KINGDOM OF BAHRAIN
Ministry of Transportation
and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

CIVIL AVIATION PUBLICATION

CAP 11
Volume 3

PBN SPECIFICATION JOB AIDS

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CIVIL AVIATION PUBLICATIONS

Bahrain CAA Publication Revisions Highlight Sheet

☒ CAP: 11 Vol. 3 ☐ TPM: __

The following pages have been revised to Revision 01 dated 21 April 2022.

Item	Chapter/Paragraph number	Page(s)	Reason
1.	---	ALL	Reflects current revision status and date.
2.	3.4	19-20	Amended to add RNP 2.
3.	3.5	23	RNP 2 Reserved deleted. RNP 1 re-numbered and revised.
4.	3.7	34	Requirements for Advanced RNP (A-RNP) introduced.
5.	Para. 3.8.4 and 3.8.6	35-36	Amended.

CIVIL AVIATION PUBLICATIONS

CAP 11

PBN

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1. INTRODUCTION

1.1 General

1.1.1 In order to facilitate a standardized approach to the process of applying for PBN approval, a structured form, known as a "job aid", has been developed.

1.1.2 Much of the application process is common to all navigation specifications but each specification has specific elements that must be addressed. The following describes the process to complete an application for approval for a PBN navigation specification:

(a) complete the generic job aid from Chapter 2 (Parts 1 and 2);

(b) complete the job aid specific elements for the navigation specification (Parts 3, 4 and 5), from Chapter 3, sections 3.1 to 3.10 as applicable; and

(c) combine the generic job aid and specific elements to form the complete approval application job aid.

2. Generic Job Aid

2.1 Purpose

Purpose of the job aid:

(a) To provide information on the relevant reference documents.

(b) To provide a record of the operator application, the inspector comments and the operator follow-up action for each relevant paragraph in the reference document(s).

2.2 Recommended actions for the inspector and operator

(a) At the pre-application meeting, the operator and the inspector review the approval process events and establish the form and content of the approval application.

(b) The operator records references to material in company documents for each relevant paragraph in the job aid.

(c) The operator submits to the inspector the completed job aid with the application.

(d) The inspector records his/her findings for each relevant paragraph in the job aid indicating compliance or necessary corrective action.

(e) The inspector informs the operator as soon as possible when a corrective action is required.

(f) The operator provides the inspector with the revised material when so requested.

(g) The BCAA provides the operator with the operations specifications (Ops Specs) or a letter of authorization (LOA), as applicable, when the tasks and documents have been completed.

2.3 Reference documents

Publisher	Reference	Title
ICAO	Annex 2	Rules of the Air
	Annex 6	Operation of Aircraft
	Doc 4444	Procedure for Air Navigation Services — Air Traffic Management
	Doc 7030	Regional Supplementary Procedures
	Doc 9613	Performance-based Navigation (PBN) Manual
FAA	Order 8400.12( )	Required Navigation Performance 10 (RNP 10)Operational Approval
	AC 20-130	Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors
	AC 20-138( )	Airworthiness Approval of Global Navigation Satellite System (GNSS) Equipment
	14 CFR Part 121, Subpart G	Manual Requirements
EASA	AMC 20-12	Recognition of FAA Order 8400.12a for RNP 10 Operations
CASA	AC 91U-2(0)	Required Navigation Performance 10 (RNP 10) Operational Authorization
ICAO (SAM)	AC 91-001	Aircraft and Operators Approval for RNAV 10 Operations (Designated and Authorised as RNP 10)

Part 1. General Information

Basic Events of the Approval Process

	Action by Operator	*Action by Inspector*
1	Establish the need for the authorization.	
2	Review the AFM, AFM supplement, TC data sheet, other appropriate documents (e.g. STCs, SBs, SLs) to determine aircraft eligibility. If necessary contact the aircraft and/or avionics OEM to confirm eligibility[1].	
3	Schedule a pre-application meeting with the inspector.	
4		During the pre-application meeting establish: • form and contents of the application; • documents required to support the application; • target date for the application submission; • requirement for flight validation.
5	Submit the application at least XX days prior to start-up of the planned operations.	
6		Review submission.
7	Ensure that amendments to manuals, programmes and other relevant documents are complete; provide training to flight crews, flight dispatchers and maintenance personnel; if required, conduct a validation flight.	If required, participate in the validation flight.
8		Once the requirements have been met, issue operational approval.

[1] *Having the navigation specification capabilities listed in a document approved by the State of Design or State of Registry facilitates determining aircraft eligibility.*

Part 2. Identification of Aircraft and Operators

Name of Operator: _____

Aircraft manufacturer, model and series	Registration number	Serial number	Long-range navigation system manufacturer, model and number	PBN specification

Date of pre-application meeting: _____

Date when application received by BCAA: _____

Date when operator intends to begin *(insert navigation specification)* operations: _____

Is the BCAA notification date appropriate? YES □ NO □

3. Specific Job Aids

3.1 RNAV 10

3.1.1 General

RNAV 10 supports 50 NM lateral and 50 NM longitudinal distance-based separation minima in oceanic or remote area airspace. Prior to the development of the PBN concept, RNAV 10 operations were 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. Because the requirements for RNP 10 did not include a requirement for on-board performance monitoring and alerting, RNP 10 is more correctly described as an RNAV operation and hence is included in the PBN manual as RNAV 10.

Recognizing 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 application in the PBN manual will be known as RNAV 10.

3.1.2 System Requirements

RNAV 10 is intended for use in oceanic and remote areas, and the navigation specification is based on the use of long range navigation systems (LRNSs). The aircraft requirements are detailed in CAP 11, Vol. 2, Chapter 13, 13.3.

3.1.3 Operating Procedures

The operating procedures are addressed in CAP 11, Vol. 2, Chapter 13, 13.4. The standard operating procedures adopted by operators flying on oceanic and remote routes should normally be generally consistent with RNAV 10 operations, although some additional provisions may need to be included. 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.

3.1.4 Pilot knowledge and training

Pilot knowledge and training requirements are detailed in CAP 11, Vol. 2, Chapter 13, 13.5. Flight crews should possess the necessary skills to conduct RNAV 10 operations with minimal additional training.

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

Part 3. Operator Application (Items and Documents)

Item	Title of document	Indication of inclusion by the operator	Comments by the Inspector
1	**Airworthiness documents showing aircraft eligibility for RNAV 10 (RNP 10).** AFM, AFM revision, AFM supplement, or Type certificate data sheet (TCDS) showing that the LRNS is eligible for RNAV 10 (RNP 10).		
2	**Aircraft modified to meet RNAV 10 (RNP 10) standards.** Documentation on aircraft inspection and/or modification, if applicable.		
3	**Maintenance program** • For aircraft with established LRNS maintenance practices, the list of references of the document or program. • For newly installed LRNS provide LRNS maintenance practices for review.		
4	**Minimum Equipment List (MEL) if applicable** showing provisions for LRNS		
5	**Training programme** for flight crews, flight dispatchers, and maintenance personnel as applicable.		
6	**Operating policies and procedures** including relevant section of Operations Manuals and checklists attached to the application, applicable to RNAV 10		
7	**Navigation database (if carried)** Details of the navigation data validation programme.		

Contents of the application to be submitted by the operator:

(a) compliance documentation for the aircraft/navigation systems;

(b) operating procedures and policies;

(c) sections of the maintenance manual related to LRNS (if not previously reviewed).

Note: Documents may be grouped in a single binder or may be submitted as individual documents.

