PBN Operational Approval

Oceanic and Remote En Route Navigation Specifications

Navigation Specifications

Applicable to Oceanic/Remote

- RNAV 10 (RNP 10)

- RNP 4

- RNP 2

- A-RNP

Prior Guidance Material

- RNP 10 guidance material published in ICAO Doc 9613 Appendix E (1999)

- RNP 4 guidance material published in State Letter AN 13/33.7 04/86 (September 2004)

- Now updated and included in Vol II of the PBN Manual

  Re-approval of qualified operators NOT required

RNAV 10

Navigation Specification	Flight Phase							
	En Route Oceanic/ Remote	En Route Continental	ARR	Approach				DEP
				Initial	Intermed	Final	Missed	
RNAV 10 (RNP 10)	10							
RNP 4	4							
RNP 2	2	2						
A-RNP	2	2 or 1	1	1	1	0.3	1	1

Grandfather Rights

IMPLEMENTING RNAV 10
(DESIGNATED AND AUTHORISED AS RNP 10)

1.1.   INTRODUCTION

1.1.1.   Background

This chapter addresses the implementation of RNP 10 to support 50 NM lateral and the 50 NM longitudinal distance-based separation minima in oceanic or remote area airspace. This guidance has been titled RNAV 10 for consistency with the other chapters in the PBN Manual. This designation and version of the material do not change any requirements, and do not affect operators who obtained an RNP 10 authorization from their relevant State regulatory authority. Recognizing the extent of existing airspace designations and operational approvals using the designation RNP 10, it is anticipated that any new airspace designations or aircraft approvals will continue to use the designation RNP 10. RNAV 10 does not require on-board performance monitoring and alerting. However, the designation of the airworthiness and operational approval as well as airspace/route designation remains "RNP 10" in order to grandfather the present publications and extensive approvals. Recognizing the extent of existing airspace designations and operational approvals under RNP 10 designation, it is anticipated that any new airspace designations and aircraft approvals will continue to use the "RNP 10" term while the required PBN application will be now known as "RNAV 10."

RNP 10 is a recognized inconsistency in RNAV and RNP naming

RNAV 10

- Supports 50 NM lateral and the 50 NM longitudinal distance-based separation minima in oceanic or remote area airspace.

- Onboard performance monitoring and alerting NOT required

- Designated and authorised as RNP 10 because cost of changing approval and operations documentation, charting and automated systems not acceptable

RNAV 10

- Two independent serviceable LRNs required

  - Dual INS

  - Dual IRS

  - Dual GNSS

  - Dual IRS/GNSS

  - Or a combination e.g. 1 x INS, 1 x GNSS

Note: A single IRS/GNSS system or dual IRS or dual IRS/GNSS with a single FMS do not constitute 2 independent LRNs

RNAV 10 Conditions

Dual INS or Dual IRS

- Basic time limit 6.2 hrs between updates

  Based on 2NM/hr radial drift

- Can be increased by:

  - Demonstration of lower drift rate

  - En-route updates

RNAV 10 Conditions

Dual GNSS

- No time limits

- Must be FDE capable

  - Continuity is a major failure

  - TSO 145/146 receivers incorporate FDE

  - TSO C129 may be modified to provide FDE

- Maximum predicted gap in FDE coverage 34 minutes

RNAV 10 Conditions

- Single GNSS and single INS or IRS

  - No time limits

  - GNSS must be FDE capable

  - Maximum predicted gap in FDE coverage 34 minutes

Note: PBN Manual refers to TSO C129a GNSS. This is the minimum requirement only and does not preclude the use of later TSO C145/146 receivers

RNAV 10 - Pre-Flight

- Check LRN system availability:
    - System updating prior to entering RNP 10 airspace
    - FDE availability for entire route
    - Ensure compliance with any time limit
    - Last update to next update allowing for headwind
- Ensure compliance with any operating restriction
- Review contingency procedures
- File '*R*' in FPL field 10, and '*PBN/A1*' in Item 18

RNAV 10 – En-route

- Check position prior to entering RNP 10 airspace

- Cross-check position as required

- Maintain FTE tolerance (+/- 5nm)

Note: All NavSpecs require pilots to maintain the route centreline. Unauthorised deviations are not permitted

RNAV 10 - Training

Pilot Knowledge:

- Commercial Operators

  - Ensure flight crews have knowledge of limits of RNP 10 navigation capabilities, effects of updating and contingency procedures

- Non-commercial operators

  - Demonstrate to aviation authority that pilot is knowledgeable of RNP 10 operations

RNAV 10 - Oversight

- Navigation Database:
  - If carried, current and appropriate for the operation
- Oversight of Operators:
  - Aviation authority may consider navigation error reports in determining remedial action:

Note: The minimum RNAV 10 LRN system is an INS which does not incorporate a database.

