777 MINIMUM EQUIPMENT REQUIREMENT FOR VARIOUS OPERATIONS

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0.1 APPROVAL SHEET

Activity	Name	Designation	Signatur	Date
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Approved by:	Capt. Irfan Khan	Chief of Flight Operations/DFO	Irfan Khan	25-May-2026

0.2 REVISION RECORD

Edition number	Revision number	Revision date
01	00	23 MAY 2024
01	01	25 MAY 2026

0.3 REVISION SUMMARY

REV 00: Initial book

REV 01: Source document references updated

0.4

0.4 TABLE OF CONTENTS

0.5 LIST OF EFFECTIVE PAGES

1 INTRODUCTION

This book is a controlled document to mention equipment requirement for various operations by the use of Flight Crew and other relevant users.

Following Opertations are considered for contents of this book:

1. RVSM
2. RNP1/2
3. RNP 4
4. RNAV1/2
5. RNP 10/RNAV 10
6. NAT HLA
7. ETOPS/EDTO

For Auto Land CAT III, refer 777 MEL Annexure 4.

RELEVANT POSITION HOLDERS

DGM Operations Engineering-II (Custodian of Master soft copy – No other hard copy will be issued)

Soft copy:

All relevant office holders shall refer to controlled soft copy on corporate intranet.

All Operations Engineers

1. RVSM

RVSM regulations require the following equipment/functions in order to be operative:

- Two Independent Altitude Measurement Systems
- One Secondary Surveillance Radar (SSR) Altitude Reporting Transponder
- An Altitude Alert System
- An Automatic Altitude Control System

Reference is:

a) FAA Advisory Circular AC_91-85B dated 29 Jan 2019
b) Boeing Service Letter 777-SL-02-002-E ATA: 0200-41 13 September 2016

2. RNP 1 / RNP 2

The 777 is capable of meeting the aircraft performance and functional criteria for the airplane to qualify for the RNP operations under FAA AC 90-105A (Appendices C and E) and ICAO PBN RNP 1 / RNP 2 navigation specifications, when the airplane is equipped with at least the following equipment as originally delivered by Boeing or as installed by FAA approved Boeing Service Bulletin:

- Dual Flight Management Computing Functions
- Dual Multi-Purpose Control and Display Units (MCDU)
- Dual GPS*
- Dual Multi-mode Receivers (MMR) with GPS or dual Global Position System Sensor Units (GPSSU) – (GPS L or GPS R advisory level alert not shown with AIMS-2 BP17A or later)
- Dual Primary Flight Displays (PFDs)
- Dual Navigation Displays (NDs)
- EICAS Display
- Single Autopilot Flight Director Computer operative
- Single Flight Director

- Fault Tolerant ADIRU
- AIMS-1 V16 and AIMS-2 V17 or later: (AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)
- All other AIMS-1 or AIMS-2 versions: (NAV AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)
- Current navigation database
- Single GPS/GPSSU operation requires regulatory agency approval provided reversion to a different navigation system is available (For example: DME/DME, DME/VOR, VOR, ADF) to proceed to a suitable airport. Dual GPS/GPSSU operation is required for RNP 2 over oceanic and remote continental airspace.

  Reference is: Boeing's document D243W018-13

3. RNP 4

The 777 is capable of meeting the aircraft performance and functional criteria for the airplane to qualify for the RNP operations under FAA Order 8400.33, FAA AC 90-105A (Appendix F) and ICAO PBN RNP 4 navigation specification, when the airplane is equipped with at least the following equipment as originally delivered by Boeing or as installed by FAA approved Boeing Service Bulletin:

- Dual Flight Management Computing Functions (FMCF) (FMC L or FMC R advisory level alert not shown)
- Dual Multi-Purpose Control and Display Units (MCDU)
- Dual GPS
- Dual Multi-mode Receivers (MMR) with GPS or dual Global Position System Sensor Units (GPSSU) – (GPS L or GPS R advisory level alert not shown with AIMS-2 BP17A or later)
- Dual Primary Flight Displays (PFDs)
- Dual Navigation Displays (NDs)
- EICAS Display
- Single Autopilot Flight Director Computer operative
- Single Flight Director

- Fault Tolerant ADIRU
- AIMS-1 V16 and AIMS-2 V17 or later: (AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)
- All other AIMS-1 or AIMS-2 versions: (NAV AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)
- Current navigation database

Note: Verify the following FMC CDU scratchpad/EICAS messages are not shown:

VERIFY POSITION

NAV UNABLE RNP

Reference is: Boeing's document D243W018-13

4. RNAV 1 / RNAV 2

The 777 is capable of meeting the aircraft performance and functional criteria for the airplane to qualify for the RNAV 1 and RNAV 2 enroute and terminal area procedure operations under FAA AC 90-100A and ICAO PBN RNAV 1/ RNAV 2 navigation specifications, when the airplane is equipped with at least the following equipment as originally delivered by Boeing or as installed by FAA approved Boeing Service Bulletin.

