COMPLIANCE CHECKLIST\*

**PBN**

**Performance-Based Navigation**

Version 2017-02-01

COMMISSION REGULATION (EU) No 965/2012

of 5 October 2012

Updated with Commission Regulations:

(EU) 800/2013, 14 Aug 2013 (NCC,NCO)

(EU) 71/2014, 27Jan 2014 (OSD)

(EU) 83/2014, 29 Jan 2014 (FTL)

(EU) 379/2014, 7 Apr 2014 (SPO, CAT sailplanes & balloons, CAT A-A)

(EU) 2015/140, 29 Jan 2015 (Sterile flight deck)

(EU) 2015/640, 23 Apr 2015 (Part 26)

(EU) 2015/1329, 31 Jul 2015

(EU) 2015/2338, 16 Dec 2015 (Flight recordings)

(EU) 2016/1199, 27 Jul 2016 (PBN, HOFO, Aeronautical data)

Updated with ED-Decisions (AMC/GM):

2012/019/R, 2013/020/R, 2015/022/R, 2016/020/R 2016/022/R

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| Name of organisation |       |
| AOC reference |       |
| Audit reference | TSL       |
| TSL Audit staff |       |
| Signature |  |
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| Signature |  |
| Date(s) of audit |       |
| Date of completion |       |

How to use Compliance Checklist (CCL)

This Compliance Checklist is meant to be an aid to show compliance with the rules in an application for Performance-Based Navigation, PBN. The CCL encompass the Implementing Rules as well as the associated AMCs and GMs.

Guidance material can also be found in ICAO Doc 9613, PBN Manual, and ICAO Doc 9997, PBN Ops Approval Manual, as referenced in the EASA rules.

Every rule reference in this document is followed by a box where the operator, in the first column, shall state where in the Operations Manual the subject is described. It will not be acceptable with just “OM-A” or “OM-A chapter 5”; the reference must be to the detailed level to facilitate the review.

The two following columns are solely for the use of the Authority.

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| State how and where the rule is implemented (Ex. Ref. to OM-A 5.4.3.5)If the rule is Not Applicable state N/A | SCAA notes | **\*\***Assessment |

\*Note: Disclaimer: This document is meant as an aid for operators to comply with the applicable rules. If any differences or discrepancies would exist between this document and the applicable EU regulations and EASA AMC/GM the latter prevail and must always be consulted.

\*\* Note: The right hand part of each box above to be completed by SCAA with one of four indicators:

 1. **C** means Compliance;

 2. **N/A** means that the rule is Not Applicable to the reviewed activity;

 3. **N/R** means the rule is applicable but Not Reviewed;

 4. **R** means Remark.

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| **The application shall contain** |
| * EASA Form 2, signed by Accountable Manager
* This compliance checklist filled as applicable
* Supporting documents of aircraft capability
* Revisions of applicable operations manuals and Aircraft Maintenance Programme
* Supporting documents of simulator capability
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*ANNEX V*

**SPECIFIC APPROVALS**

**[PART-SPA]**

**SPA.GEN.100 Competent authority**

(a) The competent authority for issuing a specific approval shall be:

(1) for the commercial operator the authority of the Member State in which the operator has its principal place of business;

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(2) for the non-commercial operator the authority of the State in which the operator is established or residing.

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(b) Notwithstanding (a)(2), for the non-commercial operator using aircraft registered in a third country, the applicable requirements under this Annex for the approval of the following operations shall not apply if these approvals are issued by a third country State of Registry:

(1) Performance-based navigation (PBN);

(2) Minimum operational performance specifications (MNPS);

(3) Reduced vertical separation minima (RVSM) airspace.

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**SPA.GEN.105 Application for a specific approval**

(a) The operator applying for the initial issue of a specific approval shall provide to the competent authority the documentation required in the applicable Subpart, together with the following information:

(1) the name, address and mailing address of the applicant;

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(2) a description of the intended operation.

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(b) The operator shall provide the following evidence to the competent authority:

(1) compliance with the requirements of the applicable Subpart;

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(2) that the relevant elements defined in the mandatory part of the operational suitability data established in accordance with Regulation (EU) No 748/2012 are taken into account.

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(c) The operator shall retain records relating to (a) and (b) at least for the duration of the operation requiring a specific approval, or, if applicable, in accordance with Annex III (Part-ORO).

