PART 2 PBN OPERATIONAL APPROVALS

Chapter 1 Overview

1.1 General

In this Part guidance is provided to assist CCAA inspectors in the evaluation of an application for PBN Operational Approval for each of the PBN Manual Navigation Specifications.

The PBN Manual contains a statement of the operational requirements for each type of operation, and while it is necessary that the Operational Approval evaluation determines that the proposed operation meets the minimum requirements, it is also necessary that an assessment is made of the operator's capability to meet the operational intent of the particular navigation specification.

It should be noted that each of the PBN Manual navigation specifications has a history of its own and the minimum requirements have originated over differing time frames and in some cases geographical operating requirements. In the development of the PBN manual it has not been possible to correlate all requirements of the individual navigation specifications and some inconsistencies may be noted between specifications.

Operations approval inspectors who have a good understanding of the underlying principles, intent and application appropriate to each of the navigation specifications should be able to manage any such limitation in the PBN Manual without difficulty.

1.2 Responsibility for Operational Approval Evaluation

Overall responsibility for the evaluation of an operational approval application will be assigned to an Operations Inspector (OI), who is (where possible) experienced and trained in PBN operations. The assigned inspector should have access to other specialist expertise where required.

It should be recognised that PBN is an operational concept and the primary task is to determine that the applicant's operating practices, procedures and training are adequate. Although some evaluation of aircraft eligibility and airworthiness is required during the operational approval process, PBN operational approval is not primarily an airworthiness task.

In some cases, particularly where documentation is available to demonstrate the aircraft eligibility, the OI may be satisfied that any airworthiness issues are addressed and assistance from airworthiness experts may not be necessary. However in most cases issues of configuration control, ongoing maintenance,

minimum equipment lists, training of maintenance personnel etc., should be assessed by qualified airworthiness inspectors in consultation with the OI.

1.3 Issue of Approval

The approval will consist of the issue of an operations specification (OPSPEC) or a letter of approval.

OPSPECs should be annotated as shown in the table below to show the individual PBN operational approvals granted. The remarks as noted should also be included on the OPSEC to assist in identifying existing approvals which are equivalent to PBN navigation specifications. For example, it should be noted (as shown) that an RNAV 5 approval is applicable in B-RNAV airspace. This will assist regulators to recognise and accept OPSECS issued in accordance with PBN navigation specifications and help to avoid misunderstandings as the transition is made to the global adoption of PBN.

OPERATIONS SPECIFICATIONS
(subject to the approved conditions in the Operations Manual)

Issuing Authority Contact Details.
Telephone: _____; Fax: _____; E-mail: _____

AOC#: Operator Name: Trading Name Date: Signature:

Aircraft Model:

Types of operation: Commercial air transportation ☐ Passengers; ☐ Cargo; ☐ Other:.....

Area of operation:

Special Limitations:

Special Authorizations:	Yes	No	Specific Approvals	Remarks
Dangerous Goods	☐	☐		
Low Visibility Operations				
Approach and Landing	☐	☐	CAT .... RVR: m DH: ft	
Take-off	☐	☐	RVR: m	
RVSM ☐ **N/A**	☐	☐		
ETOPS ☐ **N/A**	☐	☐	Maximum Diversion Time: minutes	
Navigation Specifications for PBN Operations	☒	☐	RNP 10 RNAV 5 RNAV 1 and RNAV 2 RNP 4 Basic RNP 1 RNP APCH [LNAV, LNAV/VNAV, LPV, LP][1] RNP AR APCH	 Also valid for B-RNAV routes Also valid for P-RNAV routes [1]List approach types approved. RNP APCH [LNAV] also valid for approach procedures designated as RNAV (GNSS)
Continuing Airworthiness				
Others	☐	☐		

However issued the approval will commonly include conditions, as PBN operations may be conducted using a variety of aircraft, systems and procedures which have yet to be universally standardised.

It is not necessary to issue separate airworthiness and operational approvals for PBN operations. The operational approval is issued on the basis that an assessment is made or the airworthiness aspects of the operation.