Part 4. Guide for Determining RNAV 10 (RNP 10) Aircraft Eligibility

Item	Topics	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the operator	Comments
1	**Eligibility Method 1 -** Eligibility of aircraft through RNP certification. (RNP compliance documented in the AFM).	1.3.3.1.2		
2	**Eligibility Method 2 -** Eligibility of aircraft through previous certification of the navigation system.	1.3.3.1.3		
3	**Eligibility Method 3 -** Eligibility of aircraft through data collection.	1.3.3.1.4		
4	**Aircraft Equipment**			
	Dual Long Range Navigation Systems	1.3.4		
	Dual GNSS	1.3.4.2.1		
	GNSS approved as primary means of navigation (AC 20-138 or equivalent)	1.3.4.2.1.1		
	Multi-sensor systems into which the GNSS is integrated (AC 20-130 or equivalent).	1.3.4.2.1.2		
	Complies with regulations/advisory information for use of GNSS for primary oceanic/remote performance	1.3.4.2.1.3		
	Approved FDE prediction programme	1.3.4.2.1.4		
	Dual INS or IRS	1.3.4.2.2.1		
	INSs or IRUs approved according to 14 CFR, Part 121, Appendix G (time limit 6.2 hours).	1.3.4.2.2		
	INSs or IRUs approved for MNPS operations in the North Atlantic or RNAV operation in Australia (time limit 6.2 hours).	1.3.4.2.2		
	Application for extended time limit	1.3.4.2.3		
	Operator route evaluation conducted	1.3.9.6		
	Single IRS or IRU and Single GNSS	1.3.4.2.4		
	INS/IRU approved to 14 CFR Part 121 Appendix G or equivalent	1.3.4.2.4		
	GNSS authorized for oceanic/remote (TSO C129a with FTE, TSO C145a/146a, or equivalent)	1.3.2.4		
	Approved FOE prediction programme	1.3.4.2.4		

Part 5. Operating Procedures

Item	Operating Procedures	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the Operator	Comments
1	**Flight planning**			
	Verify that aircraft has been approved for RNAV 10 (RNP 10) operations.	1.3.5		
	Verify that two LRNS are operational.	1.3.6.1		
	Verify that the RNAV 10 (RNP 10) time limit has been taken into account (aircraft equipped with only INS/IRU).	1.3.5.1 (a)		
	Verify requirements for GNSS, such as FOE, if applicable to the operation.	1.3.5.1 (b)		
	Insert the letter "R" in Box 10 of the ICAO flight plan	1.3.7		
	If required, take into account any operational restriction related to RNAV 10 (RNP 10) approval for a specific navigation system.	1.3.5.1 (c)		
2	**Pre-flight procedures**			
	Review of maintenance logs and forms for LRNS status	1.3.5.2 (a)		
	Review the emergency procedures for operations in RVAV 10 (RNP 10) airspace or routes.	1.3.5.2 (c)		
3	**En-route procedures**			
	Before oceanic point of entry verify at least two LRNS capable of navigating in RNAV 10 (RNP 10). If not consider using an alternate route or initiating a deviation.	1.3.9.1		
	Before entering oceanic airspace, check aircraft position as accurately as possible using external navigation aids.	1.3.9.2		
	Cross-check procedures in order to identify navigation errors in advance and prevent the aircraft from inadvertently deviating from the routes authorised by the ATC.	1.3.9.3		

	Notify the ATC of any degradation or failure of the navigation equipment below the navigation performance requirements, or of any deviation required for a contingency procedure.	1.3.9.4		
	Operator procedures for use of a lateral deviation indicator, an FO or an AP in lateral navigation mode (LNAV) for RNP 10 operations.	1.3.9.5		
	Operator procedures for limiting FTE to +/- ½ navigation accuracy	1.3.9.5		
	Operator procedures for manual updating of position (if approved)	1.3.9.9		
4	**Contingencies**	15.2.1 and 15.2.2		
	Inability to comply with ATC clearance due to meteorological conditions, aircraft performance or pressurization failure.	15.2.1.1		
	Check the condition of navigation antennas and surrounding fuselage skin.	15.2.3		
	Review the emergency procedures for RNP 10 operations.	5.4.2.6.3.2 15.3		

3.2 RNAV 5

3.2.1 General

RNAV 5 supports continental en-route operations using a range of different positioning sensors. Prior to the introduction of PBN, basic RNAV (B-RNAV) was introduced in Europe and the Middle East. The RNAV 5 requirements are based upon B-RNAV, and any B-RNAV approval meets the requirements of RNAV 5 without further examination.

RNAV 5 is intended for en-route navigation where not all the airspace users are equipped with GNSS and where there is adequate coverage of ground-based radio navigation aids permitting DME/DME or VOR/DME area navigation operations.

An RNAV 5 route is dependent upon an analysis of the supporting NAVAID infrastructure. This analysis is the responsibility of the air navigation service provider.

3.2.2 System Requirements

The system requirements are detailed in CAP 11, Vol. 2, Chapter 14, 14.2.

3.2.3 Operating Procedures

The operating procedures are addressed in CAP 11, Vol. 2, Chapter 14, 14.3. Normal area navigation operating procedures will usually meet the requirements of RNAV 5.

3.2.4 Pilot knowledge and training

The pilot knowledge and training requirements are detailed in CAP 11, Vol. 2,Chapter 14, 14.4. Flight crews should possess the necessary skills to conduct RNAV 5operations with minimal additional training.

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

3.2.5 Operational approval

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

In most cases the AFM will document RNAV 5 capability; failing that, many OEMs have issued statements of compliance and only occasionally will it be necessary to conduct an evaluation of aircraft capability.

With the exception of an amendment to the operations manual, a State may decide that there is no further requirement for any additional documentation of RNAV 5 approval.

The operational approval process for RNAV 5 is addressed in CAP 11, Vol. 2, Chapter 14, 14.5.

Part 3. Operator Application (Items and Documents)

Item	Title of document	Indication of inclusion by the Operator	Comments by the Inspector
1	**Airworthiness documents to determine aircraft eligibility** Airworthiness documents that establish the aircraft and the navigation system have been approved for RNAV 5 operations.		

2	**RNAV 5 system requirements** Documents that show the aircraft equipment One (1) RNAV system comprising of: • one or a combination of the following navigation sensors: VOR/DME, DME/DME, INS or IRS, and GNSS; • an Area Navigation (RNAV) computer; • a Control Display Unit (CDU); and • a navigation display(s) or instrument(s) e. g., Navigation Display (ND), Heading Situation Indicator (HSI) or Course Deviation Indicator (CDI).		
3	**Maintenance program** 1. For Aircraft with established RNAV or GPS stand-alone maintenance practices provide document references. 2. For newly installed RNAV or GPS stand-alone provide maintenance practices for review.		
4	**Minimum equipment list (MEL) if applicable** showing provisions for RNAV 5 systems.		
5	**Training** Training program for flight crews, flight dispatchers, and maintenance personnel as applicable		
6	**Operational policies and procedures** Operations manual and checklists or sections to be attached to the application, corresponding to RNAV 5 operating procedures and policies.		
7	**Navigation database (if carried)** Details of the navigation data validation programme.		

Contents of the application to be submitted by the operator:

(a) compliance documentation for the aircraft/navigation systems;

(b) operating procedures and policies;

(c) sections of the maintenance manual related to LRNS (if not previously reviewed).

Note: Documents may be grouped in a single binder or may be submitted as individual documents.

PART 4. Guide for Determining RNAV 5 (RNP 5) Aircraft Eligibility

Item	Topics	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the Operator	Comments
1	**Aircraft eligibility**			
	Aircraft approved for B-RNAV	2.3.2.6		
	Aircraft with an approved statement of compliance	2.3.2.4		
	Aircraft with statement by the manufacturer	2.3.2.4		
2	**Aircraft and System requirements - one of the following**			
	VOR/DME or DME/DME system	2.3.3.2.2 2.3.3.2.3		
	INS or IRS	2.3.3.2.1		
	GNSS a) TSO C129 with pseudo range step detection and health word checking; or b) TSO C129 (a) or TSO C145 ( ) or TSO C146( ) or equivalent	2.3.3.2.4		
3	**Availability of conventional navigation equipment** as a back-up in the event of loss of GNSS, if required by the State.	2.3.3.2.4.3		
4	**RNAV 5 system functional requirements**	2.3.3.3		

Part 5. Operating Procedures

Item	Operating Procedures	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the Operator	Comments
1	Flight planning			
	Verify aircraft is approved for RNAV operation.	2.3.4.1		
	File appropriate flight plan suffixes for RNAV 5	2.3.4.2.1		
	Verify that GNSS or ground-based navigation aids required for RNAV 5 operations are available for the route and period of operations, including any contingencies	2.3.4.2.2		
	Verify that database is current and appropriate for the route (if carried)	2.3.4.2.3		
	Confirm availability of GNSS (if carried). Revise flight planning if a continuous loss of integrity of more than 5 minutes is predicted	2.3.4.3		
2	General operating procedures			
	Operator procedures to ensure flight crew do not request, or file a flight plan for RNAV 5 routes unless they meet all the criteria in the relevant State documents.	2.3.4.4.1		
	Operator procedures to ensure any manufacturer requirements, to meet the RNAV 5 performance requirements	2.3.4.4.2		
	For RNAV 5 routes - procedures for the use of a lateral deviation indicator, a FD or an AP in the lateral navigation mode.	2.3.4.4.7		
	Operator procedures for setting lateral deviation scale (where applicable)	2.3.4.4.7		
	Operator procedures for limiting FTE to +/- ½ navigation accuracy	2.3.4.4.8		
	Operator procedures for rejoining route following ATC course assignment	2.3.4.4.9		
3	Contingency Procedures			
	Notification of ATC when RNAV performance ceases to meet the requirements for RNAV 5	2.3.4.5.1		
	Operator procedures for use of GNSS; a) Loss of integrity monitoring function b) Integrity alert	2.3.4.5.3 (a) 2.3.4.5.3 (b)		

3.3 RNAV 1 AND RNAV 2

3.3.1 General

RNAV 1 and RNAV 2 use GNSS or DME/DME positioning and support operations on:

(a) ATS routes (continental en-route);

(b) standard instrument departures and arrivals (SIDs/STARs); and

(c) instrument approach procedures up to the final approach fix (FAF)/final approach point (FAP).

