



INTERNATIONAL CIVIL AVIATION ORGANIZATION

A United Nations Specialized Agency

PBN Operational Approval Overview

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Agenda

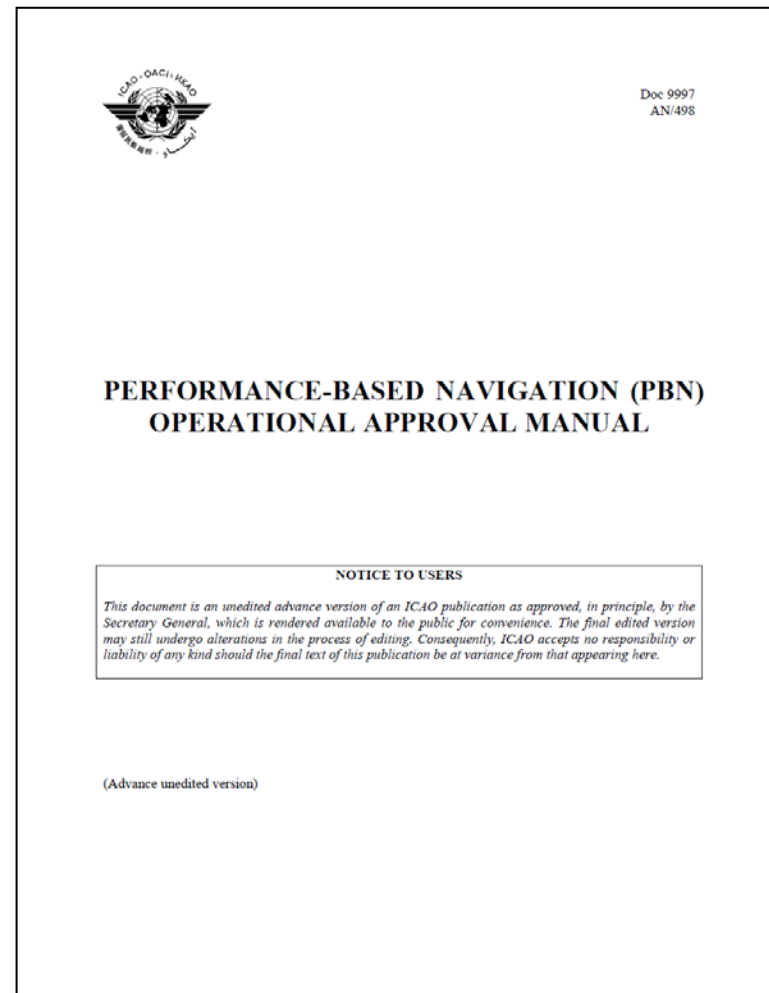
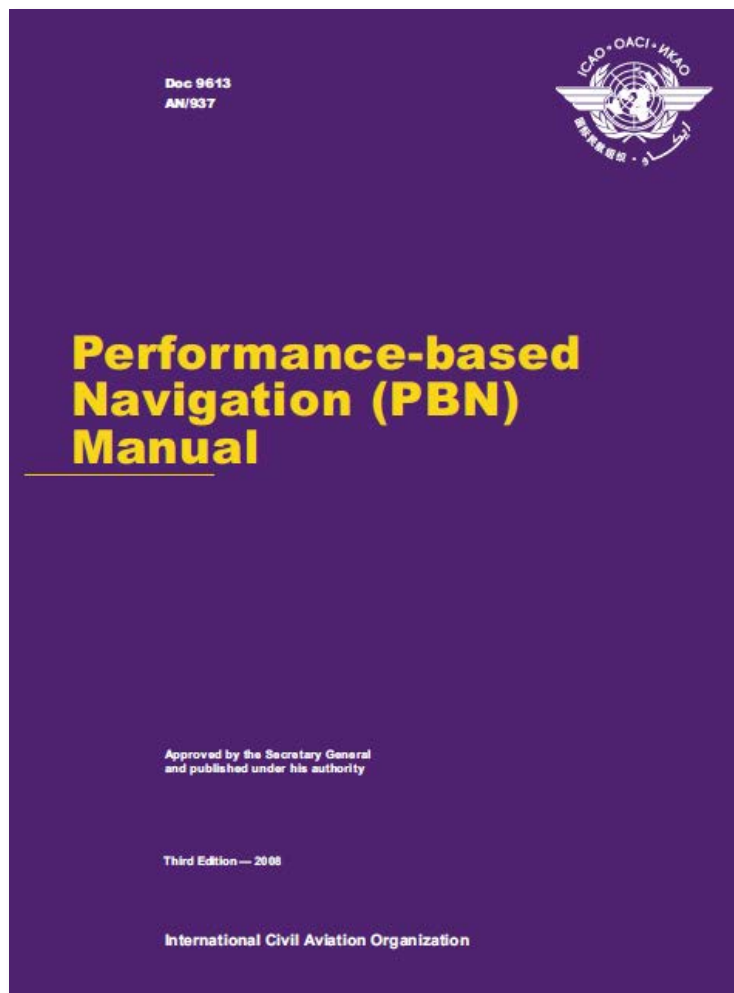


