



International Civil Aviation Organization

**THE NINTH MEETING OF PERFORMANCE BASED NAVIGATION
IMPLEMENTATION COORDINATION GROUP (PBNICG/9)**

Video Conference, 22 - 24 March 2022

Agenda Item 6: PBN OPS Approval

UNITED STATES PBN OPERATIONS APPROVAL PROCESS OVERVIEW
(Presented by United States/Federal Aviation Administration)

SUMMARY

This paper presents provides a brief overview of the PBN approval process in place within the United States. It also provides publically available resources for use by States and Operators seeking to develop PBN approval or operations.

1. INTRODUCTION

1.1 The United States actively promotes the implementation and use of Performance Based Navigation (PBN) as a means to improve overall safety and efficiency in the National Airspace System. Under PBN, navigation requirements are defined based on operational requirements vice specific navigational systems. This provides operators and manufacturers choices of navigation sensors, navigation equipment, operational procedures, and training needed to meet the performance requirements.

1.2 In order to assist users the United States publishes publically available reference information on its [Performance Based Navigation \(PBN\) Guidance & Approval](#) webpage. Material in these guides adhere to and further refine guidance provided in ICAO document *Performance-based Navigation Manual* (Doc 9613) and the *Performance-based Navigation Operational Approval* (Doc 9997). Additional detailed information covered in this paper may be found in these Advisory Circulars:

[AC 90-107Q](#) (*Guidance for Localizer Performance with Vertical Guidance and Localizer Performance without Vertical Guidance Approach Operations in the U.S. National Airspace System*).

[AC 90-105Q](#) (*Approval Guidance for RNP Operations and Barometric Vertical Navigation in the U.S. National Airspace System and in Oceanic and Remote Continental Airspace*),

[AC 90-101Q](#) (*Approval Guidance for Required Navigation Performance (RNP) Procedures with Authorization Required (AR)*),

[AC 90-100Q](#) (*U.S. Terminal and En Route Area Navigation (RNAV) Operations*).

2. DISCUSSION

2.1 The PBN concept represents a shift from ground-based navigation to Area Navigation (RNAV). Performance requirements are identified in navigation specifications (Nav Spec) and provide choices of navigation sensors, navigation equipment, operational procedures, and training needed to meet the performance requirements. Required Navigation Performance (RNP) system

performance requirements in terms of accuracy, integrity, availability, continuity, and functionality needed for particular operations or airspace. These specifications include specific values for lateral and vertical performance as well as onboard performance monitoring and alerting. RNP systems provide improvements on the integrity of operations offering significant safety, operational and efficiency benefits. Figure 1, below, illustrates the general concept of PBN applied to a generic flight, showing which Navigation Specifications are used in the specific phases of flight.

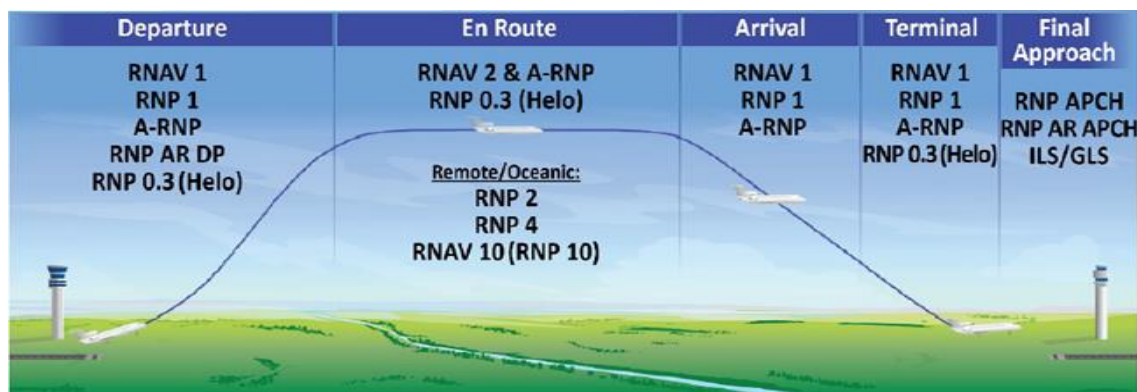


Figure 1

2.2 The fundamentals of PBN operations are relatively straightforward, and operational approval need not be a complicated process for either applicant or regulator. However the transition to new technology, new navigation and new operational concepts and the dependence on data-driven operations require careful management. The PBN operational approval process is intended to ensure that the appropriate level of oversight is provided for all PBN operations in an environment where there are currently many variables in terms of State regulations as well as experience in the related equipment, engineering and operational issues. In this way, the benefits of PBN will be achieved consistently and safely. Establishing Operational Approvals for operators relies on a determination that the proposed operation meets the minimum requirements and that the operator’s capability meets the operational intent of the navigation specification. Figure 2, below, illustrates the various Operations Specifications that may be issued to an operator to provide regulatory permissions and limitations for that particular operation. In the United States and other places, many operators found it difficult to understand the requirements including equipment eligibility, crew training requirements, and data management. This resulted in a reluctance to apply for approval. The United States, EASA, and ICAO created guidance material to demystify the process and promote PBN adoption.