Because RNAV 1 and RNAV 2 operations can be based on DME/DME or DME/DME IRU, the NAVAID infrastructure must be assessed to ensure adequate DME coverage. This is the responsibility of the ANSP and is not part of the operational approval.

A single RNAV 1 and RNAV 2 approval is issued. An operator with an RNAV 1 and RNAV 2 approval is qualified to operate on both RNAV 1 and RNAV 2 routes. RNAV 2 routes may be promulgated in cases where the NAVAID infrastructure is unable to meet the accuracy requirements for RNAV 1.

3.3.2 System Requirements

The aircraft requirements are detailed in CAP 11, Vol. 2, Chapter 15, 15.2.

3.3.3 Operating Procedures

The operating procedures are addressed in CAP 11, Vol. 2, Chapter 15, 15.3.

Operators with en-route area navigation experience will generally meet the basic requirements of RNAV 1 and RNAV 2, and the operational approval should focus on procedures associated with SIDs and STARs.

3.3.4 Pilot knowledge and training

The pilot knowledge and training requirements are detailed in CAP 11, Vol. 2,Chapter 15, 15.4.

Most crews will already have some experience with area navigation operations, and much of the knowledge and training will have been covered in past training. Particular attention should be placed on the application of this knowledge to the execution of RNAV 1 and RNAV 2 SIDs and STARs, including connection with the en-route structure and transition to final approach. This requires a thorough understanding of the airborne equipment and its functionality and management.

Part 3. Operator Application (Items and Documents)

Item	Title of Document	Indication of inclusion by the Operator	Comments by the Inspector
1	**Airworthiness documents showing aircraft eligibility for RNAV 1 and RNAV 2.** AFM, AFM revision, AFM supplement, or Type certificate data sheet (TCDS) showing that the RNAV navigation system is eligible for RNAV 1 and RNAV 2 or RNP 1 or above. or Manufacturer statement.- Aircraft with a manufacturer statement documenting compliance with RNAV 1 and RNAV 2, or P-RNAV (TGL-10) or FAA AC 90-100( ) or equivalent. *Note: Approvals in accordance with P-RNAV only or FAA AC 90-100( ) only require additional documentation to meet RNAV 1 and RNAV 2 requirements*		
2	**Aircraft modified to meet RNAV 1 and RNAV 2 standards. Documentation on aircraft inspection and/or modification, if applicable.** Maintenance records documenting the installation or modification of aircraft systems		
3	**Maintenance programme** • For aircraft with established maintenance procedures for RNAV 1 and RNAV 2 systems, the list of references of the document or programme. • For recently installed RNAV 1 and RNAV 2 systems, the maintenance procedures for review.		
4	**Minimum equipment list (MEL) if applicable** showing provisions for RNAV 1 and RNAV 2.		
5	**Training** Training programme for flight crews, flight dispatchers, and maintenance personnel as applicable.		
6	**Operating policies and procedures** including relevant section of Operations Manuals and checklists attached to the application, applicable to RNAV 1 and RNAV 2		
7	**Navigation database** Details of the navigation data validation programme.		

PART 4. Guide for Determining RNAV 1 and RNAV 2 Aircraft Eligibility

Item	Topics	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the Operator	Comments
1	**System eligibility for RNAV 1 and RNAV 2 operations**	3.3.2.6		
	a) Aircraft approved under TGL-10 and AC 90-100A	3.3.2.7.2 (b)		
	b) Aircraft approved under TGL-10 (P-RNAV) and additional requirements in Table 11-B-3-1	3.3.2.7.3 (b)		
	c) Aircraft that comply with AC 90-100A and additional requirements in Table 11- B-3-2	3.3.2.7.4 (b)		
	d) Aircraft with a statement by the manufacturer demonstrating compliance with RNAV 1 and RNAV 2 requirements.			
2	**Aircraft and system requirements (as applicable)**			
	a) FMS with TSO-C129() GNSS	3.3.3.2.1.1 (a)		
	b) FMS with TSO-C145() GNSS	3.3.3.2.1.1 (b)		
	c) Stand-alone TSO C129 ( ) Class A1 GNSS	3.3.3.2.1.1 (c)		
	d) Stand-alone TSO C146 ( ) GNSS	3.3.3.2.1.1 (d)		
	e) DME/DME RNAV equipment	3.3.3.2.2		
	DME/DME/1RU RNAV equipment	3.3.3.2.3		
3	**Functional requirements**	3.3.3.3		

Part 5. Operating Procedures

Item	Operating Procedures	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the operator	Comments
1	**Pre-flight planning**			
	File appropriate flight plan suffix	3.3.4.1.1		
	Ensure on-board navigation data current and appropriate for the region of intended operation	3.3.4.1.2		
	Use all the information available, to confirm the availability of the required navigation infrastructure for the projected routes, including any non-RNAV contingency, for the intended operation.	3.3.4.1.3		
	Check GNSS integrity prediction (for GNSS equipped aircraft)	3.3.4.1.3 3.3.4.1.4		
	For navigation relying on DME, check NOTAMs to verify the condition of critical DMEs. Assess capability to navigate (potentially to an alternate destination) in case of failure of critical DME while airborne	3.3.4.1.5		
2	**General operating procedures**			
	Operator procedures to ensure flight crew do not request, or file a flight plan for RNAV 1 and RNAV 2 routes unless they meet all the criteria in the relevant State documents.	3.3.4.2.2		
	Operator procedures to ensure any manufacturer requirements, to meet the performance requirements of this section are met	3.3.4.2.1		

	At system initialization, pilots must: a) confirm the validity of the navigation database; b) verify the current position of the aircraft; c) verify the proper entry of the assigned ATC route once the initial clearance is received, and of any subsequent route changes; and ensure that the WPT sequence displayed on the navigation system coincides with the route shown in the appropriate charts and with the assigned route.	3.3.4.2.3		
	Operator procedures to ensure SIDs and STARs are retrieved from the on-board navigation database using the procedure name are consistent with the charted procedure and only modified as outlined in the PBN Manual.	3.3.4.2.4		
	RNAV 1 or RNAV 2 routes to be obtained from the database and only modified as per approved procedures	3.3.4.2.5		
	Operator procedures for verifying navigation system text display.	3.3.4.2.6		
	Operator procedures for confirming reasonableness of navigation.	3.3.4.2.7		
	For RNAV 2 Routes - recommended procedures for the use of a lateral deviation indicator, flight director or autopilot in lateral navigation mode	3.3.4.2.8		
	For RNAV 1 routes - requirements for the use of a lateral deviation indicator, a FD or an AP in the lateral navigation mode.	3.3.4.2.9		
	Operator procedures for setting lateral deviation scale (where applicable)	3.3.4.2.10		
	Operator procedures for limiting FTE to +I- ½ navigation accuracy	3.3.4.2.11		
	Operator procedures for rejoining route following ATC course assignment	3.3.4.2.12		
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3	**Specific RNAV SID requirements**			
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	Operator procedures for observing published altitude and speed constraints	3.3.4.4.6		
5	**Contingency procedures**			
	Operators contingency procedures for loss of navigation capability	3.3.4.5.1		

3.4 RNP 4 and 2

3.4.1 General

RNP 4 supports 30 NM lateral and 30 NM longitudinal distance-based separation minima in oceanic or remote area airspace. RNP 4 is required for North Atlantic High Level Airspace (HLA) per ICAO Document 007.

RNP 2 supports 12 NM lateral and 12 NM longitudinal distance-based separation minima in oceanic or remote area airspace.

3.4.2 System Requirements

The aircraft requirements are detailed in CAP 11, Vol. 2, Chapter 16, 16.2.

3.4.3 Operating Procedures

The operating procedures are addressed in CAP 11, Vol. 2, Chapter 16, 16.3. Some additional provisions may need to be added to the standard operating procedures to specifically address RNP 4 operations.

3.4.4 Pilot knowledge and training

The pilot knowledge and training requirements are addressed in CAP 11, Vol. 2, Chapter 16, 16.5. Flight crews should possess the necessary skills to conduct RNP 4 and RNP 2 operations.

Flight crew training in a full flight simulator is required.