Documentation

- FAA Order 800.12A

  – **RNP 10** Operational Approval

- EASA AMC 20-12

  – Recognition of FAA Order 8400.12A for **RNP 10** Operations

- Civil Aviation Safety Authority (CASA) Advisory Circular (AC) 91U-2(0)

  – **RNP 10** Operational Authorisation

ORDER — U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION — 8400.12A

2/9/98

Caution: This document has been downloaded from www.faa.gov/ats/ato/rnp.htm consequently users must be alert to possible conversion and formatting errors particularly in tables, diagrams and mathematical formulae.

SUBJ: REQUIRED NAVIGATION PERFORMANCE 10 (RNP-10) OPERATIONAL APPROVAL

ED Decision 2006/12/R
22/12/2006
Annex I
AMC 20-12

AMC 20-12   Recognition Of FAA Order 8400.12a For RNP-10 Operations.

1.   PURPOSE

This AMC calls attention to the FAA Order 8400.12A "Required Navigation Performance 10 (RNP-10) Operational Approval", issued 9th February 1998. FAA Order 8400.12A addresses RNP-10 requirements, the operational approval process, application principles, continuing airworthiness and operational requirements. This AMC explains how the technical content and the operational principles of the Order may be applied as a means, but not the only means, to obtain EASA approval for RNP-10 operations.

Advisory Circular — Australian Government Civil Aviation Safety Authority

AC 91U-2(0)   NOVEMBER 2005

REQUIRED NAVIGATION PERFORMANCE 10 (RNP 10) OPERATIONAL AUTHORISATION

RNP 4

Navigation Specification	Flight Phase							
	En Route Oceanic/ Remote	En Route Continental	ARR	Approach				DEP
				Initial	Intermed	Final	Missed	
RNAV 10 (RNP 10)	10							
RNP 4	4							
RNP 2	2	2						
A-RNP	2	2 or 1	1	1	1	0.3	1	1

RNP 4

- Supports 30nm lateral and longitudinal distance-based separation minima in oceanic or remote area airspace

- On-board performance monitoring and alerting is required

Operational approval only applies to the PBN Navigation requirements. Operators should be aware that 30/30 separation will only be provided to aircaft that also meet Communication and Surveillance requirements i.e. CPDLC and ADS-C.

RNP 4

- Two independent serviceable LRNs required

  - At least one LRN must be GNSS

- 1 x INS/IRS and 1 x GNSS

- Dual IRS/GNSS

- Dual GNSS

Note: Dual IRS/GNSS with a single FMS is not acceptable

RNP 4 Conditions

Dual GNSS (no INS or IRS)

- No time limits

- GNSS must be FDE capable

  - Continuity is a major failure

  - TSO 145/146 receivers incorporate FDE

  - TSO C129 may be modified to provide FDE

- Maximum predicted gap in FDE coverage 25 minutes

RNP 4 Conditions

Multi-sensor system

- Dual IRS/GNSS

- No time limits

- GNSS must be FDE capable

- NO FDE prediction required

    - IRS provides continued navigation if GNSS updating not available

RNP 4 - Functionality

- Direct—to function

- Parallel offset

  - Note: some stand-alone receivers do not incorporate parallel offset function

- Fly-by transition

- User-defined course to fix

- Path steering

- Navigation database

> Refer to PBN Manual for a full list of functionalities

RNP 4 – Nav Database

- Navigation database required
  - Supplier should comply with complies with RTCA DO-200A/EUROCAE Doc ED 76, Standards for Processing Aeronautical Data

- Discrepancies that invalidate a route must be
  - Reported to the database provider ; and
  - Route prohibited by an operator's notice to flight crews

- Operators should consider carrying out periodic checks of their operational navigation databases

RNP 4 - Pre-Flight

- Check FDE availability for entire route

- Check and confirmation of current database

- Review contingency procedures

- File '*R*' in FPL field 10, and '*PBN/L1*' in Item 18

Flight Plan RNP 4

RNP 4 - En-Route

- Cross-check position as required

- Maintain route centreline (+/- 2nm)