- Dual Flight Management Computing Functions*
- Dual Multi-Purpose Control and Display Units (MCDU) *
- Any of the following sensor combinations:
- DME receiver for DME/DME radio updating
- VOR with DME for VOR/DME radio updating
- GPS receiver
- Multi-mode Receiver with GPS functionality
- GPSSU
- Fault Tolerant ADIRU
- AIMS-1 V16 and AIMS-2 V17 or later: (AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)

- All other AIMS-1 or AIMS-2 versions: (NAV AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)
- Dual Primary Flight Displays (PFDs)
- Dual Navigation Displays (NDs)
- EICAS Display
- Single Autopilot Flight Director Computer operative
- Single Flight Director
- Current navigation database

Note: Verify the following FMC CDU scratchpad/EICAS messages are not shown:

VERIFY POSITION

NAV UNABLE RNP

* Single FMC/MCDU operation requires regulatory agency approval provided reversion to a different navigation system is available (For example: VOR, ADF) to proceed to a suitable airport.

Reference is: Boeing's document D243W018-13

5. RNP 10 / RNAV 10

The 777 is capable of meeting the aircraft performance and functional criteria for the airplane to qualify for the RNP 10 / RNAV 10 operations under FAA Order 8400.12B, FAA AC 90-105A (Appendix G) and ICAO PBN RNAV 10 navigation specification, when the airplane is equipped with at least the following equipment as originally delivered by Boeing or as installed by FAA approved Boeing Service Bulletin:

- Dual Flight Management Computing Functions (FMCF)* (FMC L or FMC R advisory level alert not shown) and dual Multi-Purpose Control and Display Units (MCDU)* or single FMC and dual MCDU (Alternate navigation capability is basic)
- Dual Multi-mode Receivers (MMR) with GPS or dual Global Position System Sensor Units (GPSSU) – (GPS L or GPS R advisory level alert not shown with AIMS-2 BP17A or later) or without GPS, time-limited IRS operations without position update (6.2 hours since IRUs enter the nav mode and 5.9 hours after a DME/DME update)
- Dual Primary Flight Displays (PFDs)

- Dual Navigation Displays (NDs)
- EICAS Display
- Single Autopilot Flight Director Computer operative
- Single Flight Director
- Fault Tolerant ADIRU
- AIMS-1 V16 and AIMS-2 V17 or later: (AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)
- All other AIMS-1 or AIMS-2 versions: (NAV AIR DATA SYS or NAV ADIRU INERTIAL alerts not shown)
- Current navigation database

Note: Verify the following FMC CDU scratchpad/EICAS messages are not shown:

VERIFY POSITION

NAV UNABLE RNP

* Single configuration requires regulatory agency approval.

Reference is: Boeing's document D243W018-13

6. NAT HLA

In order to operate in NAT HLA airspace, the aircraft must have following capabilities:

- RNP4 or RNAV10 capability
- RVSM capability

Reference is: ICAO NAT Doc 007 North Atlantic Operations and Airspace Manual

7. ETOPS/EDTO

Reference is: 777 ETOPS Significant System Guide extracted from Boeing document D044W045 777 Configuration, Maintenance & Procedures Supplement.

777 ETOPS Significant Systems

ATA Chapter	777 ETOPS Significant System	ATA M/M Subsection	Criteria Group 1	Criteria Group 2
21 Air Conditioning	Cabin Pressure Control System	-31	X	
	Pack Flow Control	-51	X	
	Pack Cooling and Mix Manifold Temperature Control	-52	X	
	Zone Temperature Control and Indication	-61		X
22 Auto Flight	Autopilot Flight Director System	-11		X
	Thrust Management Computing System*	-31		X
23 Communications	High Frequency (HF) Communication System	-11		X
	SATCOM*	-15		X
24 Electrical Power	Generator Drive System	-11	X	
	Power and Regulation	-21	X	
	AC Generation and Bus Control	-22	X	
	Backup Electrical Power	-25	X	
	Transformer Rectifier Units (TRUs)	-32		X
26 Fire Protection	Engine Fire Detection	-11	X	
	APU Fire Detection	-15		X
	Lower Cargo Compartment and E/E Smoke Detection	-16		X
	Lower Cargo Compartment Fire Extinguishing	-23		X
28 Fuel	Engine Fuel Feed System	-22	X	
	APU Fuel Feed System	-25		X
	Fuel Quantity Indicating System*	-41		X
30 Ice/Rain Protection	Wing Anti-Ice	-11	X	
	Engine Anti-Ice System	-21	X	
	Pitot, Angle of Attack, Total Air Temperature Probe Heat	-31	X	
	Engine Probe Heat	-34		X
	Flight Compartment Window Anti-Ice	-41		X
34 Navigation	Weather Radar	-43		X
	Flight Management Computing System	-61		X
36 Pneumatic	Engine Air Supply	-11	X	
	Air Supply Distribution	-12		X
49 Airborne Auxiliary Power*	APU Power Unit	-11	X	
	APU Mounts	-13	X	
	APU Harness	-14	X	
	APU Inlet Door	-15	X	
	APU Drains and Vents	-16	X	
	APU Oil Filter Elements	-27	X	
	APU Oil Heater Assembly	-28	X	
	APU Fuel System	-31	X	
	APU Ignition	-41	X	
	APU Starting	-42	X	
	APU Air Turbine Starter	-43	X	