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**AMC1 SPA.GEN.105(a) Application for a specific approval**

DOCUMENTATION

(a) Operating procedures should be documented in the operations manual.

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(b) If an operations manual is not required, operating procedures may be described in a manual specifying procedures (procedures manual). If the aircraft flight manual (AFM) or the pilot operating handbook (POH) contains such procedures, they should be considered as acceptable means to document the procedures.

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**SPA.GEN.110 Priviliges of an operator holding a specific approval**

The scope of the activity that an operator is approved to conduct shall be documented and specified:

(a) for operators holding an air operator certificate (AOC) in the operations specifications to the AOC;

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(b) for all other operators in the list of specific approvals.

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**SPA.GEN.115 Changes to a specific approval**

When the conditions of a specific approval are affected by changes, the operator shall provide the relevant documentation to the competent authority and obtain prior approval for the operation.

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**SPA.GEN.120 Continued validity of a specific approval**

Specific approvals shall be issued for an unlimited duration and shall remain valid subject to the operator remaining in compliance with the requirements associated with the specific approval and taking into account the relevant elements defined in the mandatory part of the operational suitability data established in accordance with Regulation (EU) No 748/2012.

SUBPART B

***PERFORMANCE-BASED NAVIGATION (PBN) OPERATIONS***

***(PBN)***

**SPA.PBN.100 PBN operations**

a) An approval is required for each of the following PBN specifications:

(1) RNP AR APCH; and

(2) RNP 0.3 for helicopter operation.

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(b) An approval for RNP AR APCH operations shall allow operations on public instrument approach

procedures which meet the applicable ICAO procedure design criteria.

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(c) A procedure-specific approval for RNP AR APCH or RNP 0.3 shall be required for private instrument

approach procedures or any public instrument approach procedure that does not meet the

applicable ICAO procedure design criteria, or where required by the Aeronautical Information

Publication (AIP) or the competent authority.

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**GM1 SPA.PBN.100 PBN operations**

GENERAL

(a) PBN operations are based on performance requirements, which are expressed in navigation

specifications (RNAV specification and RNP specification) in terms of accuracy, integrity,

continuity, availability and functionality needed for the proposed operation in the context of a

particular airspace concept.

Table 1 provides a simplified overview of:

(1) PBN specifications and their applicability for different phases of flight; and

(2) PBN specifications requiring a specific approval.

(b) More detailed guidance material for the operational use of PBN applications can be found in ICAO

Doc 9613 Performance-Based Navigation (PBN) Manual.

(c) Guidance material for the design of RNP AR APCH procedures can be found in ICAO Doc 9905 RNP

AR Procedure Design Manual.

(d) Guidance material for the operational approval of PBN operations can be found in ICAO Doc 9997

Performance-Based Navigation (PBN) Operational Approval Manual.

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**SPA.PBN.105 PBN operational approval**

To obtain a PBN operational approval from the competent authority, the operator shall provide evidence that:

(a) the relevant airworthiness approval, suitable for the intended PBN operation, is stated in the AFM

or other document that has been approved by the certifying authority as part of an airworthiness

assessment or is based on such approval;

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(b) a training programme for the flight crew members and relevant personnel involved in the flight

preparation has been established;

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(c) a safety assessment has been carried out;

(d) operating procedures have been established specifying:

(1) the equipment to be carried, including its operating limitations and appropriate entries in the minimum equipment list (MEL);

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 (2) flight crew composition and experience requirements;

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(3) normal, abnormal and contingency procedures; and

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(4) electronic navigation data management.

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(e) a list of reportable events has been specified; and

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(f) a management RNP monitoring programme has been established for RNP AR APCH operations, if

applicable.

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**AMC1 SPA.PBN.105(b) PBN operational approval**

FLIGHT CREW TRAINING AND QUALIFICATIONS — GENERAL PROVISIONS

(a) The operator should ensure that flight crew members training programmes for RNP AR APCH

include structured courses of ground and FSTD training.

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(1) Flight crew members with no RNP AR APCH experience should complete the full training

programme prescribed in (b), (c), and (d) below.

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(2) Flight crew members with RNP AR APCH experience with another EU operator may

undertake an:

(i) abbreviated ground training course if operating a different type or class from that on

which the previous RNP AR experience was gained;

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(ii) abbreviated ground and FSTD training course if operating the same type or class and

variant of the same type or class on which the previous RNP. AR experience was

gained.