Part 3. Operator Application (Items and Documents)

Item	Title of document	Indication of inclusion by the operator	Comments by the Inspector
1	**Aircraft airworthiness documents showing RNP 4 compliance** per ICAO PBN Manual, e.g., AFM, AFM Revision, AFM Supplement or Type Certificate Data Sheet (TCDS) showing that aircraft LRNS are RNP 4 and 2.		
2	**Aircraft Modified To Meet RNP 4 Standards** Documentation of aircraft inspection and/or modification. If applicable, maintenance records documenting installation or modification of aircraft/LRNS.		
3	**Maintenance Program:** For aircraft with established LRNS maintenance practices, provide list of document or program references. For newly installed LRNS, provide LRNS maintenance practices for review.		
4	**Minimum Equipment List (MEL) if applicable** showing provisions for LRNS		
5	**Training programme** for flight crews, and flight dispatchers, and maintenance personnel as applicable.		
6	**Operating policies and procedures** including relevant section of Operations Manuals and checklists attached to the application, applicable to RNP 4 and RNP 2		

7	**Navigation database** Details of the navigation data validation programme.		

PART 4. Guide for Determining RNP 4 Aircraft Eligibility

Item	Topics	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the operator	Comments
1	**Eligibility Group 1** - RNP Certification (RNP compliance documented in Airplane Flight Manual (AFM)	1.3.2.3.2 (a)		
2	**Eligibility Group 2** - Prior Navigation System Certification	1.3.2.3.2 (b)		
	Aircraft fitted with GNSS only: a) Approved long-range navigation systems for oceanic and remote airspace (with FOE) b) Approved dispatch FOE availability programme	1.3.2.3.2 (b)(i)		
	Multi-sensor Systems Integrating GNSS with integrity provided by RAIM	1.3.2.3.2 (b)(ii)		
	Multi-sensor Systems Integrating GNSS with integrity provided by AAIM	1.3.2.3.2 (b)(iii)		
3	**Eligibility Group 3** - New Technology	1.3.2.3.2 (c)		
4	Requirement for at least dual Long Range Navigation System equipage including GNSS	1.3.3		
5	Functional Requirements	1.3.3.6 1.3.3.7		

Part 5. Operating Procedures

Item	Operating Procedures	Reference ICAO Doc 9613 Vol II Part B	Location in the Documents of the operator	Comments
1	**Pre-flight Planning**			
	Verify aircraft long-range navigation systems (LRNS) required to meet minimum Navigation Specification (RNP) specified for the route or area is operational.	1.3.4.1.2		
	Annotate ICAO Flight Plan block 10 (Equipment) with "R" and "Z" and annotate Item 18 with "NAV/RNP4/2"" Note: CPOLC and ADS-C will also be required when separation standard is 30 NM lateral and/or longitudinal.	1.3.4.1.1 .		
	Review applicable contingency procedures	1.3.4.1.2 (c)		
	Ensure navigation capability available including availability of FOE s applicable	1.3.4.2		
2	**Pre-flight Procedures**			
	Review of maintenance logs and forms for LRNS status	1.3.4.1.2 (a)		
	Confirm Navigation Database currency	1.3.4.1.1 (Note)		
3	**En route Procedures**			
	Before oceanic entry point, verify two LRNS meeting the minimum RNP specified are operating. If not, notify ATC and operate in accordance with policy applicable to the airspace.	1.3.4.3.1		
	Before entering oceanic airspace, perform navigation accuracy check and position update (if necessary) using accepted method.	1.3.4.3.2		
	Follow in-flight operating drills to prevent inadvertent deviation from cleared routes.	1.3.4.3.3		
	Use flight director or autopilot in lateral deviation mode	1.3.4.3.4		
	Advise ATC of loss of long-range navigation capability and operate in accordance with policy applicable to the airspace.	1.3.4.3.3		

3.5 RNP 1

3.5.1 General

RNP 1 is intended to support arrival and departure procedures using GNSS or DME/DME/IRU positioning.

3.5.2 System Requirements

The aircraft requirements are detailed in CAP 11 Volume 2, Chapter 18.

3.5.3 Operating Procedures

The operating procedures are addressed in CAP 11 Volume 2, Chapter 18.

3.5.4 Pilot knowledge and training

The pilot knowledge and training requirements are addressed in CAP 11 Volume 2, Chapter 18. Flight crews should possess the necessary skills to conduct RNP 1 operations.

Flight crew training in a full flight simulator is required.

Part 3. Operator Application (Items and Documents)

Item	Title of document	Indication of inclusion by the operator	Comments by the Inspector
1	**Airworthiness documents showing aircraft eligibility for RNP 1.** AFM, AFM revision, AFM supplement, or Type certificate data sheet (TCDS) showing that the RNP navigation system is eligible for RNP 1 or less. or Manufacturer statement - Aircraft with a manufacturer statement documenting compliance with the performance and functional requirements of the ICAO PBN Manual.		

2	**Aircraft modified to meet RNP 1 standards.** Documentation on aircraft inspection and/or modification, if applicable. Maintenance records documenting the installation or modification of aircraft systems		
3	**Maintenance programme** • For aircraft with established maintenance procedures for RNP 1 systems, the list of references of the document or programme. • For recently installed RNP 1 systems, the maintenance procedures for their review.		
4	**Minimum equipment list (MEL) if applicable** showing provisions for RNP 1 systems.		
5	**Operating policies and procedures** including relevant section of Operations Manuals and checklists attached to the application, applicable to RNP 1		
6	**Training** Training programme for flight crews, flight dispatchers, and maintenance personnel as applicable.		
7	**Navigation database** Details of the navigation data validation programme.		

PART 4. Guide for Determining RNP 1 Aircraft Eligibility

Item	Topics	Reference ICAO Doc 9613 Vol II Part C	Location in the Documents of the operator	Comments
1	**Aircraft and system requirements - one of the following:**			
	Aircraft with E/TSO-C129a GNSS sensor (Class B or C) installed in an FMS	3.3.3 a)		
	Aircraft with E/TSO-C145 () GNSS sensor installed in an FMS	3.3.3 a)		
	Aircraft with E/TSO-C129a Class A1 system or E/TSO-C146 () stand-alone GNSS	3.3.3 b)		

	Aircraft with RNP capability certified or approved with equivalent standards.	3.3.3 c)		
	Positioning data from other types of navigation sensors can be integrated with GNSS data provided they do not cause position errors that exceed the total system error (TSE)). Otherwise, means must be provided to deselect or cancel the other types of navigation sensors.	3.3.3.2		
2	**Aircraft and System eligibility for RNP 1 operations**			
	Aircraft with an approved statement of compliance	3.3.2.4		
	Aircraft with a statement by the manufacturer	3.3.2.4		
	Modified aircraft	3.3.2.4		
3	**Functional requirements** *Note: Aircraft with RNAV 1 and RNAV 2 approval or equivalent (e.g. P-RNAV and FAA AC 90-100) based on GNSS capability meet the functional requirements of this AC for RNP 1 operations.*	3.3.3		

Part 5. Operating Procedures

Item	Operating Procedures	Reference ICAO Doc 9613 Vol II Part C	Location in the Documents of the operator	Comments
1	**Pre-flight planning**			
	File appropriate flight plan suffix	3.3.4.1.1		
	Ensure on-board navigation data current and appropriate for the region of intended operation	3.3.4.1.2		
	Use all the information available, to confirm the availability of the required navigation infrastructure for the projected routes, including any non-RNAV contingency, for the intended operation.	3.3.4.1.3		
	Check GNSS integrity prediction	3.3.4.2		

2	**General operating procedures**			
	Operator procedures comply with any instruction or procedure identified by the manufacturer, as necessary, to meet the performance requirements of this section.	3.3.4.3.1		
	Operator procedures to ensure flight crew do not request, or file a flight plan for RNP 1 routes unless they meet all the criteria in the relevant State documents.	3.3.4.3.2		
	At system initialization, pilots must: a) confirm the validity of the navigation database; b) verify the current position of the aircraft; c) verify the proper entry of the assigned ATC route once the initial clearance is received, and of any subsequent route changes; and d) ensure that the WPT sequence displayed on the navigation system coincides with the route shown in the appropriate charts and with the assigned route.	3.3.4.3.3		
	Operator procedures to ensure a basic RNP 1 SID/STARs is retrieved from the on-board navigation database using the procedure name, is consistent with the charted procedure and only modified as outlined in the PBN Manual .	3.3.4.3.4		
	Operator procedures for verifying navigation system text display.	3.3.4.3.5		
	Operator procedures for confirming reasonableness of navigation.	3.3.4.3.6		
	For RNP 1routes procedures requiring the use of a lateral deviation indicator, flight director or autopilot in lateral navigation mode	3.3.4.3.7		
	Operator procedures for limiting FTE to +/- ½ navigation accuracy	3.3.4.3.8		
	Operator procedures for re-joining route following ATC course assignment	3.3.4.3.9		
	Operator procedures for setting bank angle limitations.	3.3.4.3.10		

