PBN - Navigation Specifications and Authorisations
Technical Assessor Handbook

Version 2.0 September 2016
Preface

As a Commonwealth government authority, CASA must ensure that the decisions we make, and the processes by which we make them, are effective, efficient, fair, timely, transparent, properly documented and otherwise comply with the requirements of the law. At the same time, we are committed to ensuring that all of our actions are consistent with the principles reflected in our Regulatory Philosophy.

Most of the regulatory decisions CASA makes are such that conformity with authoritative policy and established procedures will lead to the achievement of these outcomes. Frequently, however, CASA decision-makers will encounter situations in which the strict application of policy may not be appropriate. In such cases, striking a proper balance between the need for consistency and a corresponding need for flexibility, the responsible exercise of discretion is required.

In conjunction with a clear understanding of the considerations mentioned above, and a thorough knowledge of the relevant provisions of the civil aviation legislation, adherence to the procedures described in this manual will help to guide and inform the decisions you make, with a view to better ensuring the achievement of optimal outcomes in the interest of safety and fairness alike.

Mark Skidmore AM
Chief Executive Officer and
Director of Aviation Safety
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Handbook Responsibilities

Publication Approval

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<tr>
<th>Approved by:</th>
<th>Jason McHeyzer, Regulation Development and Implementation Manager, Aviation Group</th>
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</thead>
<tbody>
<tr>
<td>Date Approved:</td>
<td>28/10/2016</td>
</tr>
<tr>
<td>Approval Record:</td>
<td>D16/227107</td>
</tr>
</tbody>
</table>

Governance

The following levels of approval are required for amendment or review of this handbook:

<table>
<thead>
<tr>
<th>Authorising Manager</th>
<th>ATMS Standards Section Manager, Flight Standards Responsible for the technical content contained within this handbook.</th>
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</thead>
<tbody>
<tr>
<td>Document Sponsor</td>
<td>Flight Standards Manager Responsible for ensuring this handbook complies with branch policies and objectives.</td>
</tr>
<tr>
<td>Document Release Manager</td>
<td>Regulation Development and Implementation Manager Responsible for ensuring this handbook complies with CASA’s policies and objectives.</td>
</tr>
</tbody>
</table>

Review, Amendment and Upkeep

Users will form views as to accuracy, relevance and applicability of the content in this handbook. CASA personnel are required to provide recommendations for revisions to policies and processes in this or any other handbook or manual should they become aware of shortcomings. This allows documentation to be continually improved and remain relevant to the tasks being undertaken.

Additionally, this handbook will be reviewed by the Authorising Manager every two years. The handbook will be amended as soon as possible to reflect changes:

- in CASA and Government policies and practices
- to organisational arrangements, including title changes
- to processes and procedures contained in this handbook
- to associated regulations or advisory material.

As a user of this handbook, if you have a suggestion for improvements or corrections to this handbook please contact the Regulation Development and Implementation branch.
## Revision History

Amendments/revisions of this Handbook are recorded below in order of most recent first.

<table>
<thead>
<tr>
<th>Version No.</th>
<th>Date</th>
<th>Parts/Sections</th>
<th>Details</th>
</tr>
</thead>
</table>
| 2.0         | September 2016 | Templates, document title and various sections  | Templates updated to latest revision of handbook and worksheet templates and minor changes to layout and location of information for consistency with other handbooks and worksheets.  
Title of handbook and worksheet changed from Navigation Authorisations to *PBN - Navigation Specifications and Authorisations* and all references to *navigation authorisations* reviewed and amended where applicable.  
Review and update to legislation and guidance material references.  
Minor editorial and technical amendments as detailed in D16/227107.                                                                 |
| 1.0         | December 2014 | All                                   | First release                                                                                                                               |

## Temporary Management Instructions

Temporary Management Instructions (TMIs) may apply to this version of the handbook. TMIs are published on the CASAConnect [http://casaconnect/tools/tmi/index.htm](http://casaconnect/tools/tmi/index.htm) until the information is permanently added to the handbook.
Glossary

Acronyms and Abbreviations

The following acronyms and abbreviations are used in this handbook:

- **AAMA**: Australian Airspace Monitoring Agency
- **ADS-B**: Automatic Dependant Surveillance - Broadcast
- **ADS-C**: Automatic Dependant Surveillance - Contract
- **AFM**: Aircraft Flight Manual
- **AIP**: Aeronautical Information Publication
- **AIRAC**: Aeronautical Information Regulation And Control
- **AMP**: Aircraft Maintenance Program
- **APV**: Approach with Vertical Guidance
- **AR**: Authorisation Required
- **ARINC**: Aeronautical Radio Inc.
- **A-RNP**: Advanced RNP
- **ASE**: Altimetry System Error
- **ATC**: Air Traffic Control
- **ATS**: Air Traffic Services
- **AWI**: Airworthiness Inspector
- **Baro-VNAV**: Barometric Vertical Navigation
- **CAR**: *Civil Aviation Regulations 1988*
- **CASA**: Civil Aviation Safety Authority
- **CASR**: *Civil Aviation Safety Regulations 1998*
- **CDI**: Course Deviation Indicator
- **CPDLC**: Controller Pilot Data Link Control
- **DME**: Distance Measuring Equipment
- **(E)HSI**: (Electronic) Horizontal Situation Indicator
- **ENR**: En Route
- **ETSO**: European Technical Standard Order
- **FAA**: Federal Aviation Administration (of the USA)
- **FL**: Flight Level
- **FMS**: Flight Management System
- **FOI**: Flying Operations Inspector
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>FOSA</td>
<td>Flight Operational Safety Assessment</td>
</tr>
<tr>
<td>FRT</td>
<td>Fixed Radius Transition</td>
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<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>IRU</td>
<td>Inertial Reference Unit</td>
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<tr>
<td>ICAO</td>
<td>International Civil Aviation Organization</td>
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<tr>
<td>IFR</td>
<td>Instrument Flight Rules</td>
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<tr>
<td>INS</td>
<td>Inertial Navigation System</td>
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<tr>
<td>IRS</td>
<td>Inertial Reference System</td>
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<tr>
<td>LNAV</td>
<td>Lateral Navigation</td>
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<tr>
<td>LP</td>
<td>Localiser Performance</td>
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<tr>
<td>LPV</td>
<td>Localiser Performance with Vertical Guidance</td>
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<tr>
<td>LRNS</td>
<td>Long Range Navigation System</td>
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<tr>
<td>MEL</td>
<td>Minimum Equipment List</td>
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<tr>
<td>MMEL</td>
<td>Master Minimum Equipment List</td>
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<tr>
<td>NM</td>
<td>Nautical Miles</td>
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<tr>
<td>MOS</td>
<td>Manual of Standards</td>
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<tr>
<td>NPA</td>
<td>Non-Precision Approach</td>
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<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<tr>
<td>PBN</td>
<td>Performance Based Navigation</td>
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<tr>
<td>P-RNAV</td>
<td>Precision Based Navigation</td>
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<tr>
<td>RF Leg</td>
<td>Radius to Fix Path Terminator (commonly referred to as RF Leg)</td>
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<tr>
<td>RMA</td>
<td>Regional Monitoring Agency</td>
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<td>RNAV</td>
<td>Area Navigation</td>
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<td>RNP</td>
<td>Required Navigation Performance</td>
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<tr>
<td>RNP APCH</td>
<td>RNP Approach</td>
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<tr>
<td>RNP AR APCH</td>
<td>RNP Authorisation Required Approach</td>
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<tr>
<td>RO</td>
<td>Registered Operator</td>
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<tr>
<td>RVSM</td>
<td>Reduced Vertical Separation Minimum</td>
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<tr>
<td>SB</td>
<td>Service Bulletin</td>
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<tr>
<td>SID</td>
<td>Standard Terminal Departure</td>
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<tr>
<td>SRM</td>
<td>Structural Repair Manual</td>
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<tr>
<td>STAR</td>
<td>Standard Terminal Arrival Route</td>
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</table>
Definitions

The following terms are used in this handbook:

**Australian Airspace Monitoring Agency (AAMA):** The AAMA is one of a number of organisations the International Civil Aviation Organization (ICAO) has approved as a Regional Monitoring Agency (RMA). This agency is a branch of Airservices Australia and monitors Australian, Indonesian and New Guinea registered aircraft.

**Regional Monitoring Agency (RMA):** Following global implementation of Reduced Vertical Separation Minimum (RVSM) airspace, ICAO approved RMAs to ensure the safe use of specific airspace designated by regional agreement.

**Registered Operator:** In accordance with transitional provisions for Part 47 of the *Civil Aviation Safety Regulations (CASR)*\(^1\):

- a reference in the Civil Aviation Regulations 1988 (CAR) to the holder of a Certificate of Registration of an aircraft is taken to be a reference to the Registered Operator (RO) of the aircraft
- a duty imposed on the holder of a Certificate of Registration of an aircraft is taken to be imposed on the RO of the aircraft.

**Aeronautical Radio Inc. (ARINC424):** ARINC424 is an aeronautical specification developed and maintained by the industry that has been used for the exchange of navigation and communication data between commercial data suppliers and avionic system manufacturers for more than 30 years. It was created in the 1970s to meet the requirements of more complex embedded navigation systems such as Flight Management System (FMS) to support evolving navigation techniques. The ARINC424 sets out the air transport industry’s recommended standards for the preparation of airborne navigation system reference data files.

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\(^1\) see regulation 202.222 of CASR
The first issue of the ARINC424 was published in May 1975. The specification is maintained by the A424 committee, which groups the major aeronautical actors involved in the different steps of the data production chain:

- Air Navigation Service Provider (ANSP) and administrations
- Commercial data providers
- Avionic systems suppliers
- Aircraft manufacturers
- Airlines.

The ARINC424 defines the concept of Path and Terminators (elementary trajectories that are sequenced in order to represent a complete procedure), which is increasingly adopted outside the strict A424 community. As an example, the ARINC424 Path and Terminator concept is reused in the ICAO Performance-Based Navigation Manual.

**Key Words**

The following key words are used in this handbook to convey requirement levels:

**Must**: defines an obligation. The term is used to convey regulatory requirements. ‘Must’ is used sparingly in the *things for consideration* sections of this handbook (*Part C*) to reiterate legislative requirements.

**Should**: signifies a recommendation. The term is typically used in the *things for consideration* sections of this handbook (*Part C*) to denote those items that CASA recommends the technical assessor considers in making a decision regarding the quality and suitability of an application.

**May**: signifies something that is permitted but not required. The term is frequently used in the *things for consideration* sections of this handbook (*Part C*) to provide options and examples of how and applicant may demonstrate compliance with the regulatory requirements.
Legislation and other Referenced Material

This section provides reference to regulatory and other material that may be useful to assessors in undertaking a technical assessment of a navigation specifications and authorisations application.

CASA regulatory and technical documentation

This handbook supports and partners with the following regulatory and technical documentation:

- **Civil Aviation Regulations 1988 (CAR):**
  - Division 5, regulation 181G and/or 181M: Reduced Vertical Separation Minimum (RVSM)

- **Civil Aviation Safety Regulations 1998 (CASR):**
  - Subpart 91.U: Required Navigation Performance (RNP) 10, Area Navigation (RNAV 10)\(^2\) and RNP 4

- **Manual of Standards (MOS):**
  - Subpart 91.U
  - Part 145

- **Civil Aviation Orders (CAO):**
  - CAO 20.91: Instructions and directions for performance-based navigation
    - Appendix 1: RNAV 5
    - Appendix 2: RNAV 1 and RNAV 2
    - Appendix 3: RNP 2
    - Appendix 4: RNP 1
    - Appendix 5: RNP 0.3\(^3\)\(^4\)
    - Appendix 6: RNP Approach (RNP ARCH)
    - Appendix 7: RNP AR Operations
    - Appendix 9: Advanced RNP\(^3\)
  - CAO 20.18: Aircraft equipment – basic operational requirements
  - CAO 52.1: Directions under regulation 99AA of CAR about the use of Class A airspace

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2 The ICAO PBN Manual has the legacy RNP 10 specification incorporated as RNAV 10 for editorial correctness and consistency. To preserve the validity of existing authorisations, RNAV 10 is authorised as RNP 10.

3 PBN navigation specifications not included in the initial version of CAO 20.91.

4 RNP 0.3 is a navigation specification intended for helicopter operations in metropolitan areas and for offshore support.
• CASA Instruments:

• Civil Aviation Advisory Publication (CAAP)
  − 181A-1: Reduced vertical separation minimum (RVSM) approvals

• Advisory Circular (AC)
  − 91.U-01: Navigation Authorisations
  − 91.U-04: Airworthiness Requirements for Performance Based Navigation
  − 91.U-2: Required Navigation Performance 10 (RNP 10) Operational Authorisation
  − 91.U-3: Required Navigation Performance 4 (RNP 4) Operation Authorisation

• Supplemental specifications and authorisations used in conjunction with the above specifications and authorisations:
  − CAO 20.91:
    o Appendix 9: APV Baro-VNAV
    o Appendix 10: Radius to Fix Path Terminator (RF Leg)
    o Appendix 11: Fixed Radius Transition (FRT)
    o Appendix 12: Time of Arrival Control (TOAC)

Other reference material

Assessors are also referred to the following material that has been referenced in, or is associated with, this handbook:

• CASA Application Form 1307: Application for Navigation Approvals (PBN and RVSM)

• CASA Advisory Publications:
  − CAAP 179A-1: Guidelines for navigation using GNSS

• ICAO Documents:
  − Document 9574-AN/934: Manual of Implementation of RVSM

5 CASA Instrument 809/14 replaces CASA Instrument 356/12 and deletes material incorporated into CAO 20.91. CASA 80/14 has the criteria for GPS Oceanic operations outside RNP 10 or RNP 4 airspace. It also includes the criteria for Australian aircraft operations in the North Atlantic Minimum Navigation Performance Specification airspace and provides for SATCOM Voice use in the NAT MNPS region.

6 Time of Arrival Control (TOAC) standards are still in development by ICAO; Appendix 12 to CAO 20.91 is a placeholder for these standards. When the standards are developed, CASA will revise CAO 20.91 and this Handbook accordingly.