ATA Chapter	777 ETOPS Significant System	ATA M/M Subsection	Criteria Group 1	Criteria Group 2
49 Airborne Auxiliary Power*, Continued	APU Inlet Guide Vanes APU Surge Control Valve APU Control System APU Exhaust Gas Temperature APU Oil Quantity Temperature and Sight Gage	-52 -53 -61 -71 -94	X X X X X	
All Models				
71	Power Plant	ALL	X	
72	Engine	ALL	X	
73	Engine Fuel and Control	ALL	X	
74	Ignition	ALL	X	
75	Air	ALL	X	
76	Engine Controls	ALL	X	
77	Engine Indicating	ALL	X	
79	Oil	ALL	X	
80	Starting	ALL	X	

* Must be operational for 207-minute ETOPS diversion time (no MMEL relief).

ETOPS Significant System Criteria (two separate groups) are as follows:

Group 1 Systems

Group 1 Systems include any systems that relate to the number of engines on the airplane and are important to the safe operation of the airplane on an ETOPS flight. The following provides additional discriminating definitions of an ETOPS Group 1 Significant System:

a. A system for which the fail-safe redundancy characteristics are directly linked to the number of engines (e.g., hydraulic system, pneumatic system, electrical system).

b. A system that may affect the proper functioning of the engines to the extent that it could result in an in-flight shutdown or uncommanded loss of thrust (e.g., fuel system, engine control or indicating system, or engine fire detection system).

c. A system which contributes significantly to the safety of an engine inoperative ETOPS diversion and is intended to provide additional redundancy to accommodate the system(s) lost by the inoperative engine. These include back-up systems such as emergency generator, Auxiliary Power Unit (APU), etc.

d. A system such as the anti-icing system, essential for prolonged operation at single-engine altitudes.

In addition to the engine dependent system addressed by the above criteria, there are airplane systems and equipment which can impact the safety of an extended range diversion but are not unique to twin-engine airplanes. Examples of these systems are provided in the "Group 2" criteria below. The FAA imposes unique MMEL restrictions on these systems. The table on the next page lists all airplane systems that have an ETOPS MMEL restriction. Each airline must have appropriate maintenance programs in place to ensure these systems have adequate reliability and capability for the intended mission regardless of the number of engines on the airplane. AC 120-42A requires these systems be addressed in the airline's maintenance program for ETOPS airplanes. Below are the criteria for these non-engine dependant systems.

Group 2 Systems

Group 2 Systems are systems that do not relate to the number of engines on the airplane, but are important to the safe operation of the airplane on an ETOPS flight. The following provides additional discriminating definitions of an ETOPS Group 2 Significant System:

a. A system for which certain failure conditions would reduce the capability of the airplane or the ability of the crew to cope with an ETOPS diversion (e.g., navigation, communication and equipment cooling).

b. Time-limited system including such things as cargo fire suppression and oxygen if the ETOPS division is oxygen system dependent.

c. Systems whose failure would result in excessive crew workload for an ETOPS diversion (e.g., flight control forces that would be exhausting for a maximum ETOPS diversion, or system failures that would require continuous fuel balancing to ensure proper CG).

d. A system specifically installed to enhance the safety of long-range operations and an ETOPS diversion (e.g., SATCOM, GPS).

The hydraulic system has not been included in the list of ETOPS Significant Systems, because even though part of the system includes engine driven hydraulic pumps, the fail safe/redundancy characteristics of the total system is not directly linked to the number of engines. There are no additional maintenance or reliability monitoring requirements for the hydraulic system relative to ETOPS.