3	**Aircraft with RNP selection capability**			
	Pilots of aircraft capable of selecting RNP input must select RNP 1 or lower for RNP 1 SIDs, STARs or procedures.	3.3.4.4		
4	**Basic-RNP 1 SID specific requirements**			
	Operator procedures for determining system availability and pre-departure setup	3.3.4.5.1		
	Operator procedures/requirement for equipment use to ensure meeting basic RNP 1 performance	3.3.4.5.3		
	GNSS requirements for acquiring signal and flight plan loading to ensure the appropriate navigation system monitoring and sensitivity	3.3.4.5.4		
	Procedures for setting lateral deviation display scale for aircraft using a lateral deviation display (*e.g.*, a navigation map display), and use of FD or autopilot	3.3.4.5.5		
5	**Basic-RNP 1 STAR specific requirements**			
	Operator procedures for loading/checking route	3.3.4.6.1		
	Operator procedures related to restriction on waypoint creation.	3.3.4.6.2		
	Operator procedures for contingency procedures to revert to a conventional arrival route (where required).	3.3.4.6.3		
	Operator procedures for accepting radar headings or "direct to" tracking	3.3.4.6.4		
	Operator procedures for verifying system operation and selection of procedures	3.3.4.6.5		
	Operator procedures for observing published altitude and speed constraints.	3.3.4.6.6		
	For aircraft using stand-alone GNSS systems, operator procedures / requirements for equipment setup/flight planning to ensure basic RNP 1 lateral deviation display scale sensitivity	3.3.4.6.7		

6	**Contingency procedures**			
	Operator contingency procedures for loss of navigation capability	3.3.4.7.1		

3.6 RNP APCH

3.6.1 General

General requirements for RNP APCH are detailed in CAP 11, Vol. 2, Chapter 20, 20.1.

3.6.2 System Requirements

The aircraft requirements for RNP APCH to LNAV minima are detailed in CAP 11, Vol. 2, Chapter 20, 20.4.1.

The aircraft requirements for RNP APCH to LNAV/VNAV minima are detailed in CAP 11, Vol. 2, Chapter 20, 20.4.2.

3.6.3 Operating Procedures

The operating procedures for RNP APCH are addressed in CAP 11, Vol. 2, Chapter 20, 20.5.

3.6.4 Flight Crew knowledge and training

The pilot knowledge and training requirements for RNP APCH are addressed in CAP 11, Vol. 2, Chapter 20, 20.6.

3.6.5 Navigation Database

Navigation database requirements for RNP APCH are detailed in CAP 11, Vol. 2, Chapter 20, 20.7.

Part 3. Operator Application (Items and Documents)

Item	Title of document	Indication of inclusion by the operator	Comments by the Inspector
1	**Airworthiness documents showing aircraft eligibility for RNP APCH.** AFM, AFM revision, AFM supplement, or Type certificate data sheet (TCDS) showing that the RNP navigation system is eligible for RNP APCH. or; Manufacturer statement. - Aircraft with a manufacturer statement documenting compliance		
2	**Aircraft modified to meet RNP APCH standards.** Documentation on aircraft inspection and/or modification, if applicable. Maintenance records documenting the installation or modification of aircraft systems		
3	**Maintenance programme** • For aircraft with established maintenance procedures for RNP APCH systems, the list of references of the document or programme. • For recently installed RNP APCH systems, the maintenance procedures for their review.		
4	**Minimum equipment list (MEL) if applicable** showing provisions for RNP APCH systems.		
5	**Training** Training programme for flight crews, flight dispatchers, and maintenance personnel as applicable.		
6	**Operating policies and procedures** Operations manual (OM) and checklists or sections to be attached to the application, corresponding to RNP APCH operating procedures and policies.		
7	**Navigation database** Details of the navigation data validation programme.		

Part 4. Guide for Determining RNP APCH Aircraft Eligibility

Item	Topics	Reference ICAO Doc 9613 Vol II Part C	Location in the Documents of the operator	Comments
1	**Aircraft and system requirements**			
	Aircraft approved to conduct RNAV (GNSS) approaches.			
	Aircraft that have a statement of compliance in their flight manual (AFM), AFM supplement, pilot operations handbook (POH), or in the avionics operating manual.	5.3.2.4		
	RNP installation based on GNSS standalone system	5.3.3.1, Note 3		
	RNP installation is based on GNSS sensor equipment used in a multi-sensor system	5.3.3.1, Note 3		
	Positioning data from other types of navigation sensors can be integrated with GNSS data provided they do not cause position errors that exceed the total system error (TSE)). Otherwise, means must be provided to deselect or cancel the other types of navigation sensors.	5.3.3.2		
	Functional requirements	5.3.3.3		

Part 5. Operating Procedures

Item	Operating Procedures	Reference paragraphs ICAO Doc 9613 Vol II Part C	Location in the Documents of the operator	Comments
1	**Pre-flight planning**			
	File appropriate flight plan suffix	5.3.4.1.1		
	Ensure that the approaches which may be used for the intended flight (including alternate aerodromes): a) are selected from a valid navigation data base (current AIRAC cycle); b) have been verified through an appropriate (navigation database integrity process); and c) have not been prohibited by any NOTAM issued by the CAA or by the air navigation service providers or by an operational instruction of the company	5.3.4.1.2 a)		
	Ensure that there are sufficient means available to fly and land at the destination or alternate aerodrome in case of loss of RNP APCH capability.	5.3.4.1.2 b)		
	Take account of any NOTAM issued by the CAA or by the ANSP, or by an operational instruction of the company that might adversely affect aircraft system operation or the availability or suitability of the procedures at the destination aerodrome or at any alternate aerodromes.	5.3.4.1.2 c)		
	For missed approach procedures based on conventional NAVAIDs (VOR, NDB), verify that the appropriate airborne equipment required to fly such procedures is installed and operational in the aircraft.	5.3.4.1.2 d)		
	Use all the information available, to confirm the availability of the required navigation infrastructure for the projected routes, including any non-RNAV contingency, for the intended operation.	5.3.4.1.3		
	Check GNSS integrity prediction	5.3.4.1.3		
2	**Prior to commencing the procedure**			

	In addition to normal procedures, prior to commencing the approach (before the initial approach fix (IAF)), the flight crew must verify the correct procedure has been loaded, by comparing said procedure with the approach charts. This check must include: a) the WPT sequence; b) the integrity of the tracks and distances of the approach legs, the accuracy of the inbound course and the length of the final approach segment.	5.3.4.3.1		
	For multi-sensor systems, verify during the approach that a GNSS sensor is used for position computation.	5.3.4.3.3		
	For a RNP system with aircraft-based augmentation system (ABAS) requiring barometric aiding, set the current aerodrome barometric altimeter	5.3.4.3.4		
	Check GNSS availability	5.3.4.3.5		
	Operator procedures for rejoining route following ATC course assignment	5.3.4.3.6		
	Operator procedures to prohibit revision of lateral definition of the flight path between the FAF and the missed approach point (MAPt).	5.3.4.3.7		
3	**During the procedure**			
	Establish aircraft on course prior to FAF	5.3.4.4.1		
	Check appropriate approach mode active prior to FAF.	5.3.4.4.2		
	Select appropriate displays so that the following information can be monitored by the flight crew: a) the RNP computed desired track (DTK); and b) the aircraft position relative to the path cross track deviation (XTK) for FTE monitoring.	5.3.4.4.3		

	Discontinue approach: a) if the navigation display is announcing a failure (flagged invalid); or b) in case of loss of the integrity alerting function; or c) if the integrity alerting function is annunciated not available before passing the FAF; or d) if the FTE is excessive.	5.3.4.4.4		
	Missed approach must be flown in accordance with the published procedure. Use of the RNP system during the missed approach provided: a) the RNP system is operational (*e.g.,* there is no loss of function, no NSE alert, no failure indication, etc.). b) the whole procedure (including the missed approach) is loaded from the navigation data base.	5.3.4.4.5		
	Operator procedures for limiting FTE to +/- ½ navigation accuracy	5.3.4.4.6		
	Operator procedures for limiting vertical deviations within + 100/-50 ft when Baro-VNAV is used for vertical path guidance during the final approach segment	5.3.4.4.7		
	Operator procedures for the conduct of a missed approach if the lateral or vertical deviations are excessive	5.3.4.4.8		
4	**Contingency procedures**			
	Notify ATC of any loss of the RNP APCH capability, together with the proposed course of action.	5.3.4.6.1		
	Operator contingency procedures in order to react safely following the loss of the RNP APCH capability during the approach.	5.3.4.6.1		

3.7 ADVANCED RNP (A-RNP)

The operator must provide aircraft documentation and demonstrate in both a full flight Simulator and the aircraft the following capability before being authorized advanced (A-RNP) Advanced Required Navigation Performance (A-RNP).