• Foreign Advisory Publications:
  − Federal Aviation Administration of the USA (FAA):
    o FAA AC 20-138C: Airworthiness Approval of Positioning and Navigation Systems
    o FAA AC 91-85: Authorization of Aircraft and Operators for Flight in Reduced Vertical Separation Minimum Airspace
      Note: FAA AC 91-85 supersedes AC 91-RVSM.
  − Civil Aviation Authority New Zealand (CAANZ):
    o CAANZ AC 91-18: Aircraft Software Configuration Management.
Part A - Introduction to this Handbook

A1 Purpose of this Handbook

CASA has developed this handbook, in conjunction with its associated technical assessor worksheet, to provide a consistent assessment method for CASA technical assessors to assess applications for compliance with the Civil Aviation Regulations 1988 (CAR), the Civil Aviation Orders (CAOs), the Civil Aviation Safety Regulations 1998 (CASR) and relevant Manual of Standards (MOS).

CASA does not expect its technical assessors to interpret legislation; this handbook provides the necessary information relating to CASA standards, interpretations and explanations of the law. CASA does, however, expect that its technical assessors will apply reasonable and professional judgment in using this handbook during an assessment of legislative requirements.

Using this handbook ensures a standardised assessment outcome in a manner consistent with CASA legislation and policy.

A1.1 Who is this handbook for?

The primary audience for this handbook is suitably qualified, trained and experienced CASA Airworthiness Inspectors (AWIs) and Flying Operations Inspectors (FOIs) who assess and approve navigation specifications and authorisations for an Australian Registered Operator (RO).

For the purposes of this handbook, such inspectors are referred to as technical assessors.

A1.2 How to use this handbook

This handbook is to be used in conjunction with the associated technical assessor worksheet (referenced in Appendix 1 to this handbook), which is the primary tool for undertaking a technical assessment to determine compliance with CASA’s legislative requirements.

The worksheet is a Microsoft Excel document with various functionalities and sheet tabs, one of which is the User Instructions which should be read prior to commencing an assessment. The worksheet user instructions are also available at Appendix 1 to this handbook.

The regulatory questions in the worksheet form the assessment criteria that a technical assessor must consider before making a decision to grant any navigation specifications and authorisations. This handbook expands on those questions by providing an understanding of the question (through things for consideration).

Use the worksheet to undertake a standardised and unified entry control assessment; documenting an auditable record of the decisions and rationale against each of the assessment questions.
Use the legislation, policy and philosophy statements contained in this handbook to thoroughly understand the legislative requirements; thereby aiding a standardised decision-making process.

**A1.3 What this handbook covers**

This handbook and its associated technical assessor worksheet only cover the technical aspects for assessing an application for navigation specifications and authorisations, including any conditions or limitations that may need to be imposed.

The handbook includes the process and assessment considerations. The worksheet articulates the standardised assessment criteria, via a series of legislative questions, and is an auditable record of the complex decision making that occurs during the assessment.

This handbook has been developed in parts for ease of use. *Part A* includes introductory and policy information, *Part B* includes a high level overview of the assessment process and *Part C* describes the things for consideration, which correspond to the assessment questions in the worksheet.

**A1.4 What this handbook does not cover**

This handbook does not cover the assessment of applications from foreign operators.

This handbook does not cover how a technical assessor will make a decision about whether CASA should grant navigation specifications and authorisations. It assumes that technical assessors are suitably qualified, trained and experienced in assessing the quality of an application for the purposes of ensuring satisfactory compliance.

Although this handbook provides guidance information, the ultimate decision must be made by the technical assessor as to whether the RO has submitted information that is suitable, complies with relevant legislation and does not impose safety concerns.

This handbook does not detail the administrative processes surrounding application and approval of a navigation specification and authorisation. Processes such as application management, cost recovery and allocation of tasks are contained in other CASA manuals.

**A1.5 Where to go for further assistance**

To obtain further assistance with any of the information contained within this handbook and associated appendices, contact the ATMS Standards section of CASA.
A2 Performance Based Navigation Overview

Performance Based Navigation (PBN) is navigation that uses global navigation satellite systems (GNSS) and computerised on board systems to achieve high levels of track and height-keeping accuracy. PBN defines aircraft navigation requirements in terms of accuracy, integrity, continuity and functionality required for the range of navigation specifications. To obtain approval for any PBN specifications or authorisations, the RO must competently demonstrate that the aircraft, equipment and flight crew meet performance standards for that navigation specification.

CASA will assess the RO’s application, taking into account the RO’s compliance with the applicable aircraft type, continued airworthiness and operational procedures. Once satisfied, CASA will notify the RO in writing via an Instrument of Authorisation or revised Operation Specification for AOC holders.


A3 Introduction to Navigation Specifications and Authorisations

<table>
<thead>
<tr>
<th>CASR: Subpart 91.U</th>
<th>Part 91 of CASR applies to the operation of Australian civil aircraft in or outside Australian territory. In particular, Subpart 91.U of CASR describes the requirements relating to navigation authorisations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR: Division 5</td>
<td>Division 5 of CAR mandates that ROs wanting to operate under RVSM limits as set by Air Traffic Control (ATC) must first meet the aircraft requirements set out in the CAR. With the appropriate approval, both Australian-registered and foreign-registered civil aircraft can operate under these limits in Australian RVSM designated airspace.</td>
</tr>
<tr>
<td>CAO: 20.18</td>
<td>CAO 20.18 mandates the installation of GNSS into all Instrument Flight Rules (IFR) aircraft from 4 February 2016. On 4 February 2016 the Back-up Navigation Network concept comes into existence, which will result in approximately 200 of 450 terrestrial navigation aids being withdrawn from service. From 4 February 2016, Australia will effectively operate GNSS-based PBN.</td>
</tr>
<tr>
<td>CAO: 20.91</td>
<td>CAO 20.91 defines the requirements for PBN in Australian airspace.</td>
</tr>
<tr>
<td>CASA Instrument: 80/14</td>
<td>CASA Instrument 80/14 is a revised version of CASA 356/12 Instructions – Use of GNSS. CASA 80/14 removes material from CASA Instrument 356/12 that has been incorporated into CAO 20.91. The instrument retains the criteria for global positioning system (GPS) oceanic operations where aircraft operate in an oceanic Flight Information Region but not within RNP 10 or RNP 4 designated airspace. CASA Instrument 80/14 includes the criteria for Australian aircraft to operate within the North Atlantic Minimum Navigation Performance Specification airspace.</td>
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</table>

A3.1 Background

PBN defines performance requirements for aircraft navigating on an ATS route, terminal procedure or in a designated airspace. Implementing PBN worldwide is the ICAO’s highest priority. This will provide worldwide harmonisation of Area Navigation and allow the most efficient use of available airspace, while improving safety.

The three categories of PBN specification, as described in this chapter, are:

- RVSM
- Area Navigation (RNAV)
- Required Navigation Performance (RNP).
A3.1.1 RVSM

RVSM improves operational efficiency and reduces aircraft environmental impact by decreasing the vertical separation between aircraft flying within RVSM designated airspace. While in the airspace between flight level (FL) 290 and FL 410, inclusive, aircraft are required to conduct flights using approved equipment and procedures, if reduced vertical separation is to be achieved. If an aircraft is not approved for RVSM, Air Traffic Control (ATC) cannot separate the aircraft vertically with the reduced limits (1000 ft instead of 2000 ft). IFR aircraft can still operate in the airspace but the greater vertical separation standard is applied by ATC.

All Australian aircraft and flight crew operating RVSM procedures must be assessed and approved by CASA.\(^7\)

A3.1.2 RNAV

RNAV and RNP (described below) allow aircraft to operate on routes within the designated airspace, independent of ground based navigation aids. However, ground based aids can be a basis for position estimation. Certain navigation specifications are applicable to different phases of flight (i.e. en route, terminal, approach). RNAV does not require on-board performance monitoring and alerting systems.

Specifications for RNAV are:

- For oceanic and remote continental operations:
  - RNAV 10 (authorised as RNP 10).

- For continental en route and terminal operations flight phases:
  - RNAV 5
  - RNAV 2
  - RNAV 1.

A3.1.3 RNP

RNP operations require on-board performance monitoring and alerting systems. With the use of on board navigation performance monitoring and alerting systems RNP operations are enabled through the integrity of the navigation solution being determined on the aircraft. This means that the crew is alerted if the estimated accuracy of the aircraft’s navigation system position fails to meet the required accuracy for the airspace.

\(^7\) Refer to Regulation 181G of CAR
Specifications for RNP are:

- For oceanic and remote continental operations:
  - RNP 4
  - RNP 2 Oceanic\(^8\)
  - Advanced RNP (A-RNP).

- Applicable to continental en route and terminal operations:
  - RNP 2
  - RNP 1
  - RNP 0.3
  - A-RNP.

- Applicable to approach operations:
  - RNP APCH
  - RNP Authorisation Required Approach (RNP AR APCH)
  - RNP 0.3
  - A-RNP.

- Supplemental functionality includes:
  - Radius to fix path terminator
  - Parallel offsets
  - RNAV holding
  - Fixed radius transitions
  - Time of arrival control.

---

\(^8\) RNP 2 oceanic requires dual independent serviceable long range navigation systems (refer to subclause 5.2 of Appendix 3 to CAO 20.91). CPDLC and ADS-C are likely to be required for provision of air traffic services.
A3.2 Types of Navigation Specifications and Authorisations

A3.2.1 RVSM

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<thead>
<tr>
<th>CAR: Division 5</th>
<th>CAO: 52.1</th>
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<tr>
<td>CAAP: 181A-1</td>
<td>ICAO: Document 9574-AN/934 (ch. 4)</td>
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<tr>
<td>AC: FAA AC 91-85</td>
<td>CAANZ AC 91-18</td>
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RVSM airspace is Class A airspace between FL 290 and FL 410 inclusive where air traffic control (ATC) may separate aircraft by minimum of 1,000 feet (ft) vertically. For operators to operate with reduced vertical separation within this airspace, they must first demonstrate to CASA that they and the aircraft comply with the RVSM requirements.

A3.2.2 RNP 10

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<th>CASR: 91.5150</th>
<th>MOS: 91.U (ch. 3)</th>
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The implementation of RNP 10 (previously RNAV 10) operations refers to aircraft operating at 50 Nautical Miles (NM) lateral and 50 NM longitudinal separation minima in oceanic/remote continental area controlled airspace. This is based upon the use of at least two independent Long Range Navigation Systems (LRNSs) comprising of Inertial Navigation System (INS), an Inertial Reference System (IRS)/FMS or a GNSS. Specific LRNSs, such as INSs and IRSs, operate with designated time limitations from their last alignment or update. RNP 10 is a legacy specification that is not changed with the implementation of PBN. By strict definition it is an RNAV specification as there are no requirements for on board navigation performance monitoring.

A3.2.3 RNAV 5

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<th>CAO: 20.91 (Appendix 1)</th>
<th>AC: CASA AC 91.U-01 (s. A.3 of Appendix A)</th>
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</table>

An RNAV 5 specification (previously B-RNAV) enables aircraft to operate during the en route phases of flight along any desired flight path within the coverage of station referenced NAVAIDS (space or terrestrial). Inertial navigation systems may be used but are time limited to two hours from the last radio update. This can also be achieved within the limits of the capability of self-contained aids as well, or a combination of both.

RNAV 5 does not require the carriage of a navigation database or dual area navigation systems. However, multi-sensor systems incorporating GNSS may be used provided the
positioning data from non-GNSS sensors does not cause position errors exceeding the total system error budget. If a navigation database is carried, the database must meet all requirements for navigation databases.

A3.2.4 RNAV 1 and RNAV 2

| CAO:     | 20.91 (Appendix 2) |
| AC:      | CASA AC 91.U-01 (s. A.4 of Appendix A) |

RNAV 1 and RNAV 2 navigation specifications (previously referred to as designated Precision RNAV [P-RNAV] or US-RNAV) are applicable to the terminal phases of flight, including Standard Instrument Departure (SIDs) and Standard Terminal Arrival Route (STARs), and instrument approach procedures up to the final approach fix. These types of specifications require the use of navigation sensors, such as:

- Distance Measuring Equipment (DME) - DME/DME;
- DME/DME/Inertial Reference Unit (IRU); or
- GNSS.

These types of operations are primarily for use in environments with direct controller-pilot communication and surveillance capability. However, they may be used in non-surveillance environments if the safety case permits.

It is possible to design routes to support RNAV 1 and RNAV 2 operations depending upon the supporting NAVAID infrastructure. However, due to the limited nature of NAVAID infrastructure in Australia, RNAV 1 and RNAV 2 operations are generally dependent upon self-contained navigation systems.

RNAV 1 and RNAV 2 aircraft requirements are identical; RNAV 2 is a low accuracy version of RNAV 1 intended for use when critical navigation aids are not available to support 1 NM accuracy for RNAV 1 operations. A single navigation specification is issued which applies to both RNAV 1 and RNAV 2 operations.

A3.2.5 RNP 4

| CASR:   | 91.5150 |
| MOS:    | 91.U (ch. 4) |
| AC:     | CASA AC 91.U-01 |
|         | CASA AC 91.U-3 |

RNP 4 operations are usually used to support aircraft operating at 30 NM lateral and 30 NM longitudinal separation standards in oceanic or remote continental region controlled airspace. This is based upon the use of dual GNSS or equivalent systems as either stand-alone navigation system, or as one of the navigation inputs to a multi-sensor system.
CASA may require the aircraft to be equipped with Controller Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance – Contract (ADS-C) for RNP 4 reduced separation standard operations (see paragraph 4 of CASA AC 91.U-3).

**A3.2.6 RNP 2**

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<tr>
<th>CAO:</th>
<th>20.91 (Appendix 3)</th>
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<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.5 of Appendix A)</td>
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RNP 2 provides ROs a means to operate en route in areas with little or no ground-based navigation aid (NAVAID) infrastructure, limited ATS (Air Traffic Services) surveillance and low to medium density traffic. This is applicable to fixed or flexible routes in Continental En route and Oceanic/Remote Continental regions.