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(iii) the abbreviated course should include at least the provisions of (d)(1), (c)(1) and

(c)(2)(x) as appropriate.

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(iv) The operator may reduce the number of approaches/landings required by (c)(2)(xii) if

the type/class or the variant of the type or class has the same or similar:

(A) level of technology (flight guidance system (FGS));

(B) operating procedures for navigation performance monitoring; and

(C) handling characteristics

as the previously operated type or class.

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(3) Flight crew members with RNP AR APCH experience with the operator may undertake an

abbreviated ground and FSTD training course:

(i) when changing aircraft type or class, the abbreviated course should include at least

the provisions of (d)(1), (c)(1), (c)(2);

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(ii) when changing to a different variant of aircraft within the same type or class rating

that has the same or similar of all of the following:

(A) level of technology (flight guidance system (FGS));

(B) operating procedures for navigation performance monitoring; and

(C) handling characteristics

as the previously operated type or class.

A difference course or familiarisation appropriate to the change of variant should

fulfil the abbreviated course provisions.

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(iii) when changing to a different variant of aircraft within the same type or class rating

that has significantly different at least one of the following:

(A) level of technology (FGS);

(B) operating procedures for navigation performance monitoring; and

(C) handling characteristics,

the provisions of (c)(1) and (c)(2) should be fulfilled.

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(4) The operator should ensure when undertaking RNP AR APCH operations with different

variant(s) of aircraft within the same type or class rating, that the differences and/or

similarities of the aircraft concerned justify such operations, taking into account at least the

following:

(i) the level of technology, including the:

(A) FGS and associated displays and controls;

(B) FMS and its integration or not with the FGS; and

(C) on-board performance monitoring and alerting (OBPMA) system;

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(ii) operating procedures, including:

(A) navigation performance monitoring;

(B) approach interruption and missed approach including while in turn along an RF

leg;

(C) abnormal procedures in case of loss of system redundancy affecting the

guidance or the navigation; and

(D) abnormal and contingency procedures in case of total loss of RNP capability;

and

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(iii) handling characteristics, including:

(A) manual approach with RF leg;

(B) manual landing from automatic guided approach; and

(C) manual missed approach procedure from automatic approach.

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(b) Ground training

(1) Ground training for RNP AR APCH should address the following subjects during the initial

introduction of a flight crew member to RNP AR APCH systems and operations. For

recurrent programmes, the curriculum need only review initial curriculum items and

address new, revised, or emphasised items.

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(2) General concepts of RNP AR APCH operation

(i) RNP AR APCH training should cover RNP AR APCH systems theory to the extent

appropriate to ensure proper operational use. Flight crew members should

understand basic concepts of RNP AR APCH systems, operation, classifications, and

limitations.

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(ii) The training should include general knowledge and operational application of

RNP AR APCH instrument approach procedures. This training module should in

particular address the following specific elements:

(A) the definitions of RNAV, RNP, RNP APCH, RNP AR APCH, RAIM, and

containment areas;

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(B) the differences between RNP AR APCH and RNP APCH;

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(C) the types of RNP AR APCH procedures and familiarity with the charting of

these procedures;

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(D) the programming and display of RNP and aircraft specific displays, e.g. actual

navigation performance;

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(E) the methods to enable and disable the navigation updating modes related to

RNP;

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(F) the RNP values appropriate for different phases of flight and RNP AR APCH

instrument procedures and how to select, if necessary;

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(G) the use of GNSS RAIM (or equivalent) forecasts and the effects of RAIM ‘holes’

on RNP AR APCH procedures availability;

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(H) when and how to terminate RNP navigation and transfer to conventional

navigation due to loss of RNP and/or required equipment;

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(I) the method to determine if the navigation database is current and contains

required navigational data;

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(J) the explanation of the different components that contribute to the total

system error and their characteristics, e.g. drift characteristics when using IRU

with no radio updating, QNH mistakes;

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(K) the temperature compensation: Flight crew members operating avionics

systems with compensation for altimetry errors introduced by deviations from

ISA may disregard the temperature limits on RNP AR APCH procedures if flight

crew training on use of the temperature compensation function is provided by

the operator and the compensation function is utilised by the crew. However,

the training should also recognise if the temperature compensation by the

system is applicable to the VNAV guidance and is not a substitute for the flight

crew compensating for the temperature effects on minimum altitudes or the

DA/H;