In order to be A-RNP qualified operators must be operationally and functionally qualified to perform the following three required functions:

1. Scalability,

2. Radius to Fix (RF), and

3. Parallel offset.

Note: Higher continuity may be required for oceanic and remote continental airspace. Currently, fixed radius transition (FRT) and Time of Arrival Control (TOAC) are optional. For each applicable OpSpec, or LOA, A-RNP functions are added to the bundled hierarchy of PBN authorizations.

Flight crew training in a full flight simulator is required.

3.8 RNP AR APCH

3.8.1 General

RNP AR APCH is the designator for PBN approach procedures that require additional levels of scrutiny, control and authorization. RNP AR APCH applications can range from simple straight-in approaches, with a minimum track-keeping accuracy requirement of RNP 0.3 in final approach and RNP 1 at all other times, to complex curved approaches with RF legs used in the final and the missed approach and minimum track-keeping accuracies as low as RNP 0.1. Moreover, in addition to the RNP AR APCH procedures designed according to the *Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual* (Doc 9905), there are a number of RNP AR APCH procedures in commercial use which have been designed according to private, proprietary criteria.

GNSS, an inertial reference system and a VNAV system are required for all RNP AR APCH applications. DME/DME updating may be used as a reversionary system if the required navigation accuracy can be maintained in a specific operation, although explicit authorization is required. VOR updating shall not be used.

3.8.2 System Requirements

The aircraft requirements are detailed in CAP 11, Volume 2, Chapter 21, 21.8.

3.8.3 RNP AR APCH operations

The operating procedures are addressed in CAP 11, Volume 2, Chapter 21, 21.9. Most manufacturers have developed recommended procedures for RNP AR APCH procedures. Although the manufacturer's recommendations should be followed, the operational approval should include an independent evaluation of the operator's proposed procedures. RNP AR APCH operating procedures should be consistent with the operator's normal procedures where possible in order to minimize any human factors elements associated with the introduction of PBN operations.

3.8.4 Pilot knowledge and training

The pilot knowledge and training requirements are addressed in CAP 11, Volume 2, Chapter 21, 21.10. RNP AR APCH operations depend on sound flight crew knowledge and training. The type of navigation system has a significant effect on the conduct of this type of procedure, and flight training must take this factor intoaccount.

(a) Ground training

Ground training including computer-based training and classroom briefings shall include all required elements of the syllabus detailed in the PBN manual.

(b) Simulator training

Briefings and simulator sessions should cover all elements of the intended operation or the minimum number of approaches stipulated in the PBN manual. Proficiency may be achieved in normal uncomplicated operations in a short period of time;however, additional flight time needs to be scheduled to ensure competency in the management of approach changes, go-around, holding and other functions, including due consideration of human factors. The minimum shall be not less than one four hour session is a full flight simulator.

RNP AR APCH operations are critically dependent on valid data.

Any RNP AR APCH in the database must first be validated formally by the operator by:

(c) comparing the data in the database with the procedure published on the chart;

(d) flying the entire procedure either in a simulator or in the actual aircraft in VMC to ensure that there is complete consistency and there are no disconnects;

(e) comparing subsequent database updates with the validated master to ensure that there are no discrepancies.

The navigation database shall be obtained from a qualified source, and operators must also have procedures in place for the management of data.

Even qualified database suppliers who comply with RTCA DO-200A/EUROCAE ED/76 cannot guarantee that the databases will be error-free. Operators must have procedures in place to ensure, for every AIRAC, that the RNP AR procedure in the database is exactly the same as the RNP AR procedure that was initially validated.

3.8.5 TAWS database

The procedure validation process should include a compatibility check with the installed TAWS. The TAWS data should only be obtained from a qualified source and operators should have procedures in place for the management of the TAWS data.

3.8.6 Safety assessments

The RNP AR procedure design criteria in *Required Navigation Performance*

Authorization Required (RNP AR) Procedure Design Manual (Doc 9905) assume that any event leading the aircraft to exit the lateral (2 x RNP) or vertical (VEB) extent of the obstacle clearance volume may have hazardous repercussions. In order to ensure that the TLS of the intended operation is met, the acceptability of the repercussions of aircraft failures with respect to the RNP AR application must be addressed (PBN manual, Volume II, RNP AR navigation specifications, 6.3.3.2.7 and 6.3.3.4.1.2.).

Demonstration of compliance with those requirements may be part of the aircraft qualification criteria assessed during the airworthiness approval. The operator must demonstrate RNP APPCH in both a full flight simulator as well as actual aircraft operation.

Whatever the methodology followed, operational approval stakeholders should ensure that the aircr aft compliance documented in the airworthiness approval or the demonstrated compliance performed during the operational approval properly satisfies the 10–7 RNP AR lateral and vertical airspace containment limits. The applicant should demonstrate that any contingency procedures and operational limitations used to satisfy this objective are well understood and are applied by the applicant's flight crews. Furthermore, when States have decided to implement a "State-wide" RNP AR operational approval process, stakeholders should ensure that any demonstration is representative and is applicable to all public RNP AR procedures, including the most challenging ones.

The BCAA shall ensure that a clear statement is available from the applicant as to whether the aircraft State of Design approval has included the demonstration of compliance in the airworthiness approval of the aircraft or whether demonstration of compliance will be the operator's responsibility to be satisfied during the operational approval.

(a) If the published RNP AR value in the applicant's AFM includes the potential degradation of performance under aircraft failures and if the RNP AR level at which the aircraft has been qualified satisfies the RNP AR level required by the intended application, no additional failure demonstration should be required during the operational approval process, provided the applicant is able to give evidence through documentation obtained from the aircraft manufacturer qualification dossier.

(b) If the published RNP AR value in the applicant's AFM does not include the potential degradation of performance under aircraft failures or if the RNP AR level at which the aircraft has been qualified does not satisfy the RNP AR level required by the intended application, the CAA must require a demonstration from the applicant, additional to the RNP AR aircraft qualification, that the containment criteria are satisfied (including consideration of engine failure in addition to system failures) for the intended application. To do so, the applicant needs to obtain from the aircraft manufacturer the detailed list of failures thatmay degrade the RNP AR performance. The applicant then has to assess theeffect of those failures with respect to the intended operation using simulation means qualified as representative of the aircraft configuration approved for RNP AR.

In both cases, all contingency procedures and operational limitations required to support the demonstration that the TLS of the intended application is satisfied must be applied during the training programme.

3.8.7 Flight operational safety assessment (FOSA)

In certain circumstances, such as for RNP < 0.3 applications, approaches in areas of high terrain and other difficult conditions, or approaches in complex high traffic density environments, a flight operational safety assessment (FOSA) may need to be completed. Further guidance on how to conduct a FOSA is provided CAP 11 Volume 2, Appendix 4.

3.8.8 Documentation supporting the application for approval

Support data and information collated during the AR qualification and compliance assessment may include inputs from one or all of the following: aircraft manufacturer, avionics supplier and operator.

Support documentation will vary in form and location of content depending on the governing regulations, business processes and procedures, and other practices that may apply. Each is an acceptable means of compliance. The result is there will not be a 1 for 1 correlation between one manufacturer's documentation and another's, or one operator and another. However, what should be clear from any documentation set is what is relevant and applicable to the PBN application and the associated operational approval, e.g. this could range from a single document whose content clearly addresses RNP AR requirements only for regulatory approval, to a documentation set comprised of multiple documents with clearly identified sections for RNP AR indexed to the application requirements.

Part 3. Operator Application (Items and Documents)

Item	Title of document	Indication of inclusion by the operator	Comments by the Inspector
1	**Airworthiness documents showing aircraft eligibility for RNP AR APCH.** AFM, AFM revision, AFM supplement, or Type certificate data sheet (TCDS) showing that the RNP navigation system is eligible for RNP AR APCH. or; Manufacturer statement. - Aircraft with a manufacturer statement documenting compliance *Note: The operator should indicate the lowest RNP capability for which approval is requested and provide relevant supporting documentation*.		
2	**Aircraft modified to meet RNP AR APCH standards.** Documentation on aircraft inspection and/or modification, if applicable. Maintenance records documenting the installation or modification of aircraft systems		
3	**Maintenance programme** • For aircraft with established maintenance procedures for RNP AR APCH systems, the list of references of the document or programme. • For recently installed RNP AR APCH systems, the maintenance procedures for their review.		
4	**Minimum equipment list (MEL) if applicable** showing provisions for RNP AR APCH systems.		
5	**Training** Training programme for flight crews, flight dispatchers, and maintenance personnel as applicable.		
6	**Operating policies and procedures** Operations manual (OM) and checklists or sections to be attached to the application, corresponding to RNP AR APCH operating procedures and policies.		
7	**Navigation database** Details of the navigation data validation programme.		