RNP 2 operations require GNSS as the primary navigation sensor. This can be achieved as either a stand-alone navigation system or as part of a multi-sensor system. Under the previous GPS RNAV authorisations, RNP 2 equates to GPS RNAV En Route. (See subsection 8 of CAO 20.91).

Aircraft operating in RNP 2 Oceanic and Remote Continental airspace are also required to have dual independent systems installed and fully operational before the operation can take place. (Clause 5.2 of Appendix 3 to CAO 20.91) Aircraft operating in RNP 2 oceanic/remote continental controlled airspace could also be required by CASA to be equipped with CPDLC and ADS-C for application of reduced separation standards.

**A3.2.7 RNP 1**

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<th>CAO:</th>
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<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.6 of Appendix A)</td>
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RNP 1 provides aircraft a means of navigation in terminal airspace (TMA) with limited or no ATS surveillance and low to medium density traffic. This is applicable to terminal area arrival and departure phases of flight, to instrument approach procedures up to the final approach fix.

RNP 1 operations require GNSS as the primary navigation sensor. This can be achieved as either a stand-alone navigation or as part of a multi-sensor system.
A3.2.8 RNP 0.3

CAO: 20.91 (Appendix 5)
AC: CASA AC 91.U-01 (s. A.7 of Appendix A)

The RNP 0.3 navigation specification was developed specifically for helicopter operations in metropolitan areas and for offshore support, including Point-in-Space (PINS) arrival and departure operations. This navigation specification addresses en route, terminal and approach operations using RNP 0.3 for all phases of flight. Fixed wing aircraft that operate at speeds similar to helicopters are eligible for an RNP 0.3 navigation specification provided they meet all the requirements specified in Appendix 5 of CAO 20.91.

A3.2.9 RNP APCH

CAO: 20.91 (Appendix 6)
AC: CASA AC 91.U-01 (s. A.8 of Appendix A)

RNP APCH (referred to as RNAV GNSS on charts) provides aircraft with a GNSS based instrument approach capability. This is achieved with a minimum standard of avionics, typically a Technical Standard Order (TSO)-C129a (or equivalent) stand-alone receiver. These procedures may also be flown using a FMS with GNSS input. Under the previous GPS RNAV authorisations RNP APCH equates to GPS RNAV Approach.

One type of RNP APCH procedure has been flown in Australia for some years, initially identified as Global Positioning System Non-Precision Approach (GPS NPA) procedures and more recently as RNAV (utilising GNSS) procedures. ICAO has identified that this type of operation meets the basic requirements of an RNP operation and this type of approach is now known as an RNP APCH – lateral navigation (LNAV).

There are four types of RNP APCH procedures:

- RNP APCH–LNAV: where lateral guidance is provided by GNSS
- RNP APCH–LNAV/VNAV: (vertical navigation) where lateral guidance is provided by GNSS and vertical guidance is provided by Barometric Vertical Navigation (Baro-VNAV)
- RNP APCH–LP (Localiser Performance): where lateral guidance equivalent to a localiser approach is provided by augmented GNSS
- RNP APCH–LPV (Localiser Performance with Vertical Guidance): where lateral and vertical guidance is provided by augmented GNSS.

These procedures may be flown as either 2-dimensional (2D guidance classified as Non Precision Approach [NPA]) or 3-dimensional (3D guidance classified as Approach with Vertical Guidance [APV]) procedures.
A3.2.10 RNP AR OPERATIONS

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<th>CAO:</th>
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<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.9 of Appendix A)</td>
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It should be noted that many Australian RNP AR APCH and RNP AR Departure specifications are proprietary. These proprietary specifications provide increased levels of protection above those provided by the more generic FAA and ICAO specifications. There are three types of RNP AR procedures which RO’s may be authorised to conduct:

- RNP AR APCH procedures – (proprietary and ICAO)
- RNP AR departure (RNP AR DEP) procedures
- RNP AR engine-out SID (RNP AR EOSID One Engine Inoperative) procedures.

RNP AR proprietary operations include non-normal procedures (e.g. one engine inoperative, or may use a RNP value <0.3).

RNP AR APCH ICAO are public instrument approach procedures which do not include DEP or One Engine Inoperative (OEI) procedures. This RNP AR type is available to appropriately authorised aircraft and is designed to an All Engines Operating (AEO) standard.

As these procedures are at a higher standard of operation, CASA assesses the aircraft and RO at additional levels of scrutiny, control and authorisation. The increased risks and complexities associated with these procedures are mitigated through more stringent RNP criteria including advanced aircraft capabilities and increased aircrew training requirements.

A navigation authorisation is issued when the RO has met the standards for RNP AR operations in accordance with the CAO and AC. A full operational capability may not be achieved until the RO has demonstrated satisfactory operations at defined stages in accordance with the RO’s approved implementation program.

A3.2.11 APV BARO-VNAV

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<th>20.91 (Appendix 8)</th>
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<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.10 of Appendix A)</td>
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One method that may be used to enable an approach and landing operation with vertical guidance is an instrument approach procedure using Baro-VNAV. This type of approach is classified as an APV but when Baro-VNAV is used the lateral guidance is based on RNP APCH navigation.

Baro-VNAV is a navigation function that enables a vertical path to be defined by the on-board navigation system based on information derived from the aircraft altimetry system. The aircraft lateral path is defined by the GNSS based navigation system. An APV Baro-VNAV instrument approach is a 3-D approach and is flown to a Decision Altitude (DA).

When combined with an RNP APCH–LNAV specification an APV Baro-VNAV specification permits the conduct of an APV instrument approach procedure for which LNAV/VNAV
minima are published. The final approach vertical flight path is defined by a vertical path angle (VPA) originating at a specific waypoint and extending back along the flight path to a final approach point.

**A3.2.12 Advanced RNP**

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<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.11, A.12 and A.13 of Appendix A)</td>
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A-RNP is based solely on the use of GNSS. Additional functions supported in A-RNP are:

- parallel offsets
- RNAV holding
- FRTs\(^9\)
- radius to fix path terminator\(^7\)
- time of arrival control – (Standards not yet developed by ICAO).

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\(^9\) Note: Map display is required for these functions.
A4 Policy Statements

A4.1 Assessment of Navigation Specifications and Authorisations

The following policy statements apply to the assessment of navigation specifications and authorisations:

1. The purpose and intent of this handbook and its associated technical assessor worksheet is to ensure a standardised approach to the assessment and to maintain a CASA record of the decision-making process.

2. It is CASA policy that this handbook be the principal reference when assessing compliance, as such this handbook must be used to assess navigation specifications and authorisations.

3. The questions in the Assessment Worksheet are the assessment criteria that must be considered during reviewing and assessing an applicant's navigation specifications and authorisations package. Whilst some questions may appear to be a simple yes/no response, CASA expects its technical assessors to undertake a qualitative assessment for each question - having regard to the suitability of the applicant to conduct their operations safely.

4. The worksheet includes a Certification sheet which must be completed by each technical assessor involved in the assessment. This sheet records who was involved in the assessment, what was assessed and the declaration that the worksheet was used by each assessor to conduct the assessment.

5. If there is more than one technical assessor involved in the assessment, and each assessor has used a separate worksheet for their assessment elements, the findings must be consolidated into one final assessment worksheet showing all findings and all assessor endorsements. The final version of the assessment worksheet must be saved in the CASA approved recording-keeping system and be easily identifiable as the final version.
Part B - Assessment Process

B1 Initial assessment of navigation specifications and authorisations

1. Using this handbook and associated assessment worksheet, along with the submission of CASA Form 1307 and attachments, the technical assessor should evaluate the application noting the Things for Consideration described throughout this handbook.

The major tasks involved are:

(a) Determine aircraft eligibility – confirm that the aircraft as built or modified is capable of undertaking the requested navigation specifications and authorisation(s). If there is documentation clearly stating the aircraft capability, it could be termed a standard application. If not, it may be termed a 'non-standard' application and may need a compliance project to confirm aircraft eligibility (see section C1.2.1 of this handbook).

(b) Evaluate continued airworthiness – confirm that the operator’s continued airworthiness management procedures and documentation sets out details of all routine maintenance tasks to be carried out on the aircraft and navigational systems. The RO must show that the aircraft will be maintained in conformance with its type design.

(c) Evaluate operational tasks – confirm that operational procedures, training and competency documentation sets out details of training requirements and all routine operational tasks to be carried out while operating the aircraft and the required navigational systems during specified operations.

(d) Review worksheet and include comments – review the worksheet and add any comments in the space provided.

2. Once the worksheet is completed with the final version in the appropriate file and the recommendation sheet signed, the assessor(s) should follow existing processes for advising and/or recommending to the appropriate delegate. This may include the use of a Standard Form Recommendation (SFR) to the Delegate advising them of the ROs status regarding compliance with all legislative requirements and any conditions and limitations to be included in the authorisation documents. This handbook does not describe the recommendation and authorisation processes in detail.
B2 Assessment of amendments to existing navigation specifications and authorisations

Applications for an RO that has existing navigation specifications and authorisations can be viewed as an amendment in many cases. In all cases the scale of the amendment will need to be considered by the assessors involved. However the minimum processes required are detailed below.

B2.1 Addition of aircraft to an existing authorisation

- If the additional aircraft is/are the same make and model to the existing navigation specifications or authorisations, determine the aircraft eligibility and whether there are any significant differences between the new aircraft and the existing fleet of the same make/model. Where practicable, use previously accepted data and focus on any differences.

- If the additional aircraft is/are of a different model to the existing navigation specifications or authorisations, determine the aircraft eligibility and the continuing airworthiness requirements.

B2.2 Additional navigation specifications

- If applying for additional navigation specifications or authorisations with unchanged aircraft equipage then airworthiness compliance, pilot qualifications, training and operational procedures need to be assessed against the relevant Appendix to CAO 20.91.

- If applying for additional navigation specifications or authorisations with additional model/type of aircraft, conduct a complete assessment.
B3 Re-authorisation

Where complete re-authorisation is required, the assessment uses the same procedures as assessment of the initial authorisation. However, the procedures should be suitably modified to focus on the difference between the approved navigation specifications and authorisations and the change that drove the re-approval requirement.
Part C - Assessment Considerations

C1 Determine Aircraft Eligibility

C1.1 Introduction

The RO’s application to CASA (Form 1307) must be accompanied by documentation that identifies the aircraft, details that the instruments/systems equipped are of the appropriate standard and provides necessary information relating the aircraft type.

C1.2 Things for Consideration

Subsections 9, 10 and 11 of CAO 20.91 provide for some existing navigation specifications and authorisations to be deemed to give ROs navigation specifications and authorisations for RNAV5, RNAV1, RNAV2, RNP 2, RNP 1, RNP APCH-LNAV and RNP APCH-LPV or RN APCH-LPV. These provisions are primarily aimed at general aviation aircraft and pilots where compliance has been achieved by installation of an appropriate GNSS navigator in accordance with CASA AC 21-36 and the pilot holds a qualification under CASR Part 61.

- If the equipment was installed by the aircraft manufacturer, the Aircraft Flight Manual (AFM) or AFM supplements will demonstrate compliance.
- Documents submitted must accurately identify the aircraft for which authorisation is sought, including a valid Certificate of Airworthiness (CofA):
  - If the aircraft does not have a valid CofA the status of the aircraft needs to be determined.
• Documentation providing evidence of an aircraft’s eligibility to gain an airworthiness authorisation may be satisfied by any one of the following requirements:

  − For new aircraft – certified documentation from the manufacturer. The documentation may be extracts from the applicable AFM or AFM Supplement(s). An example AFM supplement (Citation X) is contained in Appendix 2 to this handbook.

  − For an aircraft that has a post-production Original Equipment Manufacturer (OEM) approval – a Service Information Letter, Service Bulletin (SB) or other equivalent document (including the type certificate data sheet [TCDS]) that shows airworthiness approval.

  − For aircraft that had a foreign RVSM/PBN airworthiness authorisation – that approval.

  − For modified aircraft:

    o the Supplemental Type Certificate(s) (STCs) or Engineering Order that modified the aircraft

    Note: Pay particular attention for applicability if the STC is an AML (Approved Model List) STC.

    o an appropriate maintenance certification for its incorporation (by serial number)

    o a copy of the associated AFM supplement for the fitment documenting its operational capabilities

    o a copy of the completed Post-Installation Evaluation Sheet (Appendix B of CASA AC 21-36) if modified in Australia or the equivalent if not modified in Australia.

• Any conditions and limitations that are included in the aircraft eligibility documentation but not included in the Aircraft Flight Manual may need to be included in any CASA issued navigation specifications and authorisations.

• For all aircraft, check that appropriate system and calibration checks have been carried out and certified.

Note: If the above conditions cannot be met or the application includes an RNP AR request a more detailed analysis of the equipment fitted needs to be undertaken via a ‘Compliance Project’. A separate meeting with the applicant and discussions with the CNS Advisory Panel (CNS@casa.gov.au) would need to be undertaken and this may be in the style of a pre-application meeting. Guidelines as to the types of items to consider in this event are given in section C1.2.1 below. The associated worksheet has a separate RNP AR tab to be used for an RNP AR application assessment.
C1.2.1 Compliance project technical considerations

This section provides guidelines on the types of items to consider where a more detailed analysis of the equipment fitted needs to be undertaken.

(a) **All aircraft**

- Are dual primary navigation systems connected to the electrical power system in a manner that makes it unlikely that both will fail due to automatic or manual load shedding in the event of an electrical power generation system failure?

(b) **RVSM aircraft**

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<th>CAR: 181C 181F</th>
<th>CAAP: 181A-1 (s. 7 to 11)</th>
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<td>ICAO: Document 9574-AN/934 (ch. 4)</td>
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<tr>
<td>AC: FAA AC 91-85 CAANZ AC 91-18</td>
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- Does the information show that the aircraft is equipped with:
  - two independent altitude measurement systems
  - a secondary surveillance radar transponder that has an altitude reporting system that can be switched to operate from either of the altitude measurement systems
  - an altitude alert system
  - an automatic altitude control system?