- Advise ATC of deterioration or failure of navigation equipment
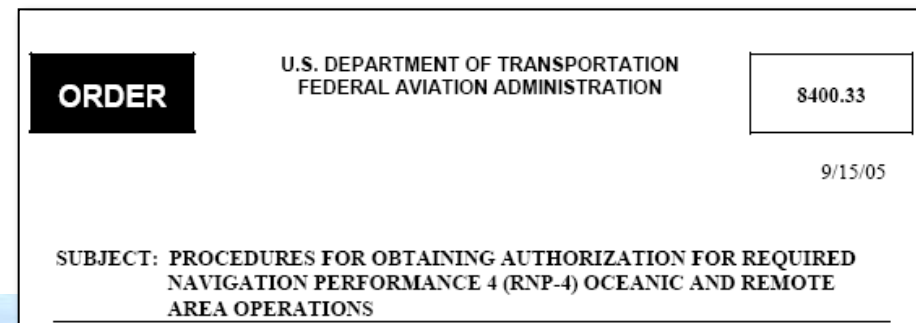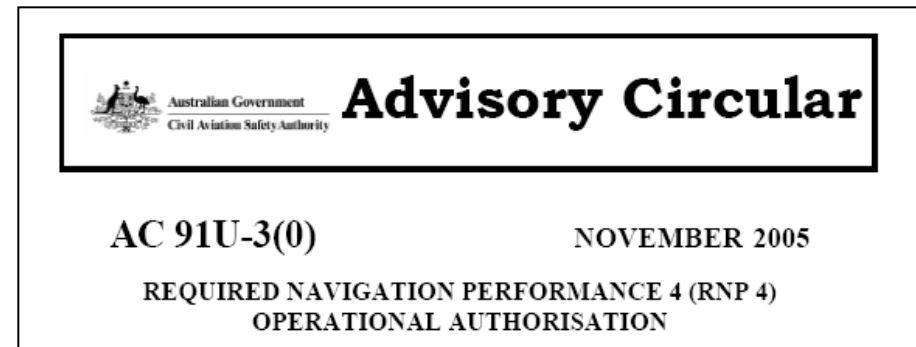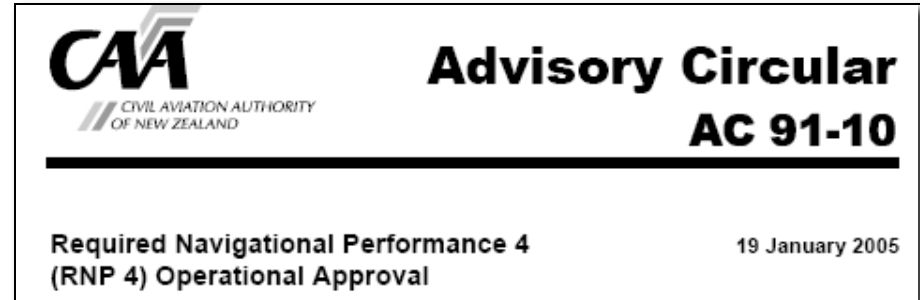
RNP 4 - Training

Pilot must understand:

- RNP system capabilities and limitations

- Operating procedures

- Contingency procedures

- Phraseology

- Flight planning

RNP 4 - Documentation

- Civil Aviation Safety Authority of New Zealand Advisory Circular 91-10

  – Required Navigation Performance 4 (RNP 4) Operational Approval

CAA CIVIL AVIATION AUTHORITY OF NEW ZEALAND — **Advisory Circular AC 91-10**

Required Navigational Performance 4 (RNP 4) Operational Approval — 19 January 2005

- CASA Advisory Circular 91U-3(0)

  – Required Navigation Performance 4 (RNP 4) Operational Authorisation

Australian Government Civil Aviation Safety Authority — **Advisory Circular**

AC 91U-3(0) — NOVEMBER 2005

REQUIRED NAVIGATION PERFORMANCE 4 (RNP 4) OPERATIONAL AUTHORISATION

- FAA Order 8400.33

  – Procedures For Obtaining Authorization For Required Navigation Performance 4 (RNP 4) Oceanic And Remote Area Operations