1. Performance-based navigation
2. Certification and operational approval
3. Approval process
4. Summary

The background of the slide is a photograph of a commercial airplane in flight, viewed from a low angle looking out from the wing. The sky is a clear, deep blue, and the ground below is a hazy, brownish landscape. The aircraft's wing, engine, and tail are visible.

1. PERFORMANCE-BASED NAVIGATION

ICAO Documents 9613 & 9997



ICAO Doc 9997 Ops Approval Manual



- Provide guidance on the operational approval process of PBN
- For flight operations inspectors and others involved in the regulation of PBN operations
- Supplement guidance material on certification and operational approval in:
 - Doc: 8335 - Manual of Procedures for Operations Inspection, Certification and Continued Surveillance

PBN Operational Process



- Ensure the appropriate level of oversight is provided for PBN operations in an environment where there are many variables:
 - State regulations
 - Experience in the related equipment
 - Engineering
 - Operational issues

PBN Overview



- PBN requires that the aircraft area navigation system performance is defined in terms of:
 - Accuracy
 - Integrity
 - Availability
 - Continuity
 - Functionality
- Appropriate positioning sensors are identified:
 - VOR/DME
 - DME/DME
 - GNSS and/or Inertial systems

PBN Overview cont.



- Performance is detailed in a navigation specification to facilitate global harmonization
- Navigation specification includes:
 - Aircraft system performance requirements
 - Aircrew requirements: crew procedures and training
 - Any appropriate maintenance requirements: navigation databases, etc.

RNAV Specifications



- Developed to support existing capabilities in aircraft equipped with area navigation systems which were not designed to provide on-board performance monitoring and alerting
- Similar to RNP specifications but do not require an on-board performance monitoring and alerting capability

RNP Specifications



- Developed to support operations that require greater integrity assurance
- Pilot is able to detect when the navigation system is not achieving, or cannot guarantee with appropriate integrity, the navigation performance required for the operation

Navigation Specifications



ICAO
Navigation
Specifications

RNAV SPECIFICATIONS

RNP SPECIFICATIONS

RNAV 10

Oceanic and Remote

RNAV 5

RNAV 2

RNAV 1

En-route and Terminal

RNP 4

RNP 2

Oceanic and Remote

RNP 2; RNP 1

A-RNP; RNP 0.3

En-route and Terminal

RNP APCH Part A

RNP APCH Part B

RNP AR APCH

Approach

Additional

Functionality

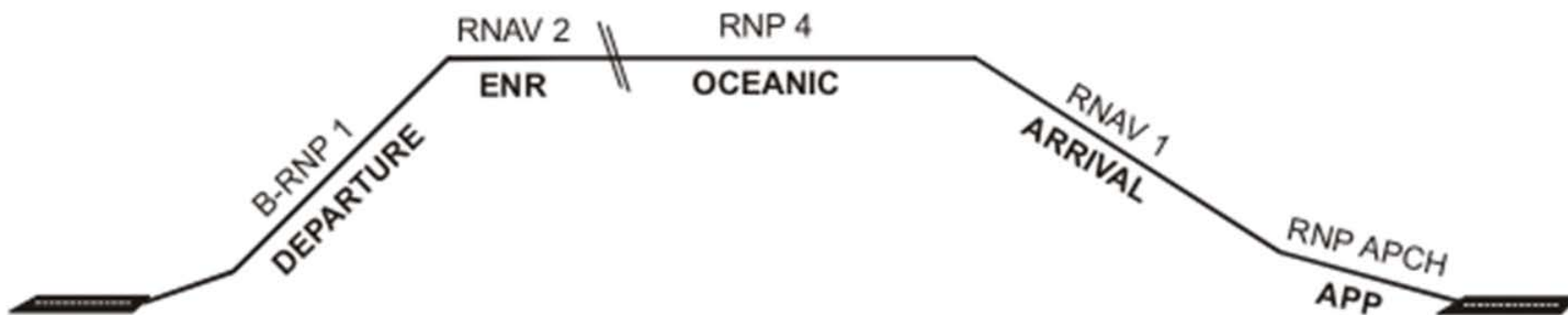
RF; VNAV;