- Check that there are no significant structural repairs or damage adjacent to the static vents. Any repairs or damage not approved under the provisions of the Structural Repair Manual (SRM) require written confirmation from the aircraft OEM that, with the repair or damage in place, the aircraft will continue to meet the RVSM requirements.

(c) **RNP 4 and RNP 10 aircraft**

| CASR: 91.5150 MOS: Subpart 91.U (ch. 3 and 4) |
| CAO: 20.91 (subsection 16) |
| AC: CASA AC 91.U-01 |

- Does the aircraft have a minimum of 2 independent LRNSs with integrity such that the navigation system does not provide misleading information?
- Has the RO nominated the RNP 10 time limit for dual INS/IRS navigation? Standard time limits are 6.2 hours from alignment and 5.9 hours from last radio update. Longer update intervals may be approved based on the AFM.

- Is the aircraft approved to use GNSS as a primary means of navigation at RNP 4 for oceanic and remote continental operations? For TSO C129 GNSS systems, evidence of the system meeting FAA Notice 8110.60 or AC 20-138 Appendix A requirements for Fault Detection and Exclusion is required.

- Does the GNSS have:
  - TSO-C129( ); or
  - European Technical Standard Order (ETSO)-C129( ) Class A1; or
  - TSO-C145/146; or
  - ETSO-C145/146 for Class Gamma and operational class 1, 2 or 3; or
  - TSO-C196 or ETSO-C196 for Class Gamma and operational class 1, 2 or 3?

- Does the IRS meet 14 CFR Part 25 App G performance criteria?

- For RNP 4, does the aircraft navigate with a cross-track Total System Error (TSE) no greater than ±4 NM for 95 per cent of the total flight time?

- For RNP 4 operations in controlled airspace with 30 NM lateral and longitudinal separation:
  - Is the aircraft equipped with CPDLC?
  - Is the aircraft equipped with ADS-C?

- For RNP 10, does the aircraft have a cross-track TSE no greater than +/-10 NM for 95% of the flight time?
  - This includes:
    - Position Estimation Error
    - Navigation System Error
    - Flight Technical Error
    - Path Definition Error
    - Display error.

- For RNP 10, does the aircraft have an along-track TSE error no greater than ±10 NM for 95 per cent of the flight time?

- Does the display of navigation data use a lateral deviation/cross track indicator or a navigation map display?
Do the LRNSs consist of INS, IRS/FMS or GPS systems?

Is the aircraft capable of coupling the navigation system to the flight director or autopilot?

**Note:** A full list of required and recommended functionalities can be found in CASA AC 91.U-3 and CASA AC 91.U-2.

### (d) RNAV 5 aircraft

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<th>CAO:</th>
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<tr>
<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.3 of Appendix A)</td>
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The navigation system must meet the following minimum standards of functionality:

- the aircraft position relative to track must be continuously displayed on a navigation display situated in the primary field of view of the pilot flying the aircraft
- where the minimum flight crew is two pilots, the aircraft position relative to track must also be continuously displayed on a navigation display situated in the primary field of view of the pilot not flying the aircraft
- the system must display distance and bearing to the active (to) waypoint
- the system must display ground-speed or time to the active (to) waypoint
- the system must store at least 4 waypoints
- the system must indicate failure of the system, including the sensors.

The following standards apply to navigation displays:

- navigation data must be available on:
  - a display forming part of the RNAV equipment; or
  - a lateral deviation display, for example, Course Deviation Indicator (CDI), (Electronic) Horizontal Situation Indicator [(E)HSI], or a navigation map display.
- the display must be suitable for use:
  - as the primary flight instrument for navigation of the aircraft
  - for manoeuvre anticipation
  - for failure, status or integrity indication.
- the display must be visible to the pilot when looking forward along the flight path
where a lateral deviation display is implemented, the display must have:
  - scaling compatible with any alerting and annunciation limits
  - scaling and full-scale deflection suitable for operations.

An aircraft is eligible for RNAV 5 navigation specification if it meets the eligibility requirements for RNAV 1, RNAV 2 or RNP 2 or RNP 1 navigation specification.

If GNSS is used for an RNAV 5 operation and positioning data from non-GNSS navigation sensors is integrated with GNSS data, is there is a means to deselect the non GNSS inputs if the non-GNSS data causes position errors?

### (e) RNAV 1 and RNAV 2 aircraft

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<th>CAO:</th>
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<tr>
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The navigation system must meet the following minimum standards of functionality:

- the aircraft position relative to track must be continuously displayed on a navigation display situated in the primary field of view of the pilot flying the aircraft
- where the minimum flight crew is two pilots, the aircraft position relative to track must also be continuously displayed on a navigation display situated in the primary field of view of the pilot not flying the aircraft
- the system must display distance and bearing to the active (to) waypoint
- the system must display ground-speed or time to the active (to) waypoint
- the navigation data base must be supplied by an organisation with a Letter of Acceptance issued by an appropriate regulatory authority
- the system must indicate failure of the system, including the sensors.

The following standards apply to navigation displays:

- navigation data must be available on:
  - a display forming part of the RNAV equipment; or
  - a lateral deviation display, for example, CDI, (E)HSI, or a navigation map display.
- the display must be suitable for use:
  - as the primary flight instrument for navigation of the aircraft
  - for manoeuvre anticipation
  - for failure, status or integrity indication.
- the display must be visible to the pilot when looking forward along the flight path
where a lateral deviation display is implemented, the display must have:

- scaling compatible with any alerting and annunciation limits
- scaling and full-scale deflection suitable for operations.

### RNP 2 and RNP 1 aircraft

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<td>Document 9613 - PBN Manual(Vol. II, Part C: ch. 3) (RNP 1)</td>
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- Does the aircraft have the minimum of GNSS installed?
- If the aircraft is equipped with a stand-alone GNSS, is it certified by the manufacturer for en route operations, installed in accordance with AC 21-36, and compliant with:
  - TSO-C129 ( ) Class A1 or A2; or
  - TSO-C129a Class A1; or
  - TSO-C146 ( ) Class Gamma and operational Class 1, 2 or 3; or
  - ETSO-C146 ( ) Class Gamma and operational Class 1, 2 or 3; or
  - standards that CASA considers are equivalent to the standards mentioned above.
- If the aircraft is equipped with a multi-sensor system (for example, FMS) with GNSS equipment, is it certified by the manufacturer for en route operations, and meets one of the following:
  - the requirements of TSO-C115b FMS or ETSO-C115b FMS, and one of the following:
    - TSO-C129(a) sensor Class B or C
    - ETSO-C129(a) sensor Class B or C
    - TSO-C145( ) Class 1, 2 or 3
    - ETSO-C145( ) Class 1, 2 or 3
    - TSO-C196( ).
    - standards that CASA considers are equivalent to the standards mentioned above.
- An aircraft is eligible for RNP 2 operations if the RO has demonstrated to CASA that the aircraft meets the requirements of ICAO Document 9613 - Performance-based Navigation (PBN) Manual, Volume II, Part C, Chapter 2: Implementing RNP 2.
• An aircraft is eligible for RNP 1 operations if the RO has demonstrated to CASA that the aircraft meets the requirements of ICAO Document 9613 - Performance-based Navigation (PBN) Manual, Volume II, Part C, Chapter 3: Implementing RNP 1.

(g) **RNP 0.3 aircraft**

<table>
<thead>
<tr>
<th>CAO: 20.91 (Appendix 5)</th>
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<tr>
<td>AC: CASA AC 91.U-01 (s. A.7 of Appendix A)</td>
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</table>

This specification is primarily intended for helicopters.

• Is the aircraft equipped with GNSS approved to TSO-C145, C146 or C196 as the primary navigation sensor?

• Are all the required functionalities stated in clause 5 of Appendix 5 to CAO 20.91 and CASA AC 91.U-01 (s. A.12 of Appendix A) installed and operational?

• An aircraft is eligible for RNP 0.3 operations if the RO has demonstrated to CASA that the aircraft meets the requirements of ICAO Document 9613, Performance-based Navigation (PBN) Manual (Edition 4), Vol. II, Part C: Chapter 7.

(h) **RNP APCH aircraft**

<table>
<thead>
<tr>
<th>CAO: 20.91 (Appendix 6)</th>
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<td>AC: CASA AC 91.U-01 (s. A.8 of Appendix A)</td>
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</table>

• Is the aircraft approved for RNP APCH operations with GNSS updating?

• Are all the required functionalities stated in the clause 5 of Appendix 6 to CAO 20.91 installed and operational?

• Is the aircraft equipped with a GNSS, installed in accordance with AC 21-36 and AC 21-37, as one of the following:
  - a stand-alone system approved for NPA operations in accordance with AC 21-36:
    - TSO/ETSO-C129a Class A1; or
    - ETSO-C145 Class Gamma an operational class 1, 2 or 3.
  - a multi-sensor system with GNSS equipment:
    - TSO/ETSO-C129 Class B1, C1, B3 or C3; or
    - ETSO-C145 Class 1, 2 or 3; or
    - TSO-C196.

• Does the aircraft demonstrate compliance with the RNP APCH requirements detailed in CASA AC 91.U-01 (see sections A.8.3 and A.8.4 of Appendix A)?
(i) APV Baro-VNAV aircraft

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<th>CAO:</th>
<th>20.91 (Appendix 8)</th>
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<tr>
<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.10 of Appendix A)</td>
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</table>

- Physically check that there are no significant structural repairs or damage adjacent to the static vents. Any repairs or damage not approved under the provisions of the SRM require written confirmation from the aircraft OEM that with the repair or damage in place, the aircraft will continue to meet the requirements.
- Has the OEM documented that the aircraft is capable of APV Baro-VNAV approach and/or departure operations?
- An aircraft that will undertake APV Baro-VNAV operations must be equipped with:
  - a Baro-VNAV system
  - a navigational database that permits the vertical path to be defined
  - navigation displays that enable vertical deviation from the defined VNAV path to be determined
  - a navigation system approved for IFR approach operations in accordance with a RNP APCH LNAV/ VNAV.

(j) Advanced RNP aircraft

<table>
<thead>
<tr>
<th>CAO:</th>
<th>20.91 (Appendix 9, 10 and 11)</th>
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<tr>
<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.12, A.13 and A.14 of Appendix A)</td>
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- A-RNP is based solely on the use of GNSS. Additional functions supported in A-RNP are:
  - parallel offsets
  - RNAV holding
  - FRTs\(^{10}\)
    - radius to fix path terminator (RF)\(^{8}\).
- A-RNP requires GNSS as the primary navigation sensor. Does the GNSS meet the requirements of FAA AC 20-138 or FAA AC 20-130A?
- Is the aircraft fitted with a map display?
- An aircraft is eligible for A-RNP operations if the RO has demonstrated to CASA that the aircraft meets the requirements of ICAO Document 9613 - Performance-based Navigation (PBN) Manual, Vol. II, Part C: Chapter 4.

\(^{10}\) Note: Map display is required for these functions.
• RF and FRT functions are available as supplemental authorisations to other PBN authorisations. They are shown in Figure 2 below. Map display is required for these functions.

<table>
<thead>
<tr>
<th>Navigation Specification</th>
<th>Radius to fix path terminator (RF)</th>
<th>Fixed radius transitions (FRT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNP 4</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>RNP 2</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>RNP 1</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>A-RNP</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RNP APCH</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>RNP AR APCH</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>RNP 0.3</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Figure 2: Availability of RF and FRT functions to PBN authorisations.\(^\text{11}\)

(k) **RNP AR aircraft**

<table>
<thead>
<tr>
<th>CAO:</th>
<th>20.91 (Appendix 7)</th>
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<tr>
<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.9 of Appendix A)</td>
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• For an aircraft equipped with GNSS sensors that comply with TSO C129a, C145a, C146a, C196 or an equivalent standard, confirm that the following minimum equipment is fitted:
  - two FMS
  - two GNSS sensors (which may be included in an MMR)
  - one IRS
  - two flight directors
  - two flight mode annunciators
  - two Radar Altimeters (RADALTs)
  - duplicated primary flight and navigation displays
  - duplicated alternating current power source (for which an auxiliary power unit [APU] may be used)
  - one autopilot channel
  - one terrain awareness and warning system (TAWS) appropriate to the class of operation.

\(^{11}\) Sourced from PBN Manual Part A Table II-A-1-2
Within the pilot’s primary field of view there must be:
  - a suitably scaled CDI
  - a map display with a numeric indication of cross-track deviation, with a scale of 0.01 NM or less.

The system must be capable of executing leg transitions and maintaining tracks consistent with an RF leg.

For an RNP AR approach or departure with an RNP of not less than 0.3, there must be within the pilot’s primary field of view:
  - a map display
  - a numeric display of cross-track deviation with a scale of 0.1 NM or less.

An aircraft is also eligible for A-RNP operations if the RO has demonstrated to CASA that the aircraft meets the requirements of ICAO Document 9613 - Performance-based Navigation (PBN) Manual, Volume II, Part C: Chapter 6.

There should be evidence that any modifications, options, or equipment with particular part numbers required by the manufacturer are installed.
C2 Continued Airworthiness Assessment Criteria

The RO is required to ensure all aircraft intended to be used in PBN or RVSM operations are maintained to conform and comply with the type design. All required equipment, processes and procedures are to be put in place and well documented to ensure the integrity of the aircraft is demonstrated.

The RO should be able to demonstrate that the navigation system will be maintained in compliance with the type design. For navigation system installations there are few specific continued airworthiness requirements other than database and configuration management, systems modifications and software revisions, but the element is included for completeness and consistency with other CNS/ATM operational approvals (for example RVSM).12

The key elements of continued airworthiness are:

- aircraft continuing airworthiness and configuration management systems (including practices, documents and equipment)
- a maintenance program
- maintenance training
- a Minimum Equipment List (MEL).

C2.1 Aircraft continuing airworthiness and configuration management

C2.1.1 Introduction

The RO must have a system to ensure the aircraft remains certified as airworthy and is in compliance with its type design and navigation specification. In order to remain compliant with its type design the aircraft must remain properly configured or have approved relief authorised (i.e. AD or MEL).