2.3. To smoothly and efficiently establish PBN Approvals processes, each State’s aviation regulator may desire to establish offices and trained personnel dedicated to establishing or accepting the airworthiness requirements and operational approvals process in their State. There are several ICAO-sponsored PBN approval training courses for regulators listed on the ICAO website. In the U.S., air operations are categorized by the Title 14 US Code of Regulations. Part 121 applies to Large Air Carriers, Part 135 applies to small Air Taxi operators, and Part 91 applies to General (Private) Aviation. In the most basic terms, more oversight and guidance is applied to Part 121 Air Carriers, and slightly different requirements apply to Part 135 operators and Part 91 operations are provided the least amount of oversight. Regulatory authority is provided in Operations Specifications and are applied to major carriers and air taxi operators, while most Part 91 operations are permitted to apply for Letters of Approval for some operations. Specific information about each operations specification, its applicability, and issuance process are available at the weblinks above.

2.4 To promote PBN implementation, the United States established a clear operational approval process for both general and commercial aviation operations. In addition to the material

available on the PBN approval webpage prospective PBN operators are encouraged to schedule a pre-application meeting with the responsible FAA Flight Standards District Office to allow the operator an opportunity to discuss the requirements for operational approval with FAA experts. This meeting has proven invaluable to reduce uncertainty and provide a clear pathway to PBN approval. During the subsequent application process applicants must provide evidence of aircraft eligibility, operating procedures for the RNAV or RNP system, crew training requirements, and a control of process for updating the navigation database.

2.5 To avoid additional burden on operators, the United States allows PBN authorizations to be bundled. This concept provides the US more latitude in granting a wider range of authorizations on a single operator application. Each flight phase, identified in Figure 2, contains a hierarchy of PBN authorizations and Operational Specifications (OPSPEC) where bundling can be accomplished. PBN authorizations within an operation specification (OpSpec), management specification (MSpec) or Letter of Authorization (LOA) are combined with less restrictive PBN authorization(s) within each phase of flight, if applicable. This reduces cost and workload for both the operator and the US.

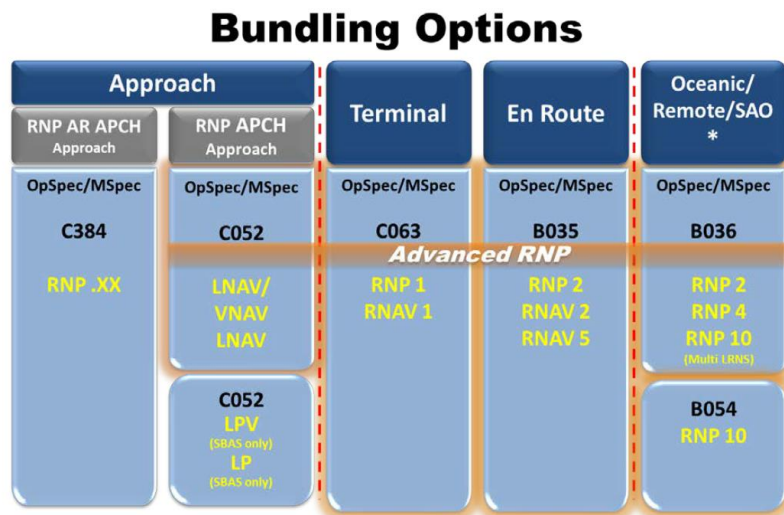


Figure 2

2.5 The appendices of the Advisory Circulars listed above also provide specific guidance and requirements for PBN operations based on phase of flight. Attachment A in the AC provides additional information and overview of the US process to establish operational approvals for PBN operations.

2.6 The United States strongly believes that open and clear communication between the regulator and the operator/applicant leads to improved outcomes and advancement of PBN implementation.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this papers; and
- b) discuss any relevant matters as appropriate.



PBN Operational Approval The Process



What does Operational Approval Do?