1.4 Job Aids

Job aids (included in Part 3) have been developed to assist CCAA inspectors in managing the process of PBN operational approvals. The job aids provide both inspectors and operators with guidance on the documentation required to be included in an operator's application, and the items that must be assessed by the OI in order for an operational approval to be issued. The job aids also serve as means of recording the documentation process.

The job aids summarise the key elements to be assessed, and should be used as a guide to the approval process but frequent reference to the ICAO PBN Manual (DOC 9613) and Cameroon PBN Operational Approval Handbook will be required to identify detailed requirements for approval.

1.5 Using the Job Aids

Job aids are divided into four sections as follows:

SECTION 1 - INFORMATION ON AIRCRAFT AND OPERATOR IDENTIFICATION contains the general information identifying the operator and aircraft applicable to the particular application. This section should be completed by the applicant. In general a PBN operational approval can be issued according to aircraft type and model and it is not necessary to identify specific aircraft by registration marks or serial number unless there are significant differences in installed equipment in the operator's fleet.

SECTION 2 – OPERATOR APPLICATION (ITEMS AND DOCUMENTS) identifies the documentation that the operator must provide in support of the application. As full documentation is necessary for the CCAA inspector to conduct a comprehensive assessment, applications which are not supported by adequate documentation should be referred back to the operator before the detailed assessment of an application is commenced.

The applicant should insert in the column headed "*Indication of inclusion by the operator*" the relevant references in the applicant's supporting documentation that demonstrate compliance.

The inspector, after assessing the information provided by the applicant, completes the "*Comments by the Inspector*" column by noting as follows:

1) Satisfactory
2) Additional information required, including items which require further action
3) Other comments

SECTION 3 – GUIDE FOR DETERMINING AIRCRAFT ELIGIBILITY provides the inspector with guidance on the basis for establishment of compliance with the PBN Manual aircraft eligibility requirements. The applicant should identify the specific reference(s) in the operator's documentation that demonstrate compliance with each requirement. Where there are more than one means of compliance the applicant should note *Not Applicable* where appropriate.
The CCAA inspector must indicate in the comments column as follows:

1) Compliant
2) Partially compliant, including items which require further action
3) Not compliant
4) Other remarks

Where applicable the inspector should attach a statement supporting the assessment including any remarks relevant to the assessment including any alternative means of compliance, conditions related to the approval or reasons for assessing the application as non-compliant.

SECTION 4 - PROCEDURES FOR PBN OPERATIONS provides a checklist to identify that the operator's procedures meet the requirements for the specific PBN operation. The operator must identify that each requirement is appropriately documented and applied to the conduct of the particular PBN operation. Procedures must be contained in the operator's Flight Crew Training Manual, checklists, and instructions to operational personnel or equivalent documents. Where appropriate, reference may be made to manufacturer documentation provided that operational personnel have ready access to relevant documents.

All items on the job aid must be identified as satisfactory or compliant (subject to any appropriate conditions or approved exemptions) before an operational approval is issued.

Chapter 2 RNAV 10

2.1 General

RNAV 10 operations have been, prior to the development of the PBN concept authorized as RNP 10 operations. An RNAV 10 operational approval does not change any requirement nor does it affect operators that have already obtained an RNP 10 approval.

RNP 10 was developed and implemented at a time when the delineation between RNAV and RNP had not been clearly defined. As the requirements for RNP 10 did not include a requirement for on-board performance monitoring and alerting, it is more correctly described as an RNAV operation and hence the inclusion in the PBN Manual as RNAV 10.

Recognising that airspace, routes, airworthiness and operational approvals have been designated as RNP 10, further declaration of airspace, routes, and aircraft and operator approvals may continue to use the term RNP 10, while the PBN Manual application will be known as RNAV 10.

RNAV 10 is applicable to operations in oceanic and remote areas and does not require any ground-based navigation infrastructure or assessment.

2.2 ATS communications and surveillance

The PBN Manual does not address communication or air traffic services (ATS) surveillance requirements that may be specified for operation on a particular route or area. These requirements are specified in other documents, such as the aeronautical information publications (AIP) and ICAO Regional Supplementary Procedures (Doc 7030). An operational approval conducted in accordance with the requirements of the PBN Manual assumes that operators and flight crews take into account all the communication and surveillance requirements related to RNP 10 routes.