C2.1.2 Things for Consideration

(a) All aircraft

| AC: CASA AC 91.U-04 |

Aircraft specific equipment list

- Does the specific aircraft equipment list include (match) the required navigation equipment as specified by the operator and/or specified in the AFM, AFM Supplement, SB, SIL, EO and/or TCDS?

12 Extract from ICAO 9997 Chapter 2– Certification and Operational Approval:
If the specific aircraft list does not match the other specifications then the deficiency must be identified and rectified by the RO.

- Does the aircraft-specific equipment list include appropriate part/version identification?
- When dual systems are installed that use the same equipment, the installations should have the same configuration. Minor installation differences are acceptable provided there is no significant operational impact. For the system software, minor version differences are acceptable provided that there are no significant functional differences.

**Electrical Load Analysis (ELA)**

- Does the ELA accord with the specific aircraft equipment list? That is, has the ELA considered all post-production modifications including installation of navigation equipment?
- Is the ELA compliant with regulatory requirements and OEM limits?
- Is there a documented process for ensuring the ELA is maintained?
- Each operator must have procedures to ensure that the ELA is maintained to reflect the actual aircraft configuration and ensure that the electrical power system complies with regulatory requirements and any OEM limits.

**Software and database configuration**

- Is the database provided by a supplier with appropriate regulatory approval?
  - For operators conducting RNP APCH operations, the navigation database should be obtained from a supplier holding a Type 2 Letter of Acceptance (LOA) (i.e. equipment specific) from their regulatory authority. A Type 1 LOA (i.e. not equipment specific) is acceptable except that, for RNP AR operations, the navigation database supplier must hold a Type 2 LOA.
- Are there processes to ensure that the aircraft software and databases are compliant with CAO 20.91?
- Are there processes to ensure that aircraft software is current within AIRAC cycles?
- Are there processes to ensure that software versions are identical or have no significant differences in dual installations?

**Calibration**

- Are the aircraft’s altimetry systems calibrated for RVSM operations?
C2.2 Maintenance Program

C2.2.1 Introduction

The RO must demonstrate their ability to maintain the aircraft in an airworthy condition, specifically addressing maintenance procedures designed to maintain conformity and integrity of the applicable navigation equipment and systems.

C2.2.2 Things for consideration

(a) All aircraft

| CAR: 30 | CASR: Part 42 |

- Does the maintenance program include a set of complete instructions for continuing airworthiness for the each applicable navigation equipment issued by the Type Certificate (TC) or STC holder?
  - This may include the aircraft maintenance program (AMP), aircraft maintenance manual (AMM), SRM, Wiring Diagram Manual (WDM), component maintenance manual (CMM), SB(s) or other applicable documents.
  - The applicant should supply applicable extracts or documents.

- Does the program include practices to maintain the accuracy and integrity of the autopilot and automatic altitude control system?

- Does the maintenance program include a reliability program for monitoring the applicable navigation equipment?

- Parts substitution may only be used when there is technical data that authorises the substitution.

- The RO’s configuration management procedures must ensure the ELA is maintained and continued compliance is assured; any changes in the electrical load must be incorporated into the ELA.

- Does the system of maintenance (SOM) program and the AMP include provisions to ensure that the aircraft remains capable of operating in RVSM airspace?
  - Do those provisions include an RVSM checklist that maintenance personnel must action?
  - Do those provisions include the relevant sections of the maintenance manual (aircraft or component) for RVSM? For example:
    - maintenance practices (for example, alignment of pitot static, probes or dents/deformation around static plates)
    - calibration practices (Built In Test Equipment [BITE] is not acceptable)
    - waviness checks within RVSM tolerances and following repair
o existing maintenance practices for altitude alert, ATC altitude reporting, altimetry systems and automatic altitude control system maintain RVSM approval integrity

o leak check after static system disturbance

o static systems maintained in accordance with manufacturer’s standards

o autopilot and automatic altitude control system accuracy and integrity.

− Do those provisions include cautions regarding repairs in RVSM critical areas?

− The operator’s maintenance procedures must ensure that the software in each system:
  o is maintained in a configuration that is compatible with other systems in the aircraft
  o has no significant operational differences between systems.

C2.3 Maintenance Training

C2.3.1 Introduction

The RO must also submit a description of training programs that include provisions for engineering personnel. This documentation should also include evidence of initial, upgrade and recurrent training.

C2.3.2 Things for consideration

(a) All aircraft

<table>
<thead>
<tr>
<th>CASR:</th>
<th>Part 42</th>
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<tr>
<td>AC:</td>
<td>CASA AC 91.U-04</td>
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</table>

- Is there evidence of initial training of maintenance personnel appropriate to the navigation specifications and authorisations sought?
- Does the operator maintain training and competency records?
- Do the training syllabi cover all maintenance training programs, maintenance practices and procedures?
- Has the maintenance controller/HAAMC/Continuing Airworthiness Manager undertaken additional training relevant to RVSM/PBN?
(b) **RVSM aircraft**

| CAAP: 181A-1 (s. 11.6) |

- For RVSM aircraft, does the training include (at a minimum):
  - aircraft geometric inspection techniques
  - test equipment calibration/usage techniques
  - pitot/static tests
  - any special documentation or procedures introduced by RVSM authorisation?
- Are maintenance staff made aware of the critical nature of RVSM airworthiness serviceability?

### C2.4 Test equipment

#### C2.4.1 Introduction

Tools and test equipment are required for maintaining systems subject to operational authorisations. ROs must be able to show that they have the necessary test equipment to maintain the authorisation requirements and ensure it is maintained and calibrated in accordance with the regulatory requirements.

**Note:** If required, test equipment and tools are specific to the aircraft (usually by model).

#### C2.4.2 Things for consideration

(a) **All aircraft**

| AC: CASA AC 91.U-04 |

- Does the maintenance organisation(s) hold required test equipment that has the required accuracy?
- Can the organisation demonstrate that they have procedures in place to maintain the test equipment, including:
  - appropriate periodic intervals to calibrate test equipment
  - calibration to national standards (i.e. NATA or OEM)
  - appropriate storage?
RVSM and APV Baro-VNAV aircraft

<table>
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<tr>
<th>CAO: 20.91 (Appendix 8)</th>
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<tr>
<td>100.5 (subsection 12)</td>
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<tr>
<td>AC: 91.U-04</td>
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<tr>
<td>CAAP: 181A-1 (s. 7 to 11)</td>
</tr>
<tr>
<td>ICAO: Document 9574-AN/934 (ch. 4)</td>
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</table>

- In addition to the considerations for all aircraft, for RVSM and APV Baro-VNAV aircraft the same considerations should also be given to the following equipment:
  - altimetry test equipment
  - pitot/static test equipment
  - airframe waviness test equipment.

C2.5 MEL

C2.5.1 Introduction

The RO should ensure that, for equipment pertinent to the elected PBN specifications(s) and authorisation(s), operational and maintenance procedures are incorporated within the MEL.

If the MEL needs to be approved then the RO will need to have a separate application to undertake this task.

If the MEL is already approved and anomalies are identified the RO should be notified.

C2.5.2 Things for consideration

(a) All aircraft

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<td>AC: CASA AC 91.U-04</td>
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<td>CAAP: 37-1</td>
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- Does the MEL reflect the applicable Master MEL (MMEL)?
  - At a minimum, ATA Chapters 22, 24, 27, 30, 31 and 34 should be reviewed to assess the following:
    - Does any proviso less stringent than that of the MMEL have adequate substantiation to establish an equivalent level of safety? If so, then substantiating technical data must be provided.
    - Do the MEL ‘O’ procedures reflect the operating procedures necessary to operate the aircraft along the intended route, including any designated alternatives, with deficiencies identified?
Do the MEL ‘M’ procedures provide either the actions to be taken or references to the maintenance procedures for the action required? The ‘M’ procedures must be specific statements of work that must be accomplished; generic statements are not acceptable.

Where the MMEL proviso states ‘As required by Regulation’, ‘As required by FAR’ or other similar statement, is there a proviso statement in the operator MEL that reflects the Australian regulatory requirements?

Where a system interfaces to other systems, are there notes or references to those other systems? For example, GNSS interfaces to Automatic Dependant Surveillance – Broadcast (ADS-B) and TAWS, therefore GNSS being inoperative makes those systems inoperative.

Has the MEL been amended to include mandatory equipment and systems for RVSM operations?
C3 Operational Assessment Criteria

To verify a navigation specification or obtain an authorisation, the RO must demonstrate that the aircraft can be operated safely and in accordance with relevant regulatory requirements.

The RO is required to ensure flight crew members who will be carrying out PBN-based operations are adequately trained. The RO’s training programs must be documented to demonstrate compliance with the regulations.

The aircraft’s documents and checklists must be updated to include the required information for equipment and procedures that are necessary for operation in airspace where PBN/RVSM specifications are the basis of air traffic separation or instrument approach and departure procedures.

C3.1 Operations manuals and procedures

C3.1.1 Introduction

AOC holders must revise the processes and procedures in their operational suite of manuals to adequately document and manage the required operational aspects for the navigation specifications and authorisations sought.

ROs who do not operate under an AOC are not required to have operations manuals. Aircraft with integrated GNSS/FMS should have operating procedures available to crew and the crew must be competent in the application of the procedures.

The RO’s normal and contingency operations must be adequate for the aircraft, equipment installation and the operations being conducted.

C3.1.2 Things for Consideration

(a) All aircraft

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<th>CAO:</th>
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<td>AC: CASA AC 91.U-01</td>
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<td>CAAP: 181A-1</td>
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- Has the RO submitted operating procedures, training manuals and checklists as part of their application?
- Do the RO’s procedures and processes adequately document and manage the required operational aspects for the navigation specifications and authorisations sought? The following are relevant:
  - standard operating procedures and checklists
  - flight crew training and competency assessments (may reference separate training manuals)
  - route guide (or other similar document)
  - aircraft equipment requirements for specific routes
− operating limitations (may be route specific)
− crew qualification requirements for specific routes
− navigation database management and validation
− error and incident reporting procedures
− contingency procedures
− MEL.

**General operating procedures**

- Do the operating manuals ensure that the following checks are undertaken:
  - Is the aircraft navigation system available and operating correctly prior to take-off?
  - Has the correct airport and runway data been loaded and properly depicted on the aircraft navigation system?
  - If the aircraft is using a TSO C129/C129a system, has the departure airport been loaded into the flight plan to achieve the appropriate navigation system monitoring and sensitivity?

- Do the ROs operating procedures require the crew to maintain the route centreline at all times except for minor deviations at waypoint transitions and when authorised by ATC unless under emergency conditions?

**SID specific requirements**

- Are there pre-take-off procedures for the crew to verify the following RNAV/RNP SID requirements:
  - the aircraft’s navigation system is available, is operating correctly and the correct aerodrome and runway data is loaded
  - the correct runway and departure procedure (including any applicable en route transition) is entered in the navigation system flight plan and properly depicted
  - if a departure procedure is assigned and the runway procedure or transition is subsequently changed, the appropriate changes are entered in the navigation system flight plan, properly depicted and available for navigation
  - the GNSS signal has been acquired before the take-off roll commences.

- Are there procedures requiring lateral guidance to be selected and available to provide flight guidance for LNAV at no later than 500 ft above the aerodrome field elevation?
STAR specific requirements

- Are there procedures for the crew to verify the following RNAV/RNP STAR requirements:
  - the aircraft navigation system is operating correctly
  - the correct arrival procedure and runway (including any applicable transition) are entered in the system and properly depicted.

- Are there procedures for the crew to check and confirm the following:
  - the active navigation system flight plan, by comparing the charts with the navigation displays
  - the sequence of waypoints
  - the reasonableness of track angles
  - distances, altitude or speed constraints
  - as far as practicable, which waypoints are fly-by and which are flyover.

- Do the RO procedures contain instructions to address the following:
  - navigation system updating and to exclude a particular navaid (if required)
  - a route is not to be used if doubt exists as to its validity in the navigation database
  - no member of the flight crew may create a new waypoint by manual entry into the navigation system
  - if the ROs contingency procedures require reversion to a conventional arrival route, provision for that arrival route must be made before commencement of the RNAV/RNP STAR
  - route modifications in the terminal area may take the form of radar headings or ‘direct to’ clearances and may require the insertion of tactical waypoints from the navigation database. However, no member of the flight crew may make a manual entry or modification of the loaded route using temporary waypoints or fixes not contained in the database
  - all relevant published altitude and speed constraints must be observed.

Contingency procedures

- ATC must be notified immediately if the navigation system performance ceases to meet the requirements for the navigation specification in use during an operation in controlled airspace.

- If GNSS is used as the sole source of position data, does the operator have a procedure to deal with loss of integrity for more than 5 minutes?
(b) **RVSM aircraft**

- Do the appropriate manuals and checklists include information/guidance on the standard operating procedures detailed in Appendix 1 of CAAP 181A-1?

- Appropriate manuals should include a statement of the airspeeds, altitudes and weights considered in RVSM aircraft authorisation. They should also include identification of any operating restrictions established for that aircraft group.

- Do pre-flight inspection procedures include inspection of static sources and surrounding skin?

### C3.2 Training and Competency

#### C3.2.1 Introduction

Flight crews are required to be trained in the use of the relevant navigation equipment and operating procedures. There are a number of practices that should be incorporated into flight crew training and procedures. Where deeming provisions apply, pilot training is satisfied by CASR Part 61. If RNP APCH LNAV/VNAV, APCH LPV, APCH LP or RNP AR are requested additional training will be required.

The RO should submit training syllabi and other appropriate material to show that operating practices, procedures and training items related to PBN/RVSM operations are incorporated in initial and, where warranted, recurrent training programs for the following items:

- flight crew qualification
- flight planning
- pre-flight
- in-flight procedures
- reporting errors
- monitoring programs
- MEL
- RNP/RNAV SID requirements
- RNP/RNAV STAR requirements
- post-flight procedures.