Part 4. Guide for Determining RNP AR APCH Aircraft Eligibility

Item	Topics	Reference ICAO Doc 9613 Vol II Part C	Location in the Documents of the operator	Comments
1	**Aircraft and system requirements**			
	Aircraft eligibility determined through demonstration of compliance against relevant airworthiness criteria.	6.3.2.6		
	Aircraft complies with FAA AC 20-129 or equivalent (Barometric VNAV)	6.3.3		
	Aircraft complies with FAA AC 20-130 or AC 20-138 or equivalent (GNSS)	6.3.3		
	Aircraft is equipped with system to monitor its achieved navigation performance, and to identify, for the pilot, whether the operational requirement is or is not being met during an operation (e.g. "Unable RQ Nav Performance - RNP", "GPS Primary Lost")	6.3.3.1.5		
	Automatic reversion to an alternate RNAV sensor if the primary RNAV sensor fails.	6.3.3.2.6		
	Aircraft barometric VNV system temperature compensated (optional)	6.3.3.2.8		

2	**Displays**	6.3.3.3.1.3		
	Aircraft displays required information (*General Requirements*)	6.3.3.3.1.3 (a) to (o)		
	Continuous display of deviation. The navigation system must provide the capability to continuously display to the pilot flying, on the primary flight instruments for navigation of the aircraft, the aircraft position relative to the RNP defined path (both lateral and vertical deviation). The display must allow the pilot to readily distinguish if the cross-track deviation exceeds the navigation accuracy (or a smaller value) or if the vertical deviation exceeds 22 m (75 ft) (or a smaller value).	6.3.3.3.1.3.(a)		
	Display of deviation. The navigation system must provide a numeric display of the vertical deviation with a resolution of 3 m (10 ft) or less, and the lateral deviation with a resolution of 0.01 NM or less. Where the display of lateral deviation does not provide a resolution of 0.01NM or less, a limitation may be placed on the lowest useable RNP consistent with the ability of the flight crew to monitor deviation from track.	6.3.3.3.1.3. (m)		
3	**Navigation Database**			
	The aircraft navigation system must use an on-board navigation database which can receive updates in accordance with the AIRAC cycle and allow retrieval and loading of RNP AR APCH procedures into the RNP system. The on-board navigation database must be protected against flight crew modifications of the stored data.	6.3.3.3.1.5		
	The aircraft must provide a means to display the validity period of the on-board navigation database to the flight crew.	6.3.3.3.1.6		
4	**Requirements for RNP AR approaches with RF legs**	**6.3.3.3.2**		
	Most RNP AR APCH capable aircraft have the capability to execute RF legs, however approval may be given to operators of aircraft without this capability limited to RNP AR approaches which do not include RF legs			

	The navigation system must have the capability to execute leg transitions and maintain tracks consistent with an RF leg between two fixes.	6.3.3.3.2.1		
	The aircraft must have an electronic map display of the selected procedure	6.3.3.3.2.2		
	The FMC, the flight director system and autopilot must be capable of commanding a bank angle up to 25 degrees above 121 m (400 ft) AGL and up to 8 degrees below 121 m (400 ft) AGL.	6.3.3.3.2.3		
	Upon initiating a go-around or missed approach (through activation of TOGA or other means), the flight guidance mode should remain in LNAV to enable continuous track guidance during an RF leg.	6.3.3.3.2.4		
5	**Requirements for RNP AR Approaches to less than RNP 0.3**	6.3.3.3.3		
	Consideration should be made for the application of the following requirements for all RNP AR approaches (i.e. including RNP 0.3) especially in areas of significant terrain.			
	No single point of failure. Aircraft fitted with duplicated navigation and guidance equipment. Most RNP AR APCH capable aircraft are equipped with duplicated systems which meet this requirement.	6.3.3.3.3.1		
	Go-around guidance. Aircraft fitted with TOGA to NAV function. If the aircraft does not provide this capability, the operator must be limited to the conduct of approaches with straight segments prior to and after the DA (Refer para 6.3.3.3.3.3 (a). Where the flight guidance system does not remain in LNAV, operators may be approved if the flight crew is able to engage LNAV guidance on flight director or autopilot by 121 m (400 ft) AGL. (refer para 6.3.3.3.3.(b)	6.3.3.3.3.3		

	Loss of GNSS. After initiating a go-around or missed approach following loss of GNSS, the aircraft must automatically revert to another means of navigation that complies with the navigation accuracy. *Typically RNP AR APCH capable aircraft meet this requirement by reversion to IRS navigation.*	6.3.3.3.3.4		
6	**Requirements for approaches with missed approach less than RNP 1.0**	**6.3.3.3.4**		
	Consideration should be made for the application of the following requirements for all RNP AR approaches especially in areas of significant terrain. Typically aircraft with RNP AR APCH capability meet the requirements for missed approach less than RNP 1.0.			
	No single point of failure. Aircraft fitted with duplicated navigation and guidance equipment. Most RNP AR APCH capable aircraft are equipped with duplicated systems which meet this requirement.	**6.3.3.3.4.1**		
	Go-around guidance. Aircraft fitted with TOGA to NAV function If the aircraft does not provide this capability, the operator must be limited to the conduct of approaches with straight segments prior to and after the DA (Refer para 6.3.3.3.3.3 (a). Where the flight guidance system does not remain in LNAV, operators may be approved if the flight crew is able to engage LNAV guidance on flight director or autopilot by 121 m (400 ft) AGL. (refer para 6.3.3.3.3.(b)	6.3.3.3.4.3		
	Loss of GNSS. After initiating a go-around or missed approach following loss of GNSS, the aircraft must automatically revert to another means of navigation that complies with the navigation accuracy. Typically RNP AR APCH capable aircraft meet this requirement by reversion to IRS navigation.	6.3.3.3.4.4		

Part 5. Operating Procedures

Item	Operating Procedures	Reference ICAO Doc 9613 Vol II Part C	Location in the Documents of the operator	Comments
	Note: If the operator has not previously qualified for RNP APCH LNAV or LNAV/VNAV, then it is recommended that Section 4 of the RNP APCH Job Aid is also applied.			
1	**Pre•flight considerations**			
	Minimum equipment list (MEL). The operator's MEL developed/revised to address the equipment requirements for RNP AR APCH instrument approaches.	6.3.4.1.1		
	Autopilot and flight director. Operator's procedures require the use of an autopilot or flight director driven by the RNP system for RNP AR APCH procedures with navigation accuracy less than RNP 0.3 or with RF legs. Typically operators and manufacturers require the use of autopilot for all RNP AR APCH operations. The use of flight director is considered acceptable in the case of an unserviceable autopilot provided the required FTE limitations are observed.	6.3.4.1.2		
	Dispatch RNP assessment. The operator uses an RNP availability prediction program.	6.3.4.1.3		
	Navaid exclusion. Operator procedures to exclude navaid facilities in accordance with NOTAMs (e.g. DMEs, VORs, localizers). Navaid exclusion may be required by the manufacturer to ensure that RNP accuracy is maintained.	6.3.4.1.4		
	Navigation database currency. Operator procedures to confirm that the navigation database is current.	6.3.4.1.5		
2	**In-flight considerations**	**6.3.4.2**		
	Modification of the flight plan. Operator procedures for loading and modification of published RNP AR APCH procedures.	6.3.4.2.1		

	Required list of equipment. Operator has determined the required list of equipment for conducting RNP AR APCHs or alternate methods to address in-flight equipment failures prohibiting RNP AR APCHs (e.g. a quick reference handbook).	6.3.4.2.2		
	RNP management. Operating procedures to ensure the navigation system uses the appropriate navigation accuracy throughout the approach	6.3.4.2.3		
	GNSS updating. Procedures to verify GNSS updating is available prior to commencement of approach.	6.3.4.2.4		
	Radio updating. Where implemented, procedures for use of DME/DME updating as a reversionary mode during the approach or missed approach.	6.3.4.2.5		
	Approach procedure confirmation. Flight crew procedures to confirm that the correct procedure has been selected.	6.3.4.2.6		
	Track deviation monitoring. Operator procedures to limit cross-track deviation to not more than +/- ½ navigation accuracy	6.3.4.2.7		
	Vertical Deviation (Final Approach). Operator procedures to limit vertical deviation in the final approach segment to +/- 22m (75ft).	6.3.4.2.8		
	Missed approach. Operator procedures for conduct of a missed approach if lateral or vertical deviation limits are exceeded.	6.3.4.2.9		
	Procedures with RF legs. Operator procedures to ensure flight crews are familiar with requirements for conducting approaches with RF legs.	6.3.4.2.11		
	Temperature compensation. For operators of aircraft equipped with approved temperature compensation system, procedures permitting flight crews to disregard temperature limits on an RNP AR APCH.	6.3.4.2.12		
	Altimeter setting. Flight crew procedures to verify that the current airport local altimeter is set prior to the final approach fix (FAF). Use of remote altimeter setting not permitted.	6.3.4.2.13		