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(L) the effect of wind on aircraft performance during RNP AR APCH operations

and the need to positively remain within RNP containment area, including any

operational wind limitation and aircraft configuration essential to safely

complete an RNP AR APCH operation;

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(M) the effect of groundspeed on compliance with RNP AR APCH procedures and

bank angle restrictions that may impact on the ability to remain on the course

centreline. For RNP procedures, aircraft are expected to maintain the standard

speeds associated with the applicable category unless more stringent

constraints are published;

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(N) the relationship between RNP and the appropriate approach minima line on

an approved published RNP AR APCH procedure and any operational

limitations if the available RNP degrades or is not available prior to an

approach (this should include flight crew operating procedures outside the FAF

versus inside the FAF);

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(O) understanding alerts that may occur from the loading and use of improper

RNP values for a desired segment of an RNP AR APCH procedure;

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(P) understanding the performance requirement to couple the autopilot/flight

director to the navigation system’s lateral guidance on RNP AR APCH

procedures requiring an RNP of less than RNP 0.3;

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(Q) the events that trigger a missed approach when using the aircraft’s RNP

capability to complete an RNP AR APCH procedure;

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(R) any bank angle restrictions or limitations on RNP AR APCH procedures;

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(S) ensuring flight crew members understand the performance issues associated

with reversion to radio updating, know any limitations on the use of DME and

VOR updating; and

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(T) the familiarisation with the terrain and obstacles representations on

navigation displays and approach charts.

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(3) ATC communication and coordination for use of RNP AR APCH

(i) Ground training should instruct flight crew members on proper flight plan

classifications and any ATC procedures applicable to RNP AR APCH operations.

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(ii) Flight crew members should receive instruction on the need to advise ATC

immediately when the performance of the aircraft’s navigation system is no longer

adequate to support continuation of an RNP AR APCH operation.

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(4) RNP AR APCH equipment components, controls, displays, and alerts

(i) Theoretical training should include discussion of RNP terminology, symbology,

operation, optional controls, and display features, including any items unique to an

operator’s implementation or systems. The training should address applicable failure

alerts and limitations.

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(ii) Flight crew members should achieve a thorough understanding of the equipment

used in RNP operations and any limitations on the use of the equipment during those

operations.

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(iii) Flight crew members should also know what navigation sensors form the basis for

their RNP AR APCH compliance, and they should be able to assess the impact of

failure of any avionics or a known loss of ground systems on the remainder of the

flight plan.

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(5) AFM information and operating procedures

(i) Based on the AFM or other aircraft eligibility evidence, the flight crew should address

normal and abnormal operating procedures, responses to failure alerts, and any

limitations, including related information on RNP modes of operation.

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(ii) Training should also address contingency procedures for loss or degradation of the

RNP AR APCH capability.

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(iii) The manuals used by the flight should contain this information.

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(6) MEL operating provisions

(i) Flight crew members should have a thorough understanding of the MEL entries

supporting RNP AR APCH operations.

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(c) Initial FSTD training

(1) In addition to ground training, flight crew members should receive appropriate practical skill

training in an FSTD.

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(i) Training programmes should cover the proper execution of RNP AR APCH operations

in compliance with the manufacturer’s documentation.

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(ii) The training should include:

(A) RNP AR APCH procedures and limitations;

(B) standardisation of the set-up of the cockpit’s electronic displays during an

RNP AR APCH operation;

(C) recognition of the aural advisories, alerts and other annunciations that can

impact on compliance with an RNP AR APCH procedure; and

(D) the timely and correct responses to loss of RNP AR APCH capability in a variety

of scenarios embracing the breadth of the RNP AR APCH procedures the

operator plans to complete.