2.3 Summary

As RNAV 10 is intended for use in oceanic and remote areas the navigation specification is based on the use of Long Range Navigation Systems. A minimum of two LRNs is required for redundancy.

Commonly available LRNs are:

- INS
- IRS
- GNSS

The most common combinations of dual LRNs are:

- Dual INS
- Dual IRS
- Dual GNSS
- GNSS/IRS (IRS updated by GNSS)

Inertial systems (unless updated by GNSS) are subject to a gradual loss of position accuracy with time (drift rate) and therefore are subject to a maximum time limit in order to meet the RNAV 10 accuracy requirement. The basic time limit is 6.2 hrs, but this may be extended by updating or by demonstration of reduced drift rate (<3.7km/2NM per hr.)

GNSS position is continuously updated and not subject to any time limit. However GNSS is subject to some operational limitations that impact on oceanic and remote navigation.

The minimum level of GNSS receiver (TSO C129) is capable of fault detection (FD) but will not provide a navigation solution if a fault is detected. Consequently, no matter how many serviceable satellites are available, the continued availability of GNSS cannot be assured and is therefore this standard of GNSS is unsuitable for oceanic and remote navigation. In order to be approved for oceanic and remote applications a GNSS receiver must be capable of excluding a faulty satellite from the solution (Fault detection and Exclusion/FDE) so that continuity of navigation can be provided. FDE is standard for GNSS receivers based on later TSO C145A/146A standards and is available as an option or modification for TSO C129( ) receivers. Consequently, where a TSO C129 ( ) GNSS is used to satisfy the requirement for one or both of the LRNs it needs to be determined that the receiver is capable of FDE and approved for oceanic/remote operations.

Despite the GNSS receiver capability for FDE, the satellite constellation may not always be adequate to provide sufficient satellite for the redundant navigation solutions to be computed in order to identify and eliminate a faulty satellite from the position solution, and in such situations FDE is not available. In order to limit the exposure to the potential loss of a navigation solution due to unavailability of FDE, a prediction of satellite availability is required, and the maximum period during which FDE is predicted to be unavailable is 34 minutes. This time limit is based on the assumption that should a fault occur during a period when FDE is unavailable, then navigation accuracy is reduced (DR).

For an IRS/GNSS system the same 34 minute time limit is also applied to a loss of FDE.

Due to the time limitations applicable to INS or IRS the operator needs to evaluate the route(s) to be flown to determine that RNAV 10 capability can be satisfied.

Accordingly an RNAV 10 operational approval is not universal for aircraft without GNSS and needs to apply to specific routes or be subject to the operator's procedures for route evaluation.

As inertial position accuracy slowly deteriorates over time since update, for aircraft with INS or IRS only, some attention needs to be placed on radio updating. Aircraft equipped with a Flight Management System normally provide automatic radio updating of inertial position. Automatic updating is normally considered adequate in such circumstances, provided the aircraft is within a reasonable distance of the radio aids at the point at which the last update is expected. If any doubt exists then the operator should be required to provide any an analysis of the accuracy of the update.

Manual updating is less common, and the operational approval needs to be based on a more detailed examination of the circumstances. Guidance is provided in the PBN Manual.

2.4 Operating Procedures

The standard operating procedures adopted by operators flying on oceanic and remote routes should normally be generally consistent with RNAV 10 operations, except that some additional provisions may need to be included to specifically address RNAV 10 operations.

A review of the operator's procedure documentation against the requirements of the PBN Manual and the [State] regulatory requirements should be sufficient to ensure compliance.

The essential elements to be evaluated are that the operator's procedures ensure that:

- The aircraft is serviceable for RNAV 10 ops
- RNAV 10 capability is indicated on the flight plan
- Route limitations are defined and observed (e.g. time limits)
- En-route loss of capability is identified and reported
- Procedures for alternative navigation are described

GNSS based operations also require the prediction of FDE availability. Most GNSS service prediction programs are based on a prediction at a destination and do not generally provide predictions over a route or large area. However for RNAV 10 operations the probability that the constellation cannot support FDE is remote and this requirement can be met by either a general route analysis or a dispatch prediction of satellite availability. For example a specified minimum satellite

constellation may be sufficient to support all RNAV 10 operations with out specific real-time route prediction being required..