RTA; Hold

GNSS OPTIONAL

GNSS REQUIRED

PBN Applications



Navigation specifications for airspace concept

A silhouette of a commercial airplane is shown flying against a blue sky background, positioned in the upper right quadrant of the slide.

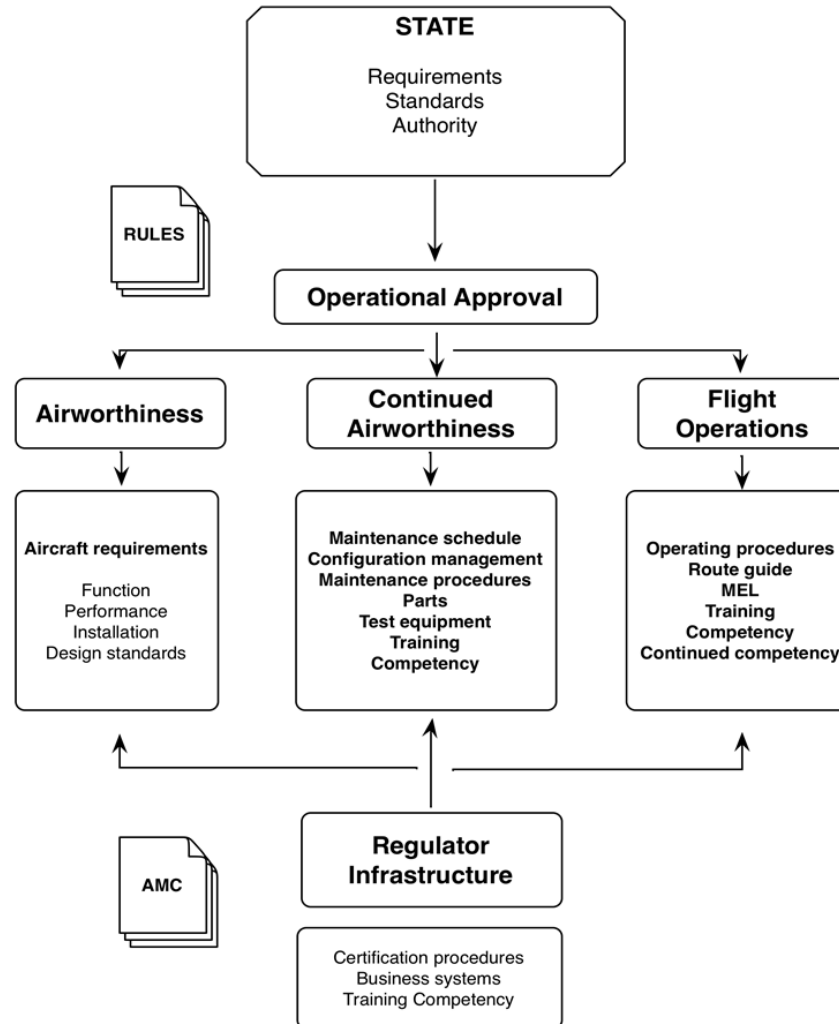
2. CERTIFICATION AND OPERATIONAL APPROVAL

Operational Approval



- PBN navigation specification operational approval authorizes an operator to carry out defined PBN operations with specific aircraft in designated airspace
- Issued when the operator has demonstrated to the State of Registry/Operator regulatory authority that the specific aircraft are:
 - Airworthiness: compliance with the relevant standards
 - Continued Airworthiness: is satisfied
 - Flight Operations: requirements are satisfied