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(2) FSTD training should address the following specific elements:

(i) procedures for verifying that each flight crew member’s altimeter has the current

setting before commencing the final approach of an RNP AR APCH operation,

including any operational limitations associated with the source(s) for the altimeter

setting and the latency of checking and setting the altimeters for landing;

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(ii) use of aircraft RADAR, TAWS or other avionics systems to support the flight crew’s

track monitoring and weather and obstacle avoidance;

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(iii) concise and complete flight crew briefings for all RNP AR APCH procedures and the

important role crew resource management (CRM) plays in successfully completing an

RNP AR APCH operation;

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(iv) the importance of aircraft configuration to ensure the aircraft maintains any

mandated speeds during RNP AR APCH operations;

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(v) the potentially detrimental effect of reducing the flap setting, reducing the bank

angle or increasing airspeeds may have on the ability to comply with an RNP AR APCH

operation;

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(vi) flight crew members understand and are capable of programming and/or operating

the FMC, autopilot, autothrottles, RADAR, GNSS, INS, EFIS (including the moving

map), and TAWS in support of RNP AR APCH operations;

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(vii) handling of TOGA to LNAV transition as applicable, particularly while in turn;

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(viii) monitoring of flight technical error (FTE) and related go-around operation;

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(ix) handling of loss of GNSS signals during a procedure;

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(x) handling of engine failure during the approach operation;

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(xi) applying contingency procedures for a loss of RNP capability during a missed

approach. Due to the lack of navigation guidance, the training should emphasise the

flight crew contingency actions that achieve separation from terrain and obstacles.

The operator should tailor these contingency procedures to their specific

RNP AR APCH procedures; and

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(xii) as a minimum, each flight crew member should complete two RNP approach

procedures for each duty position (pilot flying and pilot monitoring) that employ the

unique RNP AR APCH characteristics of the operator’s RNP AR APCH procedures (e.g.

RF legs, missed approach). One procedure should culminate in a transition to landing

and one procedure should culminate in execution of an RNP missed approach

procedure.

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FLIGHT CREW TRAINING AND QUALIFICATIONS — CONVERSION TRAINING

(d) Flight crew members should complete the following RNP AR APCH training if converting to a new

type or class or variant of aircraft in which RNP AR operations will be conducted. For abbreviated

courses, the provisions prescribed in (a)(2), (a)(3) and (a)(4) should apply.

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(1) Ground training

Taking into account the flight crew member's RNP AR APCH previous training and

experience, flight crew members should undertake an abbreviated ground training that

should include at least the provisions of (b)(2)(D) to (I), (b)((2)(N) to (R), (b)(2)(S), and (b)(3)

to (6).

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(2) FSTD training

The provisions prescribed in (a) should apply, taking into account the flight crew member's

RNP AR APCH training and experience.

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FLIGHT CREW TRAINING AND QUALIFICATIONS — RNP AR APCH PROCEDURES REQUIRING A

PROCEDURE-SPECIFIC APPROVAL

(e) Before starting an RNP AR APCH procedure for which a procedure-specific approval is required,

flight crew members should undertake additional ground training and FSTD training, as

appropriate.

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(1) The operator should ensure that the additional training programmes for such procedures

include as at least all of the following:

(i) the provisions of (c)(1), (c)(2)(x) as appropriate and customised to the intended

operation;

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(ii) the crew training recommendations and mitigations stated in the procedure flight

operational safety assessment (FOSA); and

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(iii) specific training and operational provision published in the AIP, where applicable.

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(2) Flight crew members with prior experience of RNP AR APCH procedures for which a

procedure-specific approval is required may receive credit for all or part of these provisions

provided the current operator’s RNP AR APCH procedures are similar and require no new

pilot skills to be trained in an FSTD.

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(3) Training and checking may be combined and conducted by the same person with regard to

(f)(2).

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(4) In case of a first RNP AR APCH application targeting directly RNP AR APCH procedures

requiring procedure-specific approvals, a combined initial and additional training and

checking, as appropriate, should be acceptable provided the training and checking includes

all provisions prescribed by (a), (b), (c), (d) as appropriate, (e) and (f).

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FLIGHT CREW TRAINING AND QUALIFICATIONS — CHECKING OF RNP AR APCH KNOWLEDGE

(f) Initial checking of RNP AR APCH knowledge and procedures

(1) The operator should check flight crew members’ knowledge of RNP AR APCH procedures

prior to employing RNP AR APCH operations. As a minimum, the check should include a

thorough review of flight crew procedures and specific aircraft performance requirements

for RNP AR APCH operations.

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(2) The initial check should include one of the following:

(i) A check by an examiner using an FSTD.

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(ii) A check by a TRE, CRE, SFE or a commander nominated by the operator during LPCs,

OPCs or line flights that incorporate RNP AR APCH operations that employ the unique

RNP AR APCH characteristics of the operator’s RNP AR APCH procedures.