ORDER — U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION — 8400.33

9/15/05

SUBJECT: PROCEDURES FOR OBTAINING AUTHORIZATION FOR REQUIRED NAVIGATION PERFORMANCE 4 (RNP-4) OCEANIC AND REMOTE AREA OPERATIONS

RNP 2

Navigation Specification	Flight Phase							
	En Route Oceanic/ Remote	En Route Continental	ARR	Approach				DEP
				Initial	Intermed	Final	Missed	
RNAV 10 (RNP 10)	10							
RNP 4	4							
RNP 2	2	2						
A-RNP	2	2 or 1	1	1	1	0.3	1	1

RNP 2

- Requires GNSS

- May be used in varied environments

- Oceanic/Remote/Continental

- Geographic areas with little or no ground NAVAID infrastructure, limited or no ATS surveillance, and low to medium density traffic.

Note: Loss of continuity for oceanic/remote operations is considered a major failure

RNP 2

Characteristics

- Continuity requirement depends upon airspace and available diversion aerodromes

- No surveillance required

- Route spacing to be determined

- GNSS required

- Reversionary navigation modes must be catered for in the operational concept

RNP 2

Equipment Requirements

- Navspec does not specify minimum equipment

    - State must determine requirements

    - Based on area of operation

    - Considering availability of alternates, navaids etc.,

- For oceanic/remote operation duplicated systems needed for continuity requirements

RNP 2
Navigation Services Criteria

GNSS

• E/TSO-C129a sensor (Class B or C), E/TSO-C145() and the requirements of E/TSO-C115b FMS, installed for IFR use in accordance with FAA AC 20-130A or

• E/TSO-C129a Class A1 or E/TSO-C146() equipment installed for IFR use in accordance with FAA AC 20-138A or AC 20-138B;

• Integrity provided by SBAS or RAIM

RNP 2 - Functionality

- Non-numerical deviation display (e.g. CDI, (E)HSI)

- Navigation Database – update in accordance to AIRAC cycle

- 'Direct To' Function

- Capability to load an RNP 2 ATS route from the database

- Manual entry of flexible tracks

- Automatic leg sequencing & waypoint transition

- Parallel Offset (optional)

- FRT (optional)

RNP 2 - Functionality

Parallel Off-set (option)

- Fly parallel tracks at selected offset distance.

- Accuracy and performance requirements of the original route apply .

- Offset distances up to 20 NM in increments of 1 NM, left or right .

- Operation of offset mode clearly annunciated.

- When in offset mode, cross-track deviation, distance-to-go, time-to-go relative to the offset path and offset reference points provided.

- Upcoming end of offset path annunciated with sufficient time for aircraft to return to original flight plan path.

- Offset active until offset deleted automatically; pilot enters new direct-to routing; or pilot cancels offset.

RNP 2 - Pre-Flight

- Check Navaid availability:
  - Ground navaid (for contingency)
  - GNSS availability prediction required
  - No gaps in FD greater than 5 mins
  - Confirm database is current
- Review contingency procedures
- File '*R*' in FPL field 10, and '*PBN/TBD*' in Item 18

RNP 2 - En-Route

- No requirement for cross-check

  - Integrity alert is sufficient

- Maintain route centre-line (+/- 1NM)

- Advise ATC if 'Unable RNP 2'

RNP 2 - Training

Pilot Knowledge:

- Aircraft equipment/navigation suffixes

- Route and airspace characteristics

- RNP system information

- Operating procedures

- Contingency procedures

- Phraseology

- Flight planning

RNP 2 – Nav Database

- Navigation database required
  - Supplier should comply with complies with RTCA DO-200A/EUROCAE Doc ED 76, Standards for Processing Aeronautical Data

- Discrepancies that invalidate a route must be
  - Reported to the database provider ; and
  - Route prohibited by an operator's notice to flight crews

- Operators should consider carrying out periodic checks of their operational navigation databases

Certification Documentation

As RNP 2 is a new Navspec in 4th Edition of PBN Manual relevant manufacturer documentation is yet to be developed.

Advanced RNP

Navigation Specification	Flight Phase							
	En Route Oceanic/ Remote	En Route Continental	ARR	Approach				DEP
				Initial	Intermed	Final	Missed	
RNAV 10 (RNP 10)	10							
RNP 4	4							
RNP 2	2	2						
A-RNP	2	2 or 1	1	1	1	0.3	1	1

Covered under Continental En-route

Questions?