	Altimeter cross•check. Flight crew procedures to complete an altimetry cross-check ensuring both pilots' altimeters agree within 30 m (±100 ft) prior to the FAF but no earlier than the IAF. Note: This operational cross-check is not necessary if the aircraft automatically compares the altitudes to within 30 m (100 ft) (see also 6.3.3.3.1.3, Displays, (n) Display of barometric altitude).	6.3.4.2.14		
	Non•standard climb gradient. W here the operator plans to use the DA associated with a non-standard missed approach climb gradient, procedures to ensure the aircraft will be able to comply with the published climb gradient for the planned aircraft loading, atmospheric conditions and operating procedures	6.3.4.2.16		
	Engine•out procedures. Demonstration of acceptable flight technical error with one engine inoperative to conduct RNP AR APCHs.	6.3.4.2.17		
	TOGA to NAV fitted or approved operating procedures to ensure that in a go-around LNAV guidance is engaged such that the aircraft remains within the required cross-track deviation limits.	6.3.4.2.19		
	Go-around during RF turn. Flight crew procedures and training to address the impact on navigation capability and flight guidance if the pilot initiates a go-around while the aircraft is in an RF turn.	6.3.4.2.20		
	Contingency procedures - failure while en route. Flight crew procedures to assess the impact of equipment failure on an RNP AR APCH and take appropriate action.	6.3.4.2.22		
	Contingency procedures - failure on approach. Operator's contingency procedures to address failure conditions on approach.	6.3.4.2.23		
3	**Navigation Database**			
	Operator has nominated the responsible manager for the data updating process.	6.3.6.1.1		
	Operator has documented process for accepting, verifying and loading navigation data into the aircraft.	6.3.6.1.2		
	Operator's data process placed under configuration control.	6.3.6.1.3		

	Initial data validation. The operator has a procedure to validate every RNP AR APCH procedure before flying the procedure in instrument meteorological conditions (IMC) to ensure compatibility with their aircraft and to ensure the resulting path matches the published procedure.	6.3.6.1.4		
	Data updates. The operator has a process for comparing each data update to validated procedure data.	6.3.6.1.5		
	Data suppliers. The operator obtains data from a supplier holding a Letter of Acceptance (LOA) for processing navigation data.	6.3.6.1.6		
4	**Flight Operational Safety Assessment (FOSA)**			
	Operator has completed a FOSA	6.4		

ATTACHMENT TO CHAPTER 3.8

Flight Simulation Training Device Functionality and Qualification for RNP AR APCH

(a) A statement of compliance is required that attests to the fact that the simulation of the navigation systems (i.e. EGPWS, GPS, IRS, FMS) and flight guidance systems accurately replicate the operator's equipment and is based on original equipment manufacturer's (OEM) or aircraft manufacturer's design data. A statement of compliancetemplate should be made available by the regulatory authority.

(b) While there are no requirements for airport-specific models (e.g. FAA 14 CFR Part 60, Class I or Class II models) to be used in the qualification of a flight simulation training device (FTSD) for RNP AR APCH training, any visual model must employ real-world terrain modelling. Furthermore, approved RNP AR APCH applications must be used. Generic airport models may be approved for use in training where airport recognition in the visual segment portion of the RNP/AR approach is not critical to completion of the training task. In these cases, a generic airport with a real-world visual terrain model may be utilized. In addition, any terrain awareness and warning system (TAWS/EGPWS) must provide correct terrain feedback (Class A terrain display) and warnings consistent with the specific approach being trained.

(c) Evidence must be provided that the FSTD is equipped and operated in accordance with a valid aircraft cockpit configuration and complies with all applicable software versions or limitations. The operator should ensure that the simulator has the capabilities to support the simulation of any manufacturer required, or operator adapted, normal and non- normal procedures, including appropriate aircraft/system-specific failures and relevant operating conditions (obtained from the appropriate OEM or vendor), for inclusion in theflight training programme.

(d) The following items should be addressed in the statement of compliance:

(1) Simulator PBN RNP AR capability

- Airframe
  • Model
  • Engines
  • Winglets
  • Other airframe unique options

- Flight guidance and flight management system
  • Part numbers for all software and hardware components

- Autoflight options

- Autothrust

- Air data system

- PFD

- Flight mode annunciation

- TAWS
  - GPS position as a direct input to keep terrain on navigation display
  - Peaks and obstacle function
  - Database currency

(2) Operator and crew policies and procedures

- AFM or equivalent documentation providing all training assumptions taken in the framework of RNP AR qualification of the aircraft

- FCOMs

- QRH

- Checklist

(3) Ability to generate failures and degradation

- GPS faults

- CDU faults and failures

- Display unit failures

- Flight guidance system failures

- Loss of NAV or approach modes

- Loss of deviation or performance information

- Loss of TAWS data or display

- TAWS terrain discrepancies

- Dual loss of GPS sensors

- FMS/GPS position disagreements

- FMS failures or downgrades

(4) Visuals

- Ability to add airports to the visual database

- Use of generic airport with TAWS (possibility to set a generic visual with “flat terrain” in a way so as to avoid spurious GPWS warning or crash simulator generated by an inaccurate generic visual terrain)

- Runway coordinates must match AIP

- Visual terrain is accurate and does not cause spurious TAWS alerts (or flat terrain option in visual settings)

(5) Navigation database considerations

- Procedure service provider/developer test databases and loading media

- Coordination required with multiple parties associated with process
  • Aircraft OEM
  • FMS/FGS vendor
  • Operator
  • FSTD vendor
  • Navigation database packing service provider
  • Flight training provider

(6) Evaluation criteria

- Normal performance and functionality:
  • Up-to-date database with display of validity period
  • Operable Class A TAWS identical to the aircraft
  • Dual FMSs, dual GPSs, dual autopilots and at least a single IRU and all must be operable
  • Statement of compliance with the OEM systems included in the eligible configuration of RNP AR
  • aircraft qualification
  • Ability to load the entire RNP/AR approach procedure to be flown from the on-board navigation
  • database
  • Ability to verify the RNP/AR procedure to be flown through a review of the individual waypoints
  • Either an equipment capability or an operational procedure to provide a direct means of inhibiting
  • sensor updating (VOR/DME), if required
  • FSTD autopilot/flight director able to fly an RF leg, comply with the aircraft's bank angle limits, able to maintain lateral track navigation without exceeding the RNP value while encountering strong tailwinds
  • Upon initiating a go-around or missed approach (through activation of TOGA or other means), the lateral flight guidance mode should remain in LNAV. If the aircraft cannot remain in LNAV after TOGA is selected, then proceduresto re-engage LNAV while remaining within 1 x RNP must be demonstrated and verified in the FSTD. The FSTD must permit re- engagement of LNAV by400 ft AGL.

- Non-normal performance and functionality:
  • The navigation system must have the ability to monitor the achieved navigation performance and to alert the pilot when the RNP requirements are not being met (i.e. "UNABLE RNP")
  • The instructor's operating panel must have the capability to induce the malfunction of an "UNABLE RNP" alert or other alert message that would cause a missed approach during an RNP AR APCH (e.g. FMS failure, GPS failure, AP failure, loss of guidance, loss of FD/FDE, engine failure, extreme wind/turbulence). The malfunction must appear realistic to the pilots.

- Demonstration mode:
  - The ability to demonstrate cockpit effects induced by remote or very remote failure combinations at a faster rate than real time would be advantageous, the objective being to illustrate and consolidate the theoretical knowledge received during the ground course. The FTSD should clearly indicate that the training situation is not in real time ("demo mode" displayed in front of the visual scene). Example effects could include:

- FMS/GPS position disagree

- FMS 1/FMS 2 position disagree

- Inconsistency between the terrain display and one or both FMS FPL displays

- Effect of position radio navigation update

- High/low temperature impact on non-compensated baro-VNAV FPA

- Loss of GPS, GPS primary lost, navigation accuracy downgraded

- IRS drift effect.