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(iii) Line-oriented flight training (LOFT)/line-oriented evaluation (LOE). LOFT/LOE

programmes using an FSTD that incorporates RNP AR APCH operations that employ

the unique RNP AR APCH characteristics (i.e. RF legs, RNP missed approach) of the

operator’s RNP AR APCH procedures.

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(3) Specific elements that should be addressed are:

(i) demonstration of the use of any RNP AR APCH limits/minimums that may impact

various RNP AR APCH operations;

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(ii) demonstration of the application of radio-updating procedures, such as enabling and

disabling ground-based radio updating of the FMC (e.g. DME/DME and VOR/DME

updating) and knowledge of when to use this feature;

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(iii) demonstration of the ability to monitor the actual lateral and vertical flight paths

relative to programmed flight path and complete the appropriate flight crew

procedures when exceeding a lateral or vertical FTE limit;

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(iv) demonstration of the ability to read and adapt to a RAIM (or equivalent) forecast,

including forecasts predicting a lack of RAIM availability;

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(v) demonstration of the proper set-up of the FMC, the weather RADAR, TAWS, and

moving map for the various RNP AR APCH operations and scenarios the operator

plans to implement;

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(vi) demonstration of the use of flight crew briefings and checklists for RNP AR APCH

operations with emphasis on CRM;

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(vii) demonstration of knowledge of and ability to perform an RNP AR APCH missed

approach procedure in a variety of operational scenarios (i.e. loss of navigation or

failure to acquire visual conditions);

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(viii) demonstration of speed control during segments requiring speed restrictions to

ensure compliance with an RNP AR APCH procedure;

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(ix) demonstration of competent use of RNP AR APCH plates, briefing cards, and

checklists;

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(x) demonstration of the ability to complete a stable RNP AR APCH operation: bank

angle, speed control, and remaining on the procedure’s centreline; and

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(xi) knowledge of the operational limit for deviation from the desired flight path and of

how to accurately monitor the aircraft’s position relative to vertical flight path.

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FLIGHT CREW TRAINING AND QUALIFICATIONS — RECURRENT TRAINING

(g) The operator should incorporate recurrent training that employs the unique RNP AR APCH

characteristics of the operator’s RNP AR APCH procedures as part of the overall training

programme.

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(1) A minimum of two RNP AR APCH should be flown by each flight crew member, one for each

duty position (pilot flying and pilot monitoring), with one culminating in a landing and one

culminating in a missed approach, and may be substituted for any required 3D approach

operation.

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(2) In case of several procedure-specific RNP AR APCH approvals, the recurrent training should

focus on the most demanding RNP AR APCH procedures giving credit on the less demanding

ones.

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TRAINING FOR PERSONNEL INVOLVED IN THE FLIGHT PREPARATION

(h) The operator should ensure that training for flight operation officers/dispatchers should include:

(1) the different types of RNP AR APCH procedures;

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(2) the importance of specific navigation equipment and other equipment during RNP AR APCH

operations and related RNP AR APCH requirements and operating procedures;

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(3) the operator’s RNP AR APCH approvals;

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(4) MEL requirements;

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(5) aircraft performance, and navigation signal availability, e.g. GNSS RAIM/predictive RNP

capability tool, for destination and alternate aerodromes.

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**AMC1 SPA.PBN.105(c) PBN operational approval**

FLIGHT OPERATIONAL SAFETY ASSESSMENT (FOSA)

(a) For each RNP AR APCH procedure, the operator should conduct a flight operational safety

assessment (FOSA) proportionate to the complexity of the procedure.

(b) The FOSA should be based on:

(1) restrictions and recommendations published in AIPs;

(2) the flyability check;

(3) an assessment of the operational environment;

(4) the demonstrated navigation performance of the aircraft; and

(5) the operational aircraft performance.

(c) The operator may take credit from key elements from the safety assessment carried out by the

ANSP or the aerodrome operator.

