Turbine Starter	No	No	A	A
	52 - DOORS	DOORS: - Eight entry doors -same	No	No	A	A

FROM BASE AIRCRAFT: 787-8, 787-9 TO RELATED AIRCRAFT: 777-300ER	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	70 - POWERPLANT	ENGINES: - GE90-115B - engine type design differences	No	Yes	A	A
	73 – ENGINE FUEL AND CONTROL	EEC SYSTEM - Functionally equivalent	No	No	A	A
	77 – ENGINE INDICATING	INDICATORS - Minor differences for each engine manufacturer	No	Yes	B	B
	80 - STARTING	CONTROLS AND INDICATORS - Panel layout - System operation - Pneumatic starter	No	Yes	B	B

This Design Differences table, from the 787-8 to the 787-9, was proposed by The Boeing Company and validated by the FSB. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: 787-8	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
TO RELATED AIRCRAFT: 787-9	GENERAL	- Increased dimensions and passenger capability	No	No	A	A
	DIMENSIONS	Length = 206 feet 1 inches (62.82 meters) Height = 55 feet 10 inches (17.02 meters) Wing Span = 197 feet 3 inches (60.3 meters) Nose gear to main gear = 84.9 feet	No	No	A	A
	FLIGHT DECK	- Flap handle quadrant: added 10, 17, and 18 detents	No	No	A	A
	CABIN	- Passenger capacity increased and is variable by customer	No	No	A	A
	CARGO	- Increased cargo capacity	No	No	A	A
	ENGINES	Thrust increase available on Rolls Royce Trent 1000 General Electric GEN X	No	No	A	A
	LIMITATIONS	Weight/CG difference Changed Flap Placard to annotate 10, 17, and 18 flap speeds	No	No	A	A
	21-AIR CONDITIONING	- ALTERNATE VENTILATION VALVE - Deleted	No	No	A	A

FROM BASE AIRCRAFT: 787-8 TO RELATED AIRCRAFT: 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	21-PRESSURIZATION	- Alternate Ventilation System differences. Display of outflow valve position differs to reflect system differences.	No	No	A	A
	27-FLIGHT CONTROLS	Additional takeoff flap settings 10,17,18	No	No	A	A
	28-FUEL	Fuel tank Capacities differ slightly	No	No	A	A
	70-POWER PLANT	Thrust increase available on engines	No	No	A	A

This Design Differences table, from the 787-9 to the 787-8, was proposed by The Boeing Company and validated by the FSB. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: 787-9	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
TO RELATED AIRCRAFT: 787-8						
	GENERAL	- Decreased dimensions	No	No	A	A
	DIMENSIONS	Length = 186 feet 1 inches (56.74 meters) Height = 55 feet 6 inches (16.92 meters) Wing Span = 197 feet 3 inches (60.12 meters) Nose gear to main gear = 74.9 feet (22.80 meters)	No	No	A	A
	FLIGHT DECK	- Flap handle quadrant: removed 10, 17 and 18 detents	No	No	A	A
	CABIN	- Passenger capacity decreased and is variable by customer choice	No	No	A	A
	CARGO	- Decreased cargo capacity	No	No	A	A
	ENGINES	Decreased thrust available on engines Rolls Royce Trent 1000 General Electric GEN X	No	No	A	A
	LIMITATIONS	Weight/CG difference Changed Flap Placard to eliminate 10, 17, and 18 flap limit	No	No	A	A
	21-AIR CONDITIONING	- ALTERNATE VENTILATION VALVE - Added	No	No	A	A

FROM BASE AIRCRAFT: 787-9 TO RELATED AIRCRAFT: 787-8	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	21-PRESSURIZATION	- Alternate Ventilation System differences. Display of outflow valve position differs to reflect system differences.	No	No	A	A
	27-FLIGHT CONTROLS	Removal takeoff flap settings 10,17,18	No	No	A	A
	28-FUEL	Fuel tank Capacities differ slightly	No	No	A	A
	70-POWER PLANT	Thrust decreased on available engines	No	No	A	A

This Maneuver Differences table, from the 787-8/787-9 to the 777-300ER, was proposed by The Boeing Company and validated by the FSB. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: 787-8/787-9	MANUEVER	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
TO RELATED AIRCRAFT: 777-300ER	Exterior Preflight	Minor differences	No	No	A	A
	Preflight Procedures	Minor Differences due to systems	No	Yes	A	A
	Before Start Procedures	Minor differences	No	Yes	B	B
	Taxi	Minor differences (Airport Map on EFB)	No	Yes	B	B
	Engine failure/V1	Minor differences (TAC off)	No	No	D	D
	Go-Around (All Engines)	Minor differences (TOGA to LNAV optional)	No	Yes	A	A
	ILS Engine Inoperative	Minor differences (TAC off)	No	No	D	D
	Go-Around	Minor differences (TAC off)	No	No	D	D
	Manual Landing (One Engine)	Minor differences (TAC off)	No	No	D	D
	Non-ILS approach	Minor differences (no Integrated Approach Navigation)	No	Yes	A	A

This Maneuver Differences table, from the 787-8 to the 787-9, was proposed by The Boeing Company and validated by the FSB. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: 787-8	MANUEVER	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
TO RELATED AIRCRAFT: 787-9						
	Takeoff Procedures	- Added takeoff flap positions: 10, 17, 18	No	No	A	A

This Maneuver Differences table, from the 787-9 to the 787-8, was proposed by The Boeing Company and validated by the FSB. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: 787-9	MANUEVER	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
TO RELATED AIRCRAFT: 787-8						
	Takeoff Procedures	- Removed takeoff flap positions: 10, 17, 18	No	No	A	A