Pilots flying in private operations are required to hold the relevant qualifications consistent with Part 61 of CASR.
C3.2.2 Things for Consideration

(a) All aircraft

| CAO: 20.91 | AC: CASA AC 91.U-01 (s. B.5.6 of Appendix B) |

- Does the training syllabus define the method of delivery, means of assessment and competency level required?
- If training devices are to be used, do they replicate the actual aircraft installation and functioning?
- Does the RO training manual suite include the following topics:
  - the flight planning requirements for the RNAV/RNP operations
  - the capabilities and limitations of the navigation system(s) installed
  - knowledge of the each of the navigation specifications to be used by the aircraft
  - the meaning and proper use of aircraft equipment/navigation suffixes and functionality
  - route, airspace and procedure characteristics as determined from chart depiction and textual description
  - depiction of waypoint types (fly-over, fly-by and FRT) and path terminators
  - knowledge of the required navigation equipment in order to conduct various RNAV and RNP operations including MEL provisions
  - for RNAV operations, knowledge of techniques for checking navigation performance with reference to conventional navigation aids
  - navigation system-specific information:
    - levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation
    - recognition of when the aircraft is no longer able to navigate and meet the performance requirements for the navigation specification in use
    - use of autopilot, auto throttle and flight director
    - functional integration with other aircraft systems
    - flight guidance (FG) mode behaviour
    - the meaning and appropriateness of lateral and vertical route discontinuities as well as related pilot procedures
    - monitoring procedures for each phase of the flight (for example monitor PROG or LEGS page)
    - lateral and vertical path management
- types of navigation sensors (for example DME, IRU, GNSS) utilised by the navigation system and associated system
- prioritisation/weighting/logic
- turn anticipation with consideration given to speed and altitude effects
- interpretation of electronic displays and symbols
- understanding of the aircraft configuration and operational conditions required to support PBN operations, for example appropriate selection of CDI scaling (lateral deviation display scaling)
- understanding the performance requirement to couple the autopilot/flight director to the navigation system’s lateral guidance on RNP procedures (if required)
- automatic and/or manual setting of the required navigation accuracy.

RNP system operating procedures, as applicable, including how to perform the following actions:

- verify currency and integrity of the aircraft navigation data
- verify the successful completion of RNP system self-tests
- initialise navigation system position
- retrieve and fly a route, SID or a STAR, or approach by name with appropriate transition and be familiar with procedures to deal with a runway change (RNP 1, RNAV 1and RNAV 2 only)
- retrieving a LP or LPV approach procedure from the database (for example using its name or the Space Based Augmentation System [SBAS] channel number) (LP and LPV only)
- adhere to speed and/or altitude constraints associated with routes and procedures
- where applicable, the importance of maintaining the published path and maximum airspeeds while performing RNP operations with RF Legs or FRTs
- impact of pilot selectable bank limitations on aircraft/rotorcraft ability to achieve the required accuracy on the planned route
- the effect of wind on aircraft performance during execution of RF legs and the need to remain within the RNP containment area. The training program should address any operational wind limitations and aircraft configurations essential to safely complete the RF turn
- the effect of ground speed on compliance with RF paths and bank angle restrictions impacting the ability to remain on the course centreline
- verify waypoints and flight plan programming
- fly direct to a waypoint
- fly a course/track to a waypoint
- intercept a course/track
- intercept a course/track (fly vectors, and re-join an RNP route/procedure from the ‘heading’ mode.)
- fly interception of the extended final approach segment (for example using the VTF function) (RNP APCH only)
- determine cross-track error/deviation (more specifically, the maximum deviations allowed to support each navigation specification and authorisation sought must be understood and respected)
- resolve route discontinuities
- insert and delete route discontinuity
- remove and reselect navigation sensor input
- when required, confirm exclusion of a specific NAVAID or NAVAID type
- change arrival airport and alternative airport
- perform parallel offset function if capability exists. Pilots should know how offsets are applied, the functionality of their particular RNP system and the need to advise ATC if this functionality is not available
- perform RNAV holding function
- perform a conventional holding pattern
- perform gross navigation error checks using conventional NAVAIDs
- perform a manual or automatic runway update (with take-off point shift, if applicable) (A-RNP only)
- operator-recommended levels of automation for phase of flight and workload, including methods to minimize cross-track error to maintain route centreline.

- Contingency procedures for RNAV/RNP failures
- a clear understanding of crew requirements for comparisons of primary altimeter information, altitude cross-checks (for example altimetry comparisons of 30 m [100 ft]), temperature limitations for instrument procedures using Barometric VNAV, and procedures for altimeter settings for approach
- discontinuation of a procedure based upon loss of systems or performance and flight conditions (for example inability to maintain required path tracking, loss of required guidance, etc.) (Baro-VNAV only).
C3.3 RNP AR Operations

Note: If the application includes an RNP AR request, a more detailed analysis of the equipment fitted and operational requirements needs to be undertaken via a ‘Compliance Project’. A separate meeting with the applicant and discussions with the CNS Advisory Panel (CNS@casa.gov.au) would need to be undertaken; this may be in the style of a pre-application meeting.

C3.3.1 Introduction

RNP AR operations allow the use of small navigation tolerances (<0.3 NM) for both normal and non-normal operations. The navigation tolerances allow flight paths within close proximity to terrain and other obstacles and also allow development of relatively complex flight paths for terrain avoidance in the event of an engine being inoperative on a multi-engine aircraft. Because of this complexity and high regulatory oversight required to implement procedures and navigation authorisations for RNP AR (proprietary), operations will initially be limited to operators holding a CAR 217 Training and Checking approval (or equivalent approval from another State).

Due to the higher standard of operation an RNP AR APCH (proprietary) navigation authorisation entitles an operator to also receive an RNP AR APCH (ICAO) navigation authorisation.

Comprehensive hazard identification, risk assessment and risk mitigation are required to ensure safe operations. This is undertaken by means of a Flight Operational Safety Assessment (FOSA), consistent with ICAO Document 9613 - PBN Manual (also see clause 4 of Appendix 7 to CAO 20.91). The scope of the FOSA is outlined in more detail in the ICAO Document 9613 - PBN Manual, Vol. II, Part C: Chapter 6 - Section 6.4.

The FOSA should be conducted before:

- applying to CASA for an RNP EOSID
- conducting an RNP AR operation that required and RNP value of less than 0.3 NM
- conducting an RNP AR operation in which it is planned to have least one engine inoperative.

C3.3.2 Things for Consideration

CAO: 20.91 (Appendix 7)
AC: CASA AC 91.U-01 (s. A.9 of Appendix A)
CASA AC 91.U-01 (Appendix B)

- Has the operator submitted the following:
  - an FOSA consistent with ICAO Document 9613 - PBN Manual (also see clause 4 of Appendix 7 to CAO 20.91) and that meets all aspects of RNP AR navigation authorisation, such as:
    - flight crew procedures (including contingency procedures)
o flight crew training
o engineering modifications
o operating limitations
o procedure design where a proprietary procedure is used
o procedures to determine GNSS availability and effects of terrain, turbulence, wind and temperature?
  − evidence the aircraft is equipped with the minimum equipment required as listed in Appendix 7 of the CAO.

• Does the RO intend to use flight director instead of autopilot during RNP AR operations?
  − If so, has the RO submitted the aircraft manufacturer’s recommended operating procedures and flight crew guidance and training documentation?
  − Has the RO demonstrated to CASA that the Flight Technical Error can be maintained within permitted tolerances during all circumstances when flown with the flight director?

• Does the ROs aircraft display functionality comply with the requirements specified in clause 7 of Appendix 7 to the CAO 20.91?

• Are flight crew are made aware and trained to apply temperature and speed limitation in accordance with clause 22 of Appendix 7 of the CAO while conducting certain RNP AR operations?

• Has the operator submitted the following:
  − RNP Availability Prediction documentation?
  − An implementation program, including qualification flight and a proposed method to monitor RNP AR operation?
  − A program to provide CASA with periodic reports on implementation?
  − A training program that addresses the proficiencies identified in Table 24-1 of Appendix 7 to CAO 20.91?

C3.4 Past performance

C3.4.1 Introduction

For RNP 10 and RNP 4 aircraft: The RO must include an aircraft operating history with their application to address any incidents related to navigation errors. Any incidents should be covered in new or revised training programs and contingency procedures which will also be required for submission with the ROs application.

Initial applicants may be able to demonstrate past performance with other aircraft of the same type that have been approved.
C3.4.2 Things for Consideration

(a) RNP 10 and RNP 4 aircraft

| AC: | CASA AC 91.U-2 (s. 9.1.6) (RNP 10)  
CASA AC 91.U-3 (s. 5.3.7) (RNP 4) |

- Have any modifications been made to the aircraft as a result of past performance statistics?
- Does the operating history show any significant events or incidents that indicate poor navigation performance?
- If there is evidence of significant errors or poor performance to ensure at least the following have been addressed:
  - revised training program (operational and/or maintenance)
  - contingency procedures reviewed and revised (if required)
  - aircraft modifications or aircraft maintenance practices (if required).

(b) RNP AR operations and APV Baro-VNAV aircraft

- The RO will be required to monitor and collect data of RNP AR operations conducted. This information will be submitted as part of the Implementation program (see section C3.7 of this handbook). This data will enable any negative trend in performance or operations to be identified.
- Initial applicants may be able to demonstrate expertise with other aircraft of a different type that have successfully obtained an RNP AR authorisation.
- Are there any negative trends present in the ROs data collection?

C3.5 Inertial system performance monitoring

C3.5.1 Introduction

For RNP 10 aircraft: ROs must monitor the drift rate of inertial systems on every flight to determine that the drift rate does not exceed 2 NM/hour. Crew operating procedures must ensure that the crew check the final inertial position and residual groundspeed before any inertial system self-calibration action takes place (for example groundspeed automatic zeroing).
C3.5.2 Things for Consideration

(a) **RNP 10 aircraft**


- Does the operator have a procedure for monitoring inertial systems performance at the end of each flight?

C3.6 Navigation Database – standards and discrepancies

C3.6.1 Introduction

The RO should include operational procedures to ensure that the navigation database is provided from a supplier that holds a Letter of Acceptance from their regulatory authority.

**Note:** This section does not apply to aircraft conducting only RNP 10 and/or RNAV 5 operations that do not have a navigation database installed in the aircraft.

If an aircraft is authorised to conduct RNP 10 or RNAV 5 operations and the navigation system is equipped with a navigation database, the provisions of this section apply even though there is no requirement for a navigation database in these navigation specifications.

C3.6.2 Things for Consideration

(a) **All aircraft**

| CAO: 20.91 (subsection 13) |

- Is the ROs navigation database being supplied by a supplier holding a regulatory Letter of Acceptance? If not, more information should be provided.
- Does the RO have procedures for managing navigation databases?
- Does the RO have procedures for ensuring that aircraft operate with navigation databases that are up to date for the current AIRAC cycle?
- Does the RO have procedures for validating the navigation database(s)?
- Does the RO have procedures for reporting navigation database errors in accordance with Aeronautical Information Publication En Route (AIP ENR) 1.14?
- Does the RO have procedures to ensure that flight crew check flight plans with the navigation database before use?
(b) **RNP AR operations aircraft**

<table>
<thead>
<tr>
<th>CAO:</th>
<th>20.91 (Appendix 7)</th>
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<tbody>
<tr>
<td>AC:</td>
<td>CASA AC 91.U-01 (s. A.9 of Appendix A)</td>
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</table>

- Prior to use for each AIRAC cycle, does the operator have procedures for validating each RNP AR APCH procedure prior to use?

### C3.7 RNP AR operations implementation program

#### C3.7.1 Introduction

**For RNP AR operations aircraft:** The RO will be required to submit to CASA a report containing a review of operations that include, but are not limited to the lists in Appendix 7 to CAO 20.91. This report must be submitted at intervals that would have been specified in the ROs implementation program that was developed in consultation with CASA.

An RO that has not previously conducted RNP AR or APV Baro-VNAV operations or has not conducted the operation with a particular aircraft type will have an implementation program with limits on operating minima until the RO has demonstrated the capability to safely conduct the specific authorisations to the specifications required.

#### C3.7.2 Things for Consideration

(a) **RNP AR operations and APV Baro-VNAV aircraft**

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<tr>
<th>CAO:</th>
<th>20.91 (cl. 13 of Appendix 7)</th>
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<tr>
<td>AC:</td>
<td>CASA AC 91.U-01</td>
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</table>

- Has the RO had previous RNP AR or APV Baro-VNAV experience?
- Are there any limitations on the ROs implementation program?
- Have all the elements listed in Appendix 7 to CAO 20.91?

### C3.8 Validation flight(s)

#### C3.8.1 Introduction

**For RVSM aircraft:** In some cases, the review of the RVSM application and programs may suffice for validation purposes. However, the final step of the authorisation process may be the completion of a validation flight. CASA Air Safety Auditors may accompany the RO on a flight through airspace where RVSM is applied to verify that operations and maintenance procedures and practices are applied effectively.
C3.8.2 Things for Consideration

(a) RVSM aircraft

| CAR: 181A | CAO: 20.91 (cl. 12.5 of Appendix 7) | CAAP: 181A-1 (s. 12) | ICAO: Document 9574-AN/934 (ch. 3) |

- Has the RO submitted a proposed validation flight plan for acceptance by CASA?
- Does the proposed validation flight plan meet the objectives of the validation flight?
- Has the RO/CASA flight crew undergone formal training in the conduct of non-normal operational flights, for example maintenance test flights?

C3.9 Monitoring and reporting program

C3.9.1 Introduction

For RVSM aircraft: A program to monitor or verify aircraft height-keeping performance is considered a necessary element of RVSM implementation. The RO will be required to participate in the verification or monitoring program valid for their State of registration. This program should normally entail a check of at least a portion of the ROs aircraft by an independent height-monitoring system.

For all other aircraft: Monitoring programs are required to accurately monitor the ability of the aircraft’s navigation system, its achieved navigation performance and to correctly identify to the pilot whether the operational requirements are or are not being met during an operation. The RO must include a reliable monitoring program in their application that addresses the following factors for each navigation specification and authorisation.