**GM1 SPA.PBN.105(c) PBN operational approval**

FLIGHT OPERATIONAL SAFETY ASSESSMENT (FOSA)

(a) Traditionally, operational safety has been defined by a target level of safety (TLS) and specified as

a risk of collision of 10-7 per approach operation. For RNP AR APCH operations, conducting the

FOSA methodology contributes to achieving the TLS. The FOSA is intended to provide a level of

flight safety that is equivalent to the traditional TLS, but using methodology oriented to

performance-based flight operations. Using the FOSA, the operational safety objective is met by

considering more than the aircraft navigation system alone. The FOSA blends quantitative and

qualitative analyses and assessments by considering navigation systems, aircraft performance,

operating procedures, human factor aspects and the operational environment. During these

assessments conducted under normal and failure conditions, hazards, risks and the associated

mitigations are identified. The FOSA relies on the detailed criteria for the aircraft capabilities and

instrument procedure design to address the majority of general technical, procedure and process

factors. Additionally, technical and operational expertise and prior operator experience with

RNP AR APCH operations are essential elements to be considered in the conduct and conclusion of

the FOSA.

(b) The following aspects need to be considered during FOSA, in order to identify hazards, risks and

mitigations relevant to RNP AR APCH operations:

(1) Normal performance: lateral and vertical accuracy are addressed in the aircraft

airworthiness standards, aircraft and systems operate normally in standard configurations

and operating modes, and individual error components are monitored/truncated through

system design or flight crew procedure.

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(2) Performance under failure conditions: lateral and vertical accuracy are evaluated for aircraft

failures as part of the aircraft certification. Additionally, other rare-normal and abnormal

failures and conditions for ATC operations, flight crew procedures, infrastructure and

operating environment are assessed. Where the failure or condition results are not

acceptable for continued operation, mitigations are developed or limitations established for

the aircraft, flight crew and/or operation.

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(3) Aircraft failures

(i) System failure: Failure of a navigation system, flight guidance system, flight

instrument system for the approach, or missed approach (e.g. loss of GNSS updating,

receiver failure, autopilot disconnect, FMS failure, etc.). Depending on the aircraft,

this may be addressed through aircraft design or operating procedure to cross-check

guidance (e.g. dual equipage for lateral errors, use of terrain awareness and warning

system).

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(ii) Malfunction of air data system or altimetry: flight crew procedure cross-check

between two independent systems may mitigate this risk.

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(4) Aircraft performance

(i) Inadequate performance to conduct the approach operation: the aircraft capabilities

and operating procedures ensure that the performance is adequate on each

approach, as part of flight planning and in order to begin or continue the approach.

Consideration should be given to aircraft configuration during approach and any

configuration changes associated with a missed approach operation (e.g. engine

failure, flap retraction, re-engagement of autopilot in LNAV mode).

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(ii) Loss of engine: loss of an engine while on an RNP AR APCH operation is a rare

occurrence due to high engine reliability and the short exposure time. The operator

needs to take appropriate action to mitigate the effects of loss of engine, initiating a

go-around and manually taking control of the aircraft if necessary.

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(5) Navigation services

(i) Use of a navigation aid outside of designated coverage or in test mode: aircraft

airworthiness standards and operating procedures have been developed to address

this risk.

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(ii) Navigation database errors: instrument approach procedures are validated through

flight validation specific to the operator and aircraft, and the operator should have a

process defined to maintain validated data through updates to the navigation

database.

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(6) ATC operations

(i) Procedure assigned to non-approved aircraft: flight crew are responsible for rejecting

the clearance.

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(ii) ATC provides ‘direct to’ clearance to or vectors aircraft onto approach such that

performance cannot be achieved.

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(iii) Inconsistent ATC phraseology between controller and flight crew.

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(7) Flight crew operations

(i) Erroneous barometric altimeter setting: flight crew entry and cross-check procedures

may mitigate this risk.

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(ii) Incorrect procedure selection or loading: flight crew procedures should be available

to verify that the loaded procedure matches the published procedure, line of minima

and aircraft airworthiness qualification.

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(iii) Incorrect flight control mode selected: training on importance of flight control mode,

flight crew procedure to verify selection of correct flight control mode.

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(iv) Incorrect RNP entry: flight crew procedure to verify RNP loaded in system matches

the published value.

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(v) Missed approach: balked landing or rejected landing at or below DA/H.

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(vi) Poor meteorological conditions: loss or significant reduction of visual reference that

may result in a go-around.

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(8) Infrastructure

(i) GNSS satellite failure: this condition is evaluated during aircraft qualification to

ensure obstacle clearance can be maintained, considering the low likