ADVISORY CIRCULAR

CAA-AC-GEN021A

May 2018

PERFORMANCE BASED NAVIGATION (PBN)

AIR OPERATOR APPROVAL PROCESS - GENERAL INFORMATION

1. PURPOSE

This advisory circular (AC) is published so as to provide general information for Performance Based Navigation (PBN) applicants. Detailed information and comprehensive guidance is found in the KCAA Performance Based Navigation Manual.

Cancellation; Advisory circular dated November 2017 is hereby cancelled.

2. REFERENCES AND GUIDANCE DOCUMENTS

The Civil Aviation (Operation of Aircraft for Commercial Air Transport) Regulations, 2018 regulation 131

The Civil Aviation (Instruments and Equipment) Regulations, 2018 Part III

KCAA Performance Based Navigation Manual

FORM: O-GEN021 PBN Application

FORM: O-GEN021-1 PBN Job Aid (Assessment Worksheet)

3. DEFINITIONS AND ABBREVIATIONS

See KCAA Performance Based Navigation Manual

4. INTRODUCTION TO THE PBN CONCEPT

4.1 General

4.1.1 The PBN concept represents a shift from sensor-based to PBN. Performance requirements are identified in navigation specifications, which also identify the choice of navigation sensors and equipment that may be used to meet the performance requirements. These navigation specifications provide specific implementation guidance for States and operators in order to facilitate global harmonization.

4.1.2 Under PBN, generic navigation requirements are first defined based on the operational requirements. Operators then evaluate options in respect of available technology and navigation services. A chosen solution would be the most cost-effective for the operator, as opposed to a solution being established as part of the operational requirements. Technology can evolve over time without

requiring the operation itself to be revisited as long as the requisite performance is provided by the Area Navigation (RNAV) or Required Navigation Performance (RNP) system.

4.3 Scope of PBN

4.3.1 Lateral performance

For oceanic/remote, en-route and terminal phases of flight, PBN is limited to operations with linear lateral performance requirements and time constraints due to legacy reasons associated with the previous RNP concept. In the approach phases of flight, PBN accommodates both linear and angular laterally guided operations.

4.3.2 Vertical performance

Some navigation specifications include requirements for vertical guidance using augmented GNSS (LPV) or Barometric procedures (LNAV/VNAV).

5. NAVIGATION SPECIFICATION

5.1 Introduction to Navigation Specification

The navigation specification is used by a State as a basis for the development of their material for airworthiness and operational approval. A navigation specification details:

a) the performance required of the RNAV or RNP system in terms of accuracy, integrity, and continuity;
b) which navigation functionalities the RNAV or RNP system must have;
c) which navigation sensors must be integrated into the RNAV or RNP system; and
d) which requirements are placed on the flight crew.

A navigation specification is either an RNP specification or an RNAV specification. An RNP specification includes a requirement for on-board performance monitoring and alerting, while an RNAV specification does not.

5.2 Designation of RNP and RNAV specifications

5.2.1 Oceanic, remote continental, en-route and terminal operations

For oceanic, remote, en-route and terminal operations, an RNP specification is designated as RNP X, e.g. RNP 4. An RNAV specification is designated as RNAV X, e.g. RNAV 1. If two navigation specifications share the same value for X, they may be distinguished by use of a prefix.

5.2.2 Approach

Approach navigation specifications cover all segments of the instrument approach. RNP specifications are designated using RNP as a prefix and an abbreviated textual suffix, e.g. RNP APCH or RNP AR APCH. There are no RNAV approach specifications.

5.2.3 Understanding RNAV and RNP designations

In cases where navigation accuracy is used as part of the designation of a navigation specification, it should be noted that navigation accuracy is only one of the functional and performance requirements included in a navigation specification.

5.3 Navigation Specifications by Phase of Flight

RNAV Specifications		**RNP Specifications**		
Designataion	Designation	Designation	Designation	Designation
RNAV 10 (RNP 10) For Oceanic and Remote Continental Navigation application	**RNAV 5** **RNAV 2** **RNAV 1** For Enroute and Terminal Navigation applications	**RNP 4** For Oceanic and Remote Continental Navigation application	**RNP 2, RNP 1, Advanced RNP 1 (TBD),** **RNP APCH, RNP AR APPR** For various phases of flight	**Advanced RNP** which combines severeal navigation applications

6. PBN APPROVAL

6.1 Approval overview

A PBN navigation specification operational approval is an approval that authorizes an operator to carry out defined PBN operations with specific aircraft in designated airspace. The operational approval for an operator may be issued when the operator has demonstrated to the regulatory authority that the specific aircraft are in compliance with the relevant airworthiness standard and that the continued airworthiness and flight operations requirements are satisfied.