C3.9.2 Things for Consideration

(a) All aircraft

- Has the RO submitted evidence of procedures for flight crew to monitor aircraft navigation performance against the relevant PBN specification or authorisation?
- Does the RO have procedures in place to report navigation performance to CASA?
- ADS-B will provide an acceptable means of monitoring RVSM height-keeping performance.
- Does the RO have an active Flight Operations Quality Assurance (FOQA) program to monitor RNP AR operations?
  - If not, the RO must provide information on how they intend to monitor their RNP AR activities.
### (b) RVSM aircraft

| CAR: | 181A |
| CAAP: | 181A-1 (s. 12 and Appendix 2) |
| ICAO: | Document 9574-AN/934 (ch. 4 and Appendix A) |

- Are procedures in place to monitor Total Vertical Error (TVE), Assigned Altitude Deviation (AAD) and producing a companion Altimetry System Error (ASE) estimate for each TVE measure?
- Do the procedures in place for monitoring height-keeping performance adequately meet the required scheduling, both initial and ongoing?
  - ADS-B is an acceptable means of meeting the RVSM height-monitoring requirements.

### (c) RNAV 5 aircraft

| CAO: | 20.91 (Appendix 1) |
| AC: | CASA AC 91.U-01 (s. A.3 of Appendix A) |

- During operating in or on routes designated as RNAV 5, the lateral total system error must be within 5 NM for at least 95 per cent of the total flight time. The along-track error must also be within ± 5 NM for at least 95 per cent of the total flight time.

### (d) RNAV 1 and RNAV 2 aircraft

| CAO: | 20.91 (Appendix 2) |
| AC: | CASA AC 91.U-01 (s. A.4 of Appendix A) |
| ICAO: | Document 9613 - PBN Manual (Vol. II, Part B: ch. 3 – s. 3.3.3.1) |

- The lateral total system error and along-track error for RNAV 1 operations must be within ± 1NM for at least 95 per cent of the total flight time.
- For RNAV 2 operations, the lateral total system error and along-track error must be within ± 2NM for 95 per cent of the total flight time.

### (e) RNP 4 aircraft

| MOS: | Subpart 91.U (ch. 4) |
| AC: | CASA AC 91.U-3 (s. 5.4.3) |

- Does the RO have procedures for monitoring RNP 4 required equipment performance and reporting deficiencies; this includes the CPDLC and ADS-C systems?
(f) **RNP APCH aircraft**


- During initial intermediate segments and for the RNAV missed approach of an RNP APCH, both the lateral total system and along-track errors and must be within $\pm 1$ NM for at least 95 per cent of the total flight time.
- While conducting final approach segment operations of an RNP APCH, both the lateral total system and along-track errors must be within $\pm 0.3$ NM for at least 95 per cent of the total flight time.
  - Does the RO operate RNP APCH missed approach with conventional means such as DME VHF Omni-Directional Radio Range (VOR), Non-Directional Radio Beacon (NDB) or dead reckoning?

(g) **RNP AR operations aircraft**


- Does the RO have a monitoring system in place that accurately monitors the requirements detailed in the ICAO PBN Manual?
- Does the RO have an active FOQA program?
  - If the RO does not have an FOQA program in place how will they monitor their RNP AR operations?

(h) **APV Baro-VNAV aircraft**


- The RO must submit a description of the method that is intended to be used to monitor APV Baro-VNAV operations to identify, report and investigate any failure or potential failure in the Baro-VNAV system or operating procedures.

(i) **RNP 0.3, RF Legs and FRT aircraft**

| AC: CASA AC 91.U-01 (s. A.7 of Appendix A) (RNP 0.3) | CASA AC 91.U-01 (s. A.11 of Appendix A) (A-RNP) | CASA AC 91.U-01 (s. A.12 of Appendix A) (RF Legs) | CASA AC 91.U-01 (s. A.13 of Appendix A) (FRT) |
C3.10 Reporting navigation/height keeping errors

C3.10.1 Introduction

The RO is required to report all navigation and height-keeping errors within 72 hours to CASA, ATC, Airservices Australia and/or AAMA.

PBN and RVSM operations require the RO to report navigation errors immediately to ATC while en route. If an observation indicates that the aircraft is not within the established limits, then ATS, the pilot in command or the RO must submit a report to CASA when the below mentioned parameters apply.

C3.10.2 Things for Consideration

(a) All aircraft

Requirements listed in applicable appendix to CAO 20.91

- Does the RO have procedures for reporting air traffic incidents in accordance with AIP ENR Section 1.14?
- Does the RO have procedures for reporting navigation errors listed below:
  - a lateral or longitudinal navigational error that exceeds the required accuracy value, that is the RNAV or RNP value, for other than a transient duration during a turn
  - an aircraft system failure that results in the aircraft losing the currently active navigation capability, which is there is a loss of the navigation function.

(b) RVSM aircraft

CAR: 181A
CAAP: 181A-1 (s. 12)
ICAO: Document 9574-AN/934 (ch. 3)

- The RO must report to CASA and AAMA each event in which the operator’s aircraft has exhibited any of the following altitude-keeping performance:
  - total vertical error of 300 ft or more
  - altimetry system error (ASE) of 245 ft or more
  - assigned altitude deviation of 300 ft or more.
(c) **APV Baro-VNAV aircraft**

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<tr>
<th>CAO: 20.91 (Appendix 8)</th>
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- The list in the AC details the performance standards for Baro-VNAV system used in APV Baro-VNAV operations. The RO should report any system failures or potential failures to CASA as soon as possible after the occurrence.
  - Has the aircraft met the APV Baro-VNAV performance standard on a regular basis?
Appendix 1: Technical Assessor Worksheet

The PBN – Navigation Specifications and Authorisations Technical Assessor Worksheet is Appendix 1 to this handbook.

How do I access the worksheet?

The worksheet is available in an electronic excel format and published with this handbook via a link on CASAConnect in CASA’s suite of manuals under the topic: Aerodromes & airspace.

Worksheet User Instructions

The worksheet user instructions described in the subsequent pages have been replicated from those found in the User Instructions tab of the worksheet.
IMPORTANT INFORMATION FOR USERS OF THIS WORKSHEET

1. This technical assessor worksheet contains the assessment criteria that must be considered in reviewing and assessing an applicant’s navigation specifications and authorisations package. Whilst some questions may appear to be a simple yes/no response, you are required to undertake a qualitative assessment of each question, having regard to the suitability of the applicant to conduct its operations safely.

2. This worksheet, which is Appendix 1 to the PBN – Navigation Specifications and Authorisations Technical Assessor Handbook, is intended to be used in conjunction with the policy, processes and guidance contained in the handbook.

3. The purpose and intent of this worksheet is to ensure a standardised approach to the assessment and to maintain a CASA record of the decision-making process.

4. This worksheet is a web-based asset. This means that once it is printed or saved locally it becomes an uncontrolled document. To ensure the latest revision is being used, you should always refer to the published electronic version on the CASAConnect.

5. A ‘Blank Worksheet’ has been developed and provided as a means to address new or changed legislation and/or to enter additional assessment criteria, questions and comments or notes relating to the assessment. This sheet can be useful for recording additional criteria and notes regarding the assessment or for addressing temporary management instructions that may be issued from time to time.

7. Once the worksheet has been completed, the final version must be saved as a PDF document into CASA’s approved records management system. Ensure you remove all filters on the worksheet before saving as a PDF so that the final PDF copy shows all comments and all questions.

8. Enquiries or questions regarding the content of this worksheet should be directed to the ATMS Standards section of CASA.

WORKSHEET TABS

- **User Instructions**: This tab is used to record what was assessed and who was involved in the assessment.
- **Certification Sheet**: This tab contains the assessment criteria for assessing compliance against relevant navigation legislation.
- **Nav Specifications Assessment**: This tab contains specific assessment criteria for assessing compliance against relevant RNP AR navigation legislation.
- **RNP AR Authorisation Assess**: This tab can be used to include additional assessment information and questions or it may be used as a note pad.
- **Blank Worksheet**: This tab displays legislative and guidance material relating to each specific authorisation.
CERTIFICATION SHEET

The following guidance explains how to use and complete the Certification sheet.

Note: If insufficient space is provided within any of the cells within the Certification sheet, the assessor can make a note in the associated cell to refer the reader to the Blank Worksheet where detailed information can be entered.

1. ASSESSMENT SCOPE

Prior to conducting the assessment, this part should be completed to include the applicant’s details, the type of application being assessed and any specific instructions or notes regarding the assessment scope.

The Operator Name, Operator ARN and File Number that are entered in this part will automatically populate on the associated assessment worksheets. Ensure this information is correct; if an error is made, that error will appear onto the associated assessment worksheets and can only be rectified in this part of the Certification sheet.

The assessment plan section is designed for you to record any specific information or instructions regarding the assessment. For example; a summary of the scope of assessment, an indication of if an onsite inspection of the aircraft is required or if the application warrants any special considerations or conditions.

After completing the assessment scope, the assessment team can commence the assessment in accordance with the scope described in this part.

2. ASSESSMENT REMARKS

Each assessor should endorse this part to confirm that the handbook and worksheet were used to conduct the assessment. Assessors can also include comments regarding the parts of the assessment they conducted and any specific assessment findings.

Assessors need not go into the detail of what is being recommended and why, as this information will be contained in the SFR.

It is important to note that this part does not negate the need for an SFR. This is simply to maintain a record of who conducted the assessment, what each assessor assessed and to verify that the assessment was conducted using the latest revisions of the handbook and worksheet.
ASSESSMENT WORKSHEETS

The following guidance, explanations and filtering examples explain how to use the assessment worksheets (i.e. the Nav Specifications Assessment tab and RNP AR Authorisation Assessment tab).

ROW 1 – Application Details

This row is automatically populated from the corresponding text entered into Part 1 of the Certification sheet. It includes the Name and ARN of the operator and the File Number associated with the assessment.

This row is locked from editing which means you cannot click on or edit the text. If there is an error in any of the fields in this row, the error must be corrected in the corresponding part of the Certification sheet.

ROW 2 – Title Row

This row contains the titles for all of the columns used in the worksheet and is the row you will use to apply filters to the content. This row is locked from editing, with the exception of Cells J2 and K2 which allow you to enter text.

Cell J2 allows you to enter the date of assessment, the authorisations applied for and the related aircraft. Cell K2 should only be used for existing approvals where the operator has applied to add ‘same model’ tail numbers or authorisations to their already established authorisations.

It is important to follow these steps in order to enter information into Cells J2 and K2:

1. Right Click in the cell (J2 or K2)
2. Click in the Formula bar after ‘date of assessment’ and type the date
3. Click after the ‘authorisation applied for’ text and type the authorisations.
4. Click after the ‘aircraft’ text and type the aircraft.
5. Press Enter.

Worksheet Filtering

The assessment worksheet can be filtered to assist in assessing certain regulatory requirements and for identifying outstanding or unsatisfactory criteria.

To apply filters:

1. Click on the drop down arrows against each heading in row 2 to view the list of available filters for each column.

2. Apply the filter using one of the following methods:
   (i) tick or un-tick items to select certain criteria OR
   (ii) use the search field to type in the criteria you want to display.

When you have applied a filter, rows that don’t meet the criteria are hidden and rows that remain visible have a blue number in the row. The drop down arrow within the column you have chosen to filter also changes to a filter symbol.

You can apply filters to multiple headings in Row 2, which will reduce the criteria further based on the filters already applied.
To remove filters:

To remove a filter from a single column click the drop down arrow for that column and click on ‘Clear Filter From….’ This will remove all filters you have applied to this column.

To remove filters from multiple columns select ‘clear’ from the Sort and Filter drop down menu under the editing group of the home tab.

Note: you should ensure all filters are removed before trying to apply a new filter. If you haven’t removed the existing filters you will not return all of the results you are looking for and instead will further filter your existing results.

Column A – Navigation Specification

Column A specifies the authorisation applicable to the question. This column is locked from editing.

Column A can be filtered by a specific authorisation which can be useful in conducting the assessment only for specific authorisations.

For example: You may choose to only display the assessment criteria applicable to all authorisations.

Filtering Example

To only display the criteria applicable to all authorisations:

1. In the assessment worksheet, click on the drop down list in cell A2 to view the list of available filters.
2. Type ALL in the search field of the drop down list.
3. Click OK.

Column B – Worksheet Questions

This column provides the questions to be assessed. Some questions have been broken across multiple rows to allow each part of the question to be assessed individually. This column is locked from editing.

Column C – More Info

This column provides additional guidance and information regarding the assessment questions. Where more information is available, this column contains a diamond and a red arrow in the top right hand corner of the cell. Click in those cells to review the information.

Note: The information provided in the ‘More Info’ cells is high level guidance only; detailed information is provided in the Handbook and is not duplicated in the worksheet.

The More Information column is unlocked to enable you to click in the cells that contain more information and display or resize the comment (you can also just hover over the comment).

Column D – SME

This column identifies the subject matter expertise that is required to assess the particular assessment question and can be filtered to only display questions relevant to a particular SME. Some criteria will need to be assessed by more than one SME. This column is locked from editing.

Column E – Handbook Reference

This column provides a reference to the handbook section where information and considerations that aid in determining the applicant’s compliance are found. This column is locked from editing.
### Columns F and G – Legislation and Guidance References

Column F specifies the legislation or guidance document (by type) that is applicable to the question.

Column G provides the specific reference applicable to the legislation or guidance document in Column F.

Both columns are locked from editing. Both columns can be filtered. Filtering these columns can be useful in conducting the assessment by the particular document type or section.

For example: You may choose to only display the CAO requirements.

**Filtering Example**

To only display the CAO requirements:

1. In the assessment worksheet, click on the drop down list in cell F2 to view the list of available filters.
2. Type CAO in the search field of the drop down list.
3. Click OK.

You can reduce the content further by applying an additional filter in Column G.

**Note:** Take care when filtering these columns. If you simply un-tick all of the list items and only tick 20.91, this will only display results that only contain 20.91. To return all references you should type ‘20.91’ in the search bar.