Certification & Operational Approval

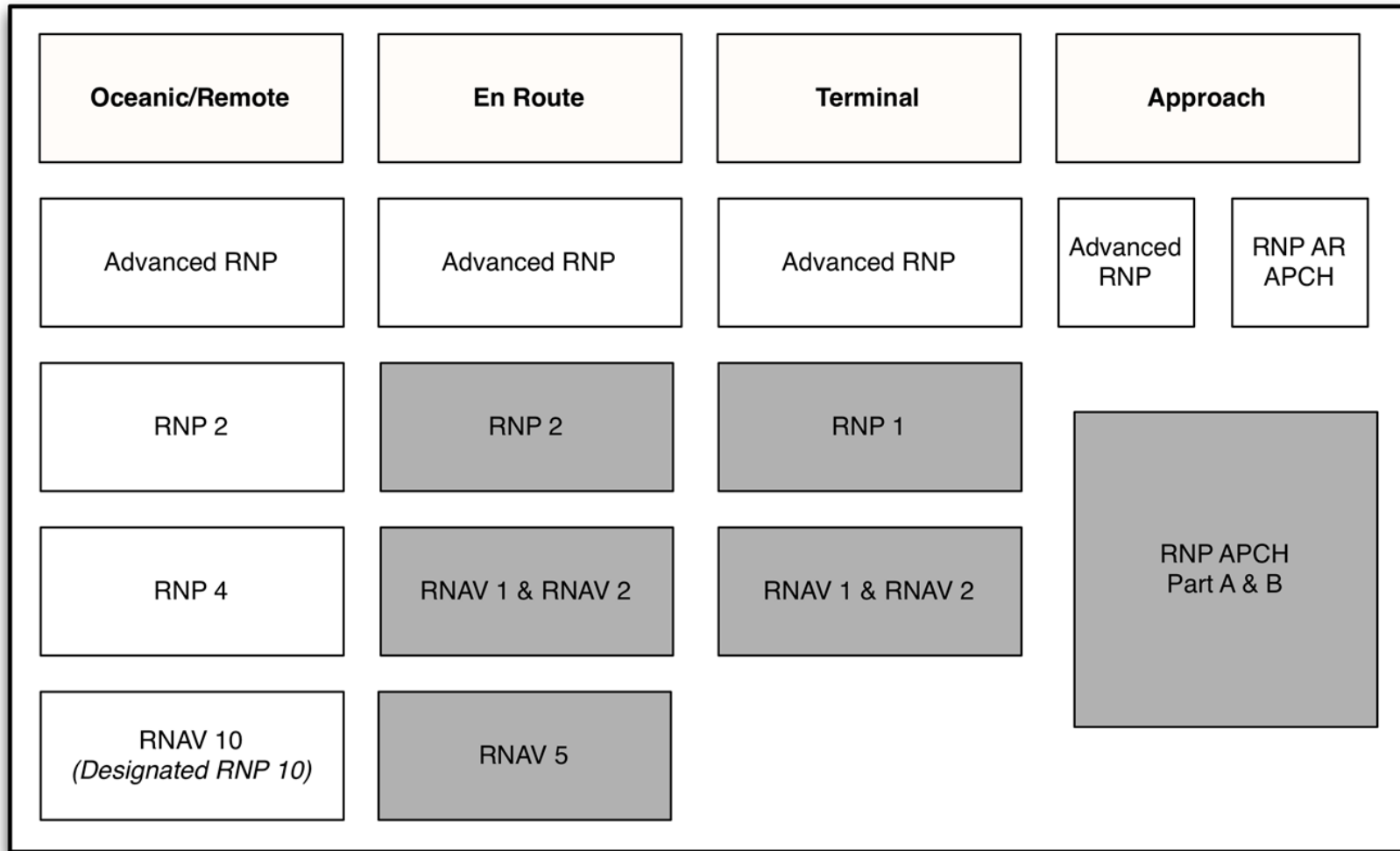


State Regulatory Responsibilities



- States must develop national regulatory material which addresses the PBN applications relevant to:
 - Their airspace
 - Relevant to operations conducted in another State by the operators and aircraft registered in their State
- States involved:
 - State of Design / Manufacturer
 - State of Registry
 - State of the Operator

Hierarchy for Flight Phase



Operational Approval



- Operational approval is usually the responsibility of the regulatory authority of:
 - State of the Operator for commercial air transport operations
 - State of Registry for general aviation operations

Operational Approval cont.