Compliance is determined against each relevant navigation specification. Compliance with one navigation specification does not automatically imply compliance with another.

6.2 Operational Approval

6.2.1 The following factors can influence the Authority's decision to require a formal operational approval process and specific documentation of approval:

a) the degree of linkage to the basis for aircraft/avionics certification, i.e. whether the aircraft, including its RNAV or RNP navigation system, has an airworthiness approval covering the type of envisaged PBN operations;

b) the complexity of the PBN operation and the level of associated challenges to operators and regulators;

c) the maturity of the related operational concept and systems and, specifically, whether the issues are well understood and relatively stable;

d) the risk associated with improper conduct of operations and operator-specific safety expectations, as well as those of third parties in the air and on the ground;

e) the availability of appropriate training, and checking standards and procedures for the respective type of PBN operations (mainly for pilots but also for maintenance and dispatcher personnel, as appropriate); and

f) the promulgation of information from holders of TCs to air operators (e.g. MMEL and training requirements) throughout the life cycle of the aircraft.

See further guidance to PBN phased approval process in Appendix 1 to this AC.

6.2.2 The operational approval assessment must take account of the following:

a) aircraft eligibility and airworthiness compliance (any limitations, assumptions or specific procedures considered in the framework of the airworthiness approval must be addressed);

b) operating procedures for the navigation systems used;

c) control of operating procedures (documented in the operations manual);

d) flight crew initial training and competency requirements and continuing competency requirements;

e) dispatch training requirements; and

f) control of navigation database procedures.

Where a navigation database is required, operators need to have documented procedures for the management of such databases.

6.2.3 For legacy aircraft, while the aircraft is capable of meeting all the airworthiness requirements of a PBN navigation specification, there may be no clear statement in the applicable TC or STC or associated documents (AFM or equivalent document). In such cases, the aircraft manufacturer may elect to issue an SB with an appropriate AFM update or instead may publish a compliance statement in the form of a letter, for simple changes, or a detailed aircraft-type-specific document for more complex changes. The Authority may determine that an AFM change is not required if it accepts the OEM documentation.

6.2.4 In general, documents to be submitted by the operator for PBN approval include:

a) compliance documentation demonstrating aircraft eligibility detailing the aircraft/navigation systems;

b) operating procedures and policies;

c) sections of the maintenance manual related to relevant navigation equipment and navigation databases (as applicable);

d) Minimum equipment list (MEL) covering PBN applicable equipment;

e) PBN training programmes for flight crew, operations officers and where applicable maintenance personnel.

Details of all requirements are covered in the KCAA PBN Manual.

Director Aviation Safety, Security &Regulation
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APPENDIX 1

PBN PHASED APPROVAL PROCESS

a) Approval process for all the navigation specifications consists of two components to the approval, airworthiness and operational. Although the two have different requirements, they must be considered in one single process.

b) Each process is an orderly method used by the Authority to make sure that the applicants meet the established requirements.

c) The approval process is made up by the following phases:

1) Phase one: Pre-application

2) Phase two: Formal application

3) Phase three: Documentation evaluation

4) Phase four: Inspection and demonstration

5) Phase five: Approval

d) In *Phase one - Pre-application*, the Authority calls the applicant or operator to a pre-application meeting. At this meeting, the Authority informs the applicant or operator of all the operational and airworthiness requirements that it must meet during the approval process, including the following:

1) the contents of the formal application;

2) the review and evaluation of the application by the Authority;

3) the limitations (if any) applicable to the approval; and

4) conditions under which the navigation specification(s) applied for could be cancelled.

e) In *Phase two – Formal Application*, the applicant or operator submits the formal application along with all the relevant documentation, as established in the applicable advisory circular (see FORM: O-GEN021 PBN Application, as amended).

f) In Phase three – *Documentation evaluation*, the Authority evaluates all the documentation and the navigation system to determine their eligibility and the approval method to be followed in connection with the aircraft. As a result of this analysis and evaluation, the Authority may accept or reject the formal application along with the documentation (see FORM: O-GEN021-1: PBN Job Aid (Assessment Worksheet).

g) In *Phase four – Inspection and demonstration*, the Authority inspects aircraft equipment and on-going training as necessary. Flight operations procedures including a validation flight may be inspected if required.

h) In *Phase five* – Approval. The Authority issues the operations specifications for the applicable navigation specification once the operator has met the airworthiness and operational requirements. For commercial air operators the Authority will issue an amended OpSpecs for the particular aircraft type. For General Aviation operators (private), a letter of authorisation (LOA) will be issued for RNP AR APCH operations. It may also be issued for other navigation specifications as determined by the CAA.