

Performance Based Navigation Implementation

New Navigation Specifications



Australian Government
Civil Aviation Safety Authority

www.casa.gov.au



Ron Doggett

safe skies for all

Contents

- Significant Changes in the Manual
 - Volume I
 - Volume II
- New Navigation Specifications
- Advanced RNP Navigation Specification



Significant Editorial Changes

- Overall, the Manual has had numerous editorial changes to improve the clarity and readability of the document.
- Terminology has been made uniform throughout the Manual.
 - Area navigation is the generic term – there is no abbreviation.
 - RNAV refers to specifications without on-board monitoring.
 - RNP refers to specifications with on-board monitoring.

Volume I Changes

- Implementation guidance has been enhanced:
 - More information on the planning for PBN implementation.
 - Operational approvals guidance has been enhanced.
 - More detailed information on operations approvals is provided.

Volume II Changes

- Existing navigation specifications revised to ensure consistency between specifications.
- New navigation specifications introduced.
- Common functional requirements moved to Attachments and Appendices.
- Navigation service monitoring requirements moved to a separate chapter in Part A.
- Sample airspace concepts attachment added.

Navigation Service Monitoring

- Service monitoring requirements in each chapter lacked clarity and consistency.
 - The new chapter is referred to from all specifications.
- The chapter identifies the monitoring requirements for conventional navigation, RNAV and RNP applications.
- Guidance is provided for establishing:
 - Service monitoring for GNSS.
 - Service monitoring for DME/DME.

New/Changed Navigation Specifications

- RNP 2 – higher performance specification for:
 - Oceanic or remote continental applications with medium density traffic and little or no ground infrastructure.
 - Continental applications that will benefit from improved performance.
- Advanced RNP – a fully capable and scalable navigation specification.

New/Changed Navigation Specifications

- RNP 0.3 – for helicopters operating in metropolitan areas or offshore support.
- Radius to Fix Path Terminator and Fixed Radius Transition Appendices added with a placeholder for Time of Arrival Control.



RNP 2, RNP 0.3 & RNP AR

RNP 2

- RNP 2 is based on the functional requirements of RNP 1 using GNSS as the primary means of navigation.
- RNP 2 is intended for a diverse set of en route applications; particularly in geographic areas with:
 - Little or no ground navigation aid infrastructure.
 - Limited or no ATS surveillance.
 - Low to medium density traffic.

RNP 2

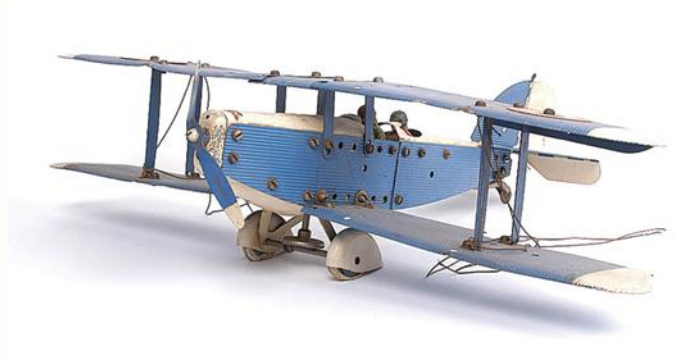
- Use of RNP 2 in continental applications requires a lower continuity requirement than use in oceanic/remote applications.
 - In oceanic/remote areas the target traffic is primarily transport category aircraft operating at high altitude;
 - Loss of function in oceanic/remote regions is a major failure.
 - Continental applications may include a significant percentage of general aviation aircraft.
 - Loss of function in continental areas is a minor failure provided the aircraft can revert to a different navigation system and proceed to a suitable airport.

RNP 0.3

- Intended for:
 - Helicopter operations but can be used for other slow aircraft.
 - Low level routes in obstacle rich or sensitive environments.
 - Efficient operations in high density airspace.
- Provides RNP 0.3 for all phases of flight.
- Provides for Point-in-Space approach and departure operations.
- Requires TSO C145a/146a/196 GNSS equipment.

RNP AR Operations

- Intent was to revise RNP AR APCH to add departures and be retitled to RNP AR Operations.
 - Lack of APAC representation resulted in removal of new material.
- RNP AR operations are GNSS based but with a provision that DME/DME may be used if approved by the State regulator.
- Vertical navigation compliant with RNP APCH down to LPV minima meets the vertical requirement.
- One engine inoperative procedures are not included in the specification.



ADVANCED RNP

Advanced RNP

- The Advanced RNP navigation specification permits the implementation of higher density routes where there is insufficient ground navigation infrastructure for conventional routes.
- Advanced RNP is designed for operation on en-route, arrival and departure routes, and approaches.
 - The RNP will be scalable from RNP 2 to RNP 0.3.
- Advanced-RNP differs from the other navigation specifications in that it allows a range of lateral navigation accuracies.
 - Advanced RNP meets RNAV 5, RNAV 2, RNAV 1, RNP 2, Basic RNP, RNP APCH and Radius to Fix requirements.

Advanced RNP

- For Advanced-RNP, some features / requirements may be required in one flight phase and optional or unnecessary in another.
 - No distinctions are made regarding this flight phase association.
 - A general set of criteria spanning all phases of flight and navigation applications is provided.
- Advanced-RNP aircraft qualification can be applicable to multiple navigation specifications without re-examination of aircraft eligibility.
 - This enables an operator's approved procedures, training, etc. to be common to multiple navigation applications.
 - Advanced-RNP aircraft qualification will also facilitate multiple operational approvals.

Additional A-RNP Functions

- Additional functions may be required for an operation in given airspace:
 - Vertical navigation (Baro-VNAV or LPV)
 - Parallel Offset.
 - Fixed Radius Transition.
 - Holding.
 - Time of Arrival Control.
- Parallel Offset, Fixed Radius Transition and RNP Holding are defined in RTCA DO-236B.

Additional A-RNP Functions

- Parallel Offsets:
 - Intended for en route tactical use only; strategic offsets will be by route definition.
- Fixed Radius Transitions:
 - Removes the variability of the fly-by transition.
 - Standard radius is 22.5 NM for FL200 and above and 15 NM for FL190 and below.
 - Radius to be used will be loaded from the database.
- Holding:
 - A hold is defined by a point, the turn direction, an inbound track and an outbound distance.

Advanced RNP Specification Issue

- Publication of the Advanced RNP specification was delayed because some States are wanting full scalability.
- OEMs are concerned at the aircraft re-certification impact so want to limit the range of RNP values required.
 - RNP 0.3, 0.5, 1 and 2.

Advanced RNP Specification Issue

- Solution:
 - The ASBU Block 1 upgrade (2018) will include Advanced RNP with fixed RNP values that include RNP 0.5.
 - The ASBU Block 2 upgrade (2023) will include Advanced RNP with full scalability and Fixed Radius Transitions.
 - Full scalability and Fixed Radius Transitions will be optional for ASBU Block 1.
 - Fixed Radius Transitions may be required for European operations from 2018.

Questions?