Authorizes PBN operations:

- In designated airspace
- On a PBN specified route
- On a PBN approach (or departure)

Operational Approval does not involve evaluation of routes, airspace or approach/departure procedures

- Responsibility of the ANSP



State Responsibilities

Up to three different States/regulatory bodies can be involved:

- State of Design / Manufacture
- State of Registry
- State of the Operator



State of Design

- Issues the Type Certificate (TC) to the design organisation.
- Approves the Master Minimum Equipment List (MMEL), the mandatory maintenance tasks and intervals, and the Aircraft Flight Manual (AFM) and its amendments
- May issue a design change approval for an aircraft as a Supplemental Type Certificate (STC).



State of Registry

- The State in which the aircraft is registered
- Responsible for the airworthiness of the aircraft
- Approves the aircraft maintenance programme and issues the Certificate of Airworthiness
- Approves aircraft repairs and modifications
- Approves the Minimum Equipment List (MEL) and the conduct of specified PBN operations for General Aviation



State of the Operator

- For commercial air transport operators
- Accepts the aircraft maintenance programme and approves the MEL, the flight crew training programmes and the conduct of specified PBN operations.
- May be different from the State of Registry



Operational Approval

- *Operations conducted in accordance with National regulations*
- Operational Approval usually the responsibility of the State of the Operator for commercial air transport operations and the State of Registry for general aviation operations
- Approval process may involve input from State of Design/Manufacture, State of Registry and State of the Operator
- Do not re-approve technical data provided by another State



Documentation

State decision to require a formal operational approval
Extent of documentation depends on:

- Existing certification
- Complexity of PBN operation
- Maturity of operational concept
- Risk of improper conduct/implementation
- Availability of training, procedures and checking standards
- Promulgation of information (e.g MMEL and training requirements).



Operations by Flight Phase

Oceanic/Remote	En Route	Terminal	Approach	
Advanced RNP	Advanced RNP	Advanced RNP	Advanced RNP	RNP AR APCH
RNP 2	RNP 2	RNP 1	RNP APCH Part A & B	
RNP 4	RNAV 1 & RNAV 2	RNAV 1 & RNAV 2		
RNAV 10 (Designated RNP 10)	RNAV 5			



General Aviation

- General Aviation approval requirements may differ from those for Commercial Operators
- Formal documentation of approval may not be necessary.
- GA may need formal issuance of an LOA to enable operation in foreign states.

Note: The absence of a formal operational approval for GA is not intended to imply a lesser standard of operations



Operator Compliance

Operator must demonstrate compliance with:

- **Airworthiness** – aircraft is eligible for operation
- **Continued Airworthiness** – aircraft remains eligible
- **Flight Operations** – operating procedures and training



Airworthiness

- Functions and performance levels defined in navigation specification/referenced certification standard
- Installation governed by relevant airworthiness standards (US 14 CFR / EASA CS Part 25)
- Non-navigation equipment may also be relevant (e.g. datalink)



Continued Airworthiness

- Inherent in the aircraft airworthiness approval
- Navigation system must be maintained compliant with the type design.
 - Database and configuration management, systems modifications and software revisions)
- Consistent with other CNS / ATM operational approvals e.g. RVSM.



Flight Operations

Operator's infrastructure for conducting PBN operations:

- Operations Manual
- Flight crew operating procedures, training and competency
- Checklists (Crew Review Cards)
- MEL
- Database management
- Dispatch
- Other



Approval of Technical Data

States should not re-approve technical data
approved by another State

- **Re-approval** transfers the responsibility to the State
- States should:
 - Review the data
 - Determine that it is acceptable
 - Formally **accept** the data



Summary

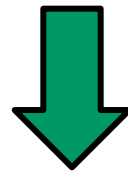
- Eligible/qualified/approved aircraft and navigation equipment



- Procedures for flight crew/pilots, maintenance, and dispatch



- Training for personnel



- Approval/authorization





5 Step Approval Process

- *Step one: Pre-application*
- *Step two: Formal application*
- *Step three: Analysis of the documentation*
- *Step four: Demonstration and inspection*
- *Step five: Approval*

For simple approvals some steps may be condensed or eliminated



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
- *Pre-application meeting with regulator usually beneficial.*
- *Assistance from OEMs/design organisations 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

Tip: Appointment of trained/experienced PBN Project Manager is a key to success



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

Tip: PBN Project Manager should be supported by an expert team



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 ops always require this step (e.g. RNP AR)

Tip: Project Managers and key inspectors should be qualified to fly the PBN operations under evaluation



Step 5 - Approval

CAA approval given via

- Ops Spec associated with AOC; and
- Ops Manual amendment
- LOA

Some GA operations may not require formal approval

Note: An OPSPEC is the appropriate method of approval for commercial operators.



Complexity Scale

Notional Levels of Difficulty

“Simple”

“Challenging”



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



Questions?