

ADVISORY CIRCULAR

No. : AC-28-01-004

Date : 1 March 2016

A. SUBJECT.

Performance Based Navigation (PBN) Approvals

B. PURPOSE.

This Advisory Circular (AC) provides guidance for Air Operator Certificate (AOC) holder/applicant to obtain PBN approvals.

C. STATUS.

This is the third edition of AC - 28 - 01 - 004, dated 1 March 2016, and it will remain current until withdrawn or superseded.

D. CONTENTS.

- 1.0 PBN approval guidance material.
- 2.0 Operational approval.
- 3.0 PBN flight crew general training guide.

E. REFERENCES.

The following documents were used as reference material:

- ICAO Doc 9613.



PBN Approvals

- 1.0 PBN Approval Guidance Material.** For PBN approval refer to ICAO Doc 9613 Performance-Based Navigation (PBN) Manual.
- 2.0 Operational Approval.** The operational approval assessment must take account of the following:
 - 2.1 Aircraft Eligibility.**
 - 2.2 Operating Procedures.** The SOP must be developed to cover both normal and non-normal (contingency) procedures for the systems used in the PBN operation. The SOP must address:
 - a. Preflight planning requirements including the MEL and, where appropriate, RNP/RAIM prediction.
 - b. Actions to be taken prior to commencing the PBN operation.
 - c. Actions to be taken during the PBN operation; and
 - d. Actions to be taken in the event of a contingency, including the reporting of significant incidents.
 - 2.3 Control of Operating Procedures.** The SOP must be adequately documented in the OM and checklists.
 - 2.4 Flight Crew and Dispatch Training.** A flight crew and dispatch training program for the PBN operation must cover all the tasks associated with the operation and provide sufficient background to ensure a comprehensive understanding of all aspects of the operation. The operator must have adequate records of course completion for flight crew, flight dispatchers and maintenance personnel.
 - 2.5 Control of Navigation Database Procedures.** If a navigation database is required, the procedures for maintaining currency, checking for errors and reporting errors to the navigation database supplier must be documented in the maintenance manual by commercial operators, and
 - 2.6 Continued Airworthiness.** Operators should have procedures for assessing and incorporating instructions for continued airworthiness and maintenance or inspection information concerning system modifications, software revisions, etc.



3.0 PBN Flight Crew General Training Guide.

3.1 General.

- a. The amount and type of training required for flight crews varies significantly depending upon a number of factors including:
 - (1) Previous training and experience.
 - (2) Complexity of operations.
 - (3) Aircraft equipment.
- b. Consequently it is not possible to specify for each of the PBN Manual navigation specifications the particular training that will be required, and some judgment is required in determining the content and structure of flight crew training. The navigation specifications in the PBN Manual cover a wide range of operations, from basic to complex and that training needs to be appropriate to the particular circumstances.
- c. Each navigation specification includes guidance on flight crew training although it should be noted that the training specified for each operation is generally considered independently. It should be recognized that the PBN Manual is a compilation of guidance material, some of which has been in existence in other forms for some number of years, and the training requirements may not be entirely consistent across the range of navigation specifications.
- d. For en-route operations, ground training is commonly sufficient to provide crews with the necessary knowledge. Delivery methods will vary, but class room training, computer based training or in some cases desk-top simulator training is normally sufficient.
- e. Arrival and departure operations and particularly approach operations normally will also require some flight simulator training, in addition to ground training and briefings.
- f. Consideration should also be placed upon the need for flight crews to demonstrate that competency standards are achieved and the means of documentation of qualification.