- Operational approval assessment must consider the following:
 - Aircraft eligibility and airworthiness compliance
 - Operating procedures for the navigation systems used
 - Control of operating procedures
 - Flight crew initial training and competency requirements and continuing competency requirements
 - Dispatch training requirements
 - Control of navigation database procedures

Aircraft Eligibility



- First step in assessing an application for PBN operational approval is to establish that the aircraft and its systems are suitable for the specific operation
- Includes the capability, functionality and performance characteristics of the navigation and other relevant flight systems against the requirements of the particular PBN operation

Operating Procedures



- Standard operating procedures (SOPs) must be developed to cover normal and non-normal (contingency) procedures for the systems used in the PBN operation
- Practices and procedures should follow those established by the manufacturer and the air navigation service provider (ANSP) in whose airspace the PBN operations occur
- SOPs must be adequately documented in the operations manual

Training



- Navigation specifications cover a wide range of operations
- Training needs to be appropriate to the particular circumstances
- Amount and type of training required for flight crews varies significantly depending upon:
 - Previous training and experience
 - Complexity of operations
 - Aircraft equipment
- Impossible to specify, for each of the navigation specifications, the particular training required

Navigation Databases



- Packed navigation databases should be delivered to the operator at least one week prior to the AIRAC effective date
- Operator should have procedures in place for ensuring:
 - Correct version is loaded on the aircraft
 - Database errors/omissions reported by the suppliers are addressed by flight crew
 - Database errors/omissions reported by the flight crew are addressed by flight crew and reported to the suppliers
 - Loaded version is checked by the flight crew
 - Prior to use, the procedure is checked against the chart, by the flight crew

The background of the slide is a blue-tinted aerial photograph of a large commercial airplane in flight, viewed from above. The aircraft's wings, fuselage, and landing gear are clearly visible against the clear blue sky.

3. APPROVAL PROCESS

Approval Process



- Based on the determination of whether or not the applicant:
 - Meets the requirements established by the State in its air navigation regulations
 - Is adequately equipped
 - Is capable of conducting the proposed operation in a safe and efficient manner
- Complexity is based on the inspector's assessment of the applicant's proposed operation
- Must be thorough and flexible enough to apply to all possibilities of operations and differences in applicant knowledge

5 Step Approval Process

1. Pre-application
2. Formal application
3. Analysis of the documentation
4. Demonstration and inspection
5. Approval

Step 1 - Pre-Application

Operator

- Reviews requirements of State of Operator
- Checks aircraft eligibility according to State of Registry
- Checks operating procedures
- Checks dispatch procedures
- Checks training requirements and records
- Checks maintenance procedures
- Fills in application

Note:

- Pre-application meeting with regulator usually beneficial
- Assistance from OEM (Original equipment manufacturers)/design organizations may be necessary for complex applications

Step 2 - Formal Application



- Operator submits formal written application to CAA
- CAA appoints project manager
 - For a specific approval
 - Or general PBN approvals

Step 3 – Document Evaluation



- CAA Project Manager evaluates application
 - Aircraft eligibility and maintenance procedures
 - Operating procedures
 - Training

Note: Complex applications may require assistance from other agencies or experts

Step 4 – Demonstration and Inspection



- CAA Project Manager visits operator for formal inspection
- Operator demonstrates how requirements are being met
- May require team of inspectors/observers from CAA
- Simple applications may not require this step
 - e.g. RNAV 5
- Complex operations always require this step
 - e.g. RNP AR



Step 5 - Approval

- CAA approval given via
 - Ops Spec associated with AOC; and
 - Ops Manual amendment
 - LOA (Letter of Authorization)

Note: Some General Aviation operations may not require formal approval

Complexity Scale



Notional Levels of Difficulty

“Simple”

“Challenging”



RNAV 5 RNAV10 RNAV1and 2 RNP 1 RNP 4 RNP 2 RNP APCH RNP AR APCH

Summary of Approval Process



1. Eligible/qualified/approved aircraft and navigation equipment
- +
2. Procedures for flight crew/pilots, maintenance and dispatch
- +
3. Training for personnel
- ↓
4. Approval/authorization

The background of the slide is a high-angle aerial photograph of an aircraft's wing, extending from the left side towards the center. The wing is dark grey and shows various panels and rivets. Below the wing, a thick layer of white clouds covers the ground, with a clear blue sky above. The overall scene is bright and clear.

4. SUMMARY

Summary



- The fundamentals of PBN operations are straightforward
- Operational approval must be a simple process for the applicant and regulator
- The key to successful PBN implementation is knowledge and experience
- Many operators and regulators lack both
- ICAO is ready to assist



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Thank You

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