2.5 Pilot Knowledge and Training

Unless the operator is inexperienced in the use of RNAV, flight crews should possess the necessary skills to conduct RNAV 10 operations with minimal additional training.

Where GNSS is used, flight crews must be familiar with GNSS principles related to en-route navigation.

Where additional training is required, this can normally be achieved by bulletin, computer based training or classroom briefing. Flight training is not normally required.

Chapter 3 RNAV 5

3.1 General

In the context of the terminology adopted in the PBN Manual, B-RNAV requirements are termed RNAV 5.

B-RNAV approval meets the requirements of RNAV 5 without additional examination.

RNAV 5 is intended for en-route navigation where there is adequate coverage of ground-based radio navigation aids permitting DME/DME or VOR/DME area navigation operations.

Consequently an RNAV 5 route is dependent upon an analysis of the supporting navaid infrastructure. However consideration of navaid coverage it not part of an operational approval as this is the responsibility of the air navigation service provider.

3.2 Summary

- A single RNAV system only is required.
- A navigation database is not required. Manual entry of waypoint data is permitted, but is subject to human error.
- Storage of a minimum of 4 waypoints is required
- Navigation system alerting is not required.
- Navigation displays in the pilot's forward view must be sufficient to permit track following and manoeuvring.
- The maximum cross-track error deviation permitted is 2.5NM
- An RNAV system failure indication is required.

3.3 INS or IRS

An INS or IRS system may be used for RNAV 5. If automatic radio updating is not carried out a time limit of 2 hrs applies from the last on ground position update, unless an extended limit has been justified.

3.4 GNSS

GNSS approved in accordance with ETSO C129(A), FAA TSO C129 (A) or later meets the requirements of RNAV 5.

Stand-alone receivers manufactured to ETSO C129 or FAA TSO C129 are also applicable provided they include pseudo-range step detection and health word checking functions.

GNSS based operations require prediction that a service (with integrity) will be available for the route. Most GNSS availability prediction programs are computed for a specific location (normally the destination airport) and are unable to provide predictions over a route or large area. However for RNAV 5 the probability of a loss of GNSS integrity is remote and the prediction requirement can normally be met by determining that sufficient satellites are available to provide adequate continuity of service.

3.5 Operating procedures

For most operators normal RNAV operating procedures will meet the requirements of RNAV 5.

The essential elements to be evaluated are that the operator's procedures ensure that:

- The aircraft is serviceable for RNAV 5
- RNAV 5 capability is indicated on the flight plan
- En-route loss of capability is identified and reported
- Procedures for alternative navigation are described

If the navigation system does not use a navigation database manual waypoint entry significantly increases the potential for navigation errors. Operating procedures need to be robust to reduce the incidence of human error, including cross-checking of entry, checking of tracks/distances/bearings against published routes and general situational awareness and checking for reasonableness.

Where navigation data is not extracted from a valid database, operations should be limited to not below the minimum obstacle clearance altitude.

As RNAV 5 operations are typically conducted in areas of adequate navaid coverage, contingency procedures will normally involve reversion to conventional ground-based radio navigation.

3.6 Pilot Knowledge and Training

Unless the operator is inexperienced in the use of RNAV, flight crews should possess the necessary skills to conduct RNAV 5 operations with minimal additional training.

Where GNSS is used, flight crews must be familiar with GNSS principles related to en-route navigation.

Where additional training is required, this can normally be achieved by bulletin, computer based training or classroom briefing. Flight training is not normally required.

3.7 Operational Approval

The operational approval process for RNAV 5 is generally straightforward, given that most aircraft are equipped with RNAV systems which exceed the minimum requirements for RNAV 5.

In most cases the AFM will document RNAV 5 capability and only occasionally will it be necessary to conduct an evaluation of aircraft capability.