3.2 Knowledge Requirements. For all PBN operations the following areas of knowledge will need to be included, with varying content and complexity depending upon the particular operations:



- a. **Area Navigation Principles.** Area navigation is the basis for all PBN operations, and the same general knowledge of is applicable to all navigation specifications. Note that pilots with previous experience may not be familiar with some more advanced features such as Radius to Fix legs (RF) and the application of vertical navigation.
- b. **Navigation System Principles.** Flight crews should have a sound knowledge of the navigation system to be used. The relevance of the navigation system to particular PBN Manual navigation specifications should be clearly established. For example knowledge of inertial navigation and updating is relevant to requirements for some oceanic and remote navigation specifications, as is knowledge of GNSS is necessary for RNP AR APCH operations.
- c. **Equipment Operation and Functionality.** Considerable variation exists in the operation of navigation equipment, cockpit controls, displays and functionality. Crews with experience on one type of installation or aircraft may require additional training on another type of equipment. Special attention should be placed on the differences between stand-alone GNSS equipment and Flight Management Systems with GNSS updating.
- d. **Flight Planning.** Flight planning knowledge of the relevant aspects of each of the navigation specifications that relate to flight planning is required. The complexity of operating procedures varies considerably between PBN operations. RNP APCH and RNP AR APCH require a detailed knowledge of standard operating procedures for both normal and non-normal operations.
- e. **Monitoring and Alerting.** Flight crew responsibilities for performance monitoring and alerting provided by the navigation system or other means (crew procedures) must be understood.
- f. **Limitations.** Operating limitations (e.g. time limits, minimum equipment) vary both between and within the PBN Manual navigation specifications and flight crews need to be able to recognize and plan accordingly.
- g. **Contingencies.** Alternative means of navigation or other contingency procedures must be included.
- h. **Air Traffic Control Procedures.** Flight crews need to be aware of ATC procedures that may be applicable to PBN operations.



3.3 Flight Training Requirements.

- a. Approach and departure operations, and in some cases arrivals require flight training and the demonstration of flight crew competency.
- b. The amount of flight training required varies with the PBN operation, previous flight crew training and experience and other factors. In the course of operational approval all relevant circumstances need to be considered and the training evaluated for completeness and effectiveness. Ongoing and recurrent training should also be considered.
- c. Despite the variation in training requirements, some general guidelines may be helpful in evaluating the extent of training that might be required. Some examples of “average” cases are included below. These examples assume that flight crews have previous relevant experience, and have completed knowledge training curriculum.
 - (1) **En-Route.**
 - (2) **Arrival & Departure:** As departure and arrival operations require strict adherence to track during periods of higher workload, and are associated with reduced clearance from terrain and increased traffic, crews need to be fully conversant with the operation of the navigation system. Consequently, unless crews have significant appropriate operational experience simulator or flight training must be provided. Particular care should be taken in the evaluation of this type of operation conducted with stand-alone GNSS equipment where functional limitations require crew intervention.
 - (3) **RNP APCH:** Training for RNP APCH conducted using stand-alone GNSS equipment; particularly in a single-pilot aircraft normally requires multiple in-flight exercises each with pre-flight and post-flight briefing. Considerable attention needs to be given to programming and management of the navigation system, including in-flight re-programming, holding, multiple approaches, mode selection and recognitions, human factors and the navigation system functionality. Approaches conducted in FMS equipped aircraft, are generally much easier to manage and aircraft are generally fitted with good map displays assisting situational awareness. Normal operations are generally quite simple and competency can be achieved with one or two approaches.



Additional training should be provided to achieve familiarity and competency in operations which involve changes to the planned approach, system alerting and missed approach requirement. Attention also needs to be placed on the method of vertical navigation, using standard non-precision approach procedures (LNAV) or barometric VNAV (LNAV/VNAV). As a guide initial training for crews with previous relevant GNSS & RNAV experience typically can achieve competency during one full flight simulator training session with associated pre-flight and post flight briefing.

- (4) **RNP AR APCH:** RNP AR APCH operations are able to deliver improvements in safety and efficiency which are enabled by the Authorization required process which ensures that all areas of the operating are carefully examined and appropriate attention placed on all aspects of the operation including training. Accordingly training for RNP AR APCH operations should be thorough and ensure that crews are able to manage operations safely within the additional demands placed on procedure design, aircraft and crew procedures.
- d. As a guide, crews without previous relevant experience (e.g. RNP APCH with Baro VNAV), may require a course of ground training (1 - 2 days) plus simulator flight training (4 hrs or more) in order to achieve competency.
- e. The specific information regarding flight crew knowledge and training is requirements, can be found in ICAO Doc 9613 Performance-Based Navigation (PBN) Manual



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