### Column H - Operator's Compliance Reference

This column enables you to record the document reference to where evidence of compliance can be found in the applicant's documentation. This may be a reference to a page number or a numbered heading as applicable. The references provided in this column may provide sufficient justification to support the assessment outcome, alleviating the need for detailed comments in Column J.

This is an unlocked free text column, allowing you to reference the applicant’s documentation using the referencing system the applicant has chosen for its documents.

### Column I – Compliant (there are two functions to this column)

#### 1. Recording compliance against each assessment question

The blank cells in this column are used to record compliance with the assessment question. These cells contain drop down lists from which you must select an appropriate response. There are four available responses:

- Yes / No / MI (More Information) / N/A (Not Applicable)

Where an assessment question contains multiple rows, the criteria will populate in a specific order of priority based on the responses to the rows; automatically showing the most critical response.

The order of priority is 'No', 'MI', 'Yes', 'N/A'. E.g. If one part of a question contains a 'No', then 'No' will automatically populate in the first row for that question.

**Filtering Example**

To only display items that are not yet satisfactory:

1. Un-tick 'Select All' in the drop down filters for Column I
2. Tick only 'MI', 'Site Visit' and 'No' options.
3. Click OK.

#### 2. Recording a status against each section of the worksheet

Status cells are the coloured cells in Column I which appear in the header row for each particular section or subsection.

The purpose of the status cell is to allow you to record an appropriate decision on the overall compliance for a particular assessment section or subsection. The status cell is also used to indicate sections that are not applicable to the applicant.

There are three available responses:

- Not Applicable / Satisfactory / Unsatisfactory
Not Applicable

Where an entire section is not applicable, select Not Applicable from the status drop down list in the header row for that section and insert a comment in the comments field to explain why the section has not been completed.

Note: Only select this option when all questions under the associated heading are not applicable.

Satisfactory or Unsatisfactory

After assessing compliance against all of the questions under a section or subsection, return to the section heading row and select an appropriate response (satisfactory or unsatisfactory) from the drop down list.

A Satisfactory status should only be selected where all of the questions in Column I (for the associated section) have been satisfied through a ‘Yes’ and/or ‘N/A’ status. If any of the questions contain a status of ‘No’ or ‘MI’ you must select Unsatisfactory - meaning the applicant is not compliant or more information may be required before compliance can be achieved.

Column J and K - Comments

The purpose of these columns is to record relevant comments and decisions for the assessed criteria, which will support the final status. All comments must be professional and provide sufficient information on how you made your decision. Relevant comments may include ‘why’ and ‘where’ clarification or verification is required.

Note: For traceability, all comments entered during the assessment should be retained in the worksheet – do not delete these comments, even if compliance is eventually achieved. This column should provide the history of the decision making process (including any initial deficiencies) for possible reference during future surveillance activities.

TIP: If you need to enter onto a new line within the comments cells use ALT+Enter.

The comments cells have been formatted to wrap text. This means that the cells will automatically resize to fit the text across multiple lines within the cell.

When entering multiple comments against a particular question, it is recommended that you add a space between each comment (see TIP above) and that you add the date and your initials to the end of your comment. This will ensure the comments are easy to read and you can easily identify who has made the comment; this is particularly useful when multiple technical assessors are involved.

Note: If a criteria is satisfied elsewhere within the assessment worksheet, then relevant comments should be entered in this section to reflect this.

Printing the Worksheet

You can print the worksheet to a local printer or save as a PDF, however it is important to note that the worksheet has been designed to be, and should be, completed electronically.

The assessment worksheet tab has been set up to print in landscape orientation at A3 size and to display the row and column headings which allow you to refer to a specific cell within the worksheet.

Note: You can also choose to filter specific information before printing. For example, you may like to filter the ‘Satisfactory’ column by status ‘No’ and ‘MI’ and print a report detailing only those items not to yet satisfactory.
Working in a shared workbook

To ensure both an AWI and a FOI can access and edit their relevant assessment criteria, you must ensure the 'Share Workbook' option is active upon opening the Worksheets and save the file in a shared drive so both parties can have access to it.

1. Click on the Review tab
2. Select the 'Share Workbook' icon
3. Ensure the 'Allow changes by more than one user at the same time' option is ticked

This option will allow the workbook to merge once users have made changes.

This box also allows you to see any other people who have the workbook open simultaneously.

4. Exit this box without making changes.
5. Save the file on a shared drive and notify the other user of its location.

To confirm that the shared option has taken effect the document tile should now have the word [Shared] at the end of it.

Tracked Changes within a Shared Workbook

Upon opening the document you will be able to see the changes the other person has made. However, if they were to make changes to their already existing work, the cell they modified will be highlighted with a tab in the top left hand corner indicating a comment. Hover over the cell to see the details of the change.

To track specific changes that others have made click on 'Tracked Changes' and select 'Highlight Changes' from the drop down options.

From these options you will be able to specify when and by whom the changes were made. Click ‘OK’ to action request.
### Appendix 2: Navigation Authorisations – FAA flight manual extract

#### FAA APPROVED
75FMA-S11-00
Configuration S11-AA
U.S.
S11-3

<table>
<thead>
<tr>
<th>SECTION V - SUPPLEMENTS</th>
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</thead>
<tbody>
<tr>
<td>AIRPLANE CONFIGURATION CODES</td>
<td>MODEL 750</td>
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The following is a list of airplane configuration codes which appear at the bottom of each page of this supplement to the basic FAA Approved Airplane Flight Manual. The codes indicate page effectivity by serial number. This list contains only the configurations which have been incorporated into this supplement.

<table>
<thead>
<tr>
<th>Configuration Code</th>
<th>Effectivity by Serial Number</th>
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MODEL 750

HONEYWELL FMZ SERIES, P-2000 FLIGHT MANAGEMENT SYSTEM

INTRODUCTION

This supplement is part of, and must be placed in, the basic FAA Approved Airplane Flight Manual for airplanes 750-0173 and On and Airplanes incorporating SB750-71-10. This supplement applies to airplanes equipped with the Honeywell FMZ Series, P-2000 Flight Management System. The information contained herein supplements the information of the basic FAA Approved Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic FAA Approved Airplane Flight Manual.

NAVIGATION OPERATIONAL CAPABILITIES

The FMZ Series, P-2000 Flight Management System (FMS) is approved under TSO C129 C1/C3, and has been demonstrated capable of, and been shown to meet the requirements (this does not constitute operational approval) for the following operations:

1. Oceanic/Remote - Provided two FMSs are installed and operating, and are receiving usable signals from each (dual or combination) of the following navigation sensors (or one FMS and one navigation sensor for those routes requiring only one Long Range Navigation (LRN) sensor):
   a. GPS (meets the requirements of FAA Notice 8110.60 for primary navigation sensor).
   b. Inertial Reference System (IRS).

2. North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) Airspace (as defined in AC 91-49 and AC 91-70) - Provided two FMSs are installed and operating and are receiving usable signals from each (dual or combination) of the following navigation sensors:
   a. GPS (meets the requirements of FAA Notice 8110.60 for primary navigation sensor).
   b. Inertial Reference System (IRS).

3. RNP-10 Airspace - In accordance with FAA Order 8400.12A, as amended, as primary means of navigation within RNP-10 airspace with no time limitation when receiving usable signals from one or more of the following sensors:
   a. GPS (meets the requirements of FAA Notice 8110.60 for primary navigation sensor).
   b. Inertial Reference System (IRS). For operations with the IRS as the only position sensor, operations are limited to 6.2 hours after the last position update from VOR/ DME, DME/DME or GPS sources.

4. RNP-4 Airspace: This aircraft is capable of operation in RNP-4 oceanic and remote airspace in accordance with FAA Order 8400.33 when receiving usable signals from either of the following sensors:
   a. Dual IRS only - Up to 2 hours flight time after both IRS are placed in NAV mode.
   b. DME/DME or VOR/DME no time limit with Dual IRS (1.75 hours flight time allowed after loss of radio updating with Dual IRS).
   c. A minimum of one IRS and GPS sensor each with no time limitations. Execution of an approved dispatch FDE program is not required for this configuration.

(Continued Next Page)
NAVIGATION OPERATIONAL CAPABILITIES (Continued)

5. Enroute and Terminal including BRNAV (RNP 5 accuracy) - In accordance with AC20-130A, AC90-96A, and JAA ACJ 20X4, provided it is receiving usable navigation information from one or more of the following:
   a. VOR/DME or multiple DMEs.
   b. GPS.
   c. Inertial Reference System (IRS).

6. RNAV Routes, DPs and STARS - Meets the requirements of AC90-100A for U.S. Type A RNAV DPs and STARS and Type B RNAV DPs and STARS. This includes Q Routes within the contiguous United States per FAA Order 7400.9L. Excluded are Gulf of Mexico (Q) routes and Alaska VOR/DME RNAV routes (JXXXR).

7. PRNAV Airspace - Operation in PRNAV airspace is approved in accordance with AC 90-94, AC 20-130A and JAA TGL-10 provided at least one FMS is receiving usable information from one of the following:
   a. GPS
   b. One VOR/DME or multiple DMEs.

8. Non Precision Approach - In accordance with AC 90-94 provided the FMS is receiving usable navigation information from the GPS sensor. GPS equipment may be used to fly all non precision instrument approach procedures that are retrieved from a database, except localizer, localizer directional aid (LDA), and simplified directional facility (SDF) approach procedures.

9. Non Precision Approach - In accordance with AC 20-130A provided the FMS is receiving usable navigation information from the GPS, DME/DME or VOR/DME sensors.

NOTE

If the GPS is not operating, DME/DME or VOR/DME will be the only sensors available for non precision approach procedures. DME/DME and VOR/DME navigation is not authorized for many approach procedures due to inadequate navaid geometry. Refer to the approach procedure to ensure DME/DME or VOR/DME navigation is authorized.

10. RNP 0.3 Performance - With usable GPS or DME/DME signals, the FMZ-2000 provides the necessary RNP 0.3 navigation performance and is compatible with RNAV approaches published in accordance with FAR Part 97 (ref. FAA Order 8260.40).

11. NZ 5.1 is approved for VNAV in the enroute and terminal phases only in accordance with AC 20-129 provided the FMS is receiving usable navigation information. Use of VPTH mode guidance to published decision altitude minimums (DA) is not approved for this software load. (See Operating Limitations)

12. NZ 6.0 is approved for VNAV in the enroute, terminal, and approach phases in accordance with AC 20-129 provided the FMS is receiving usable navigation information. Use of VGP mode guidance to published DA is approved. Use of VPTH mode guidance to published DA is not approved. (See Operating Limitations)
MODEL 750

OPERATING LIMITATIONS

GENERAL

1. With the exception of Oceanic/Remote, other navigation equipment appropriate to the ground facilities along the intended route must be installed and operable, as required by the operating rules applicable to the specific type of operation (i.e. VOR, DME, etc.).

2. The FMS is not approved for primary means of navigation in the DEGRADE or DR mode.

3. IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database and verifies each selected waypoint for accuracy by reference to current approved data.

4. The use of manually inserted runway coordinates is limited to VFR operations only.

5. Use of the VIDEO mode (and GRAPHIC mode for NZ 6.0 and higher) is prohibited on the FMS being used for navigation by the pilot during terminal area operations, including approaches.

6. The fuel quantity, fuel required, fuel remaining, and gross weight estimate performance functions of the FMS are supplemental information only and must be verified by the flight crew.

APPROACHES

1. Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are retrieved from the FMS navigation database. The FMS database must incorporate the current update cycle.

NOTE

- Not all published approaches are in the FMS database. The flight crew must ensure that the planned approach is in the database.

- When an instrument approach procedure missed approach point is not identified in the database as a runway (i.e. RW02, etc.), VNAV guidance may not be appropriate for straight-in approach operations.

2. The FMS approach annunciator (cyan APP left of PFD compass display), must be illuminated at the Final Approach Fix (FAF), in order to conduct the instrument approach procedure.

3. RAIM must be available at the FAF to accomplish RNAV approaches using GPS navigation data.

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OPERATING LIMITATIONS (Continued)

4. Use of VPTH mode guidance to published DA is not approved.
5. When conducting RNAV or GPS approaches, the flight director must be coupled to the LNAV mode.
6. When using FMS guidance for conducting instrument approach procedures that do not include "or GPS" in the title of the published procedure, the flight crew must verify that the procedure specified navaid and associated avionics are operational. The primary navigation source (other than FMS) must be displayed to the flight crew during the approach.
7. IFR non-precision approach approval is limited to published approaches within the U.S. National Airspace System. Approaches to airports in other airspaces are not approved unless authorized by the appropriate governing authority.
8. ILS, LOC-BC, LDA, SDF and MLS approaches using the FMS for final approach guidance are prohibited.
9. When conducting missed approach procedures, autopilot coupled operation is prohibited until the flight crew has established a rate of climb that ensures all altitude requirements of the procedure will be met.
10. When the approach at the destination is based on GPS and an alternate airport is required by the applicable operating rules, it must be served by an approach not based on GPS. The airplane must have operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
11. For approaches using a Procedure Turn for course reversal: Proceeding to the Initial Approach Fix using the Heading Select Intercept Procedure is prohibited.

SOFTWARE LEVEL NZ 5.1

1. The Honeywell FMZ Series Flight Management System (FMS) Pilot’s Operating Manual, Publication Number A29-1146-127-00 (without TOLD) Revision 0, dated August 1998 or later, must be immediately available to the flight crew whenever navigation or performance is predicated on the FMS.
2. Refer to the TOLD LIMITATIONS for additional Operating Limitations.
3. The software status stated in the pilot’s manual must match that displayed on the FMS CDU, SW NZ 5.1.
4. DME ARC: Executing a DIRECT-TO a DME arc starting waypoint is prohibited as a loss of FMS guidance to and loss of the DME arc display can occur.
5. Use of approach VNAV (VGP) mode is prohibited.
6. RNAV approaches utilizing LNAV/VNAV guidance to a DA are prohibited.
7. Unless the FMS INTERCEPT function (Heading Select option) has been activated for the published inbound course to the FAF, use ofHDG or ROL mode to intercept the course to the FAF on an FMS approach is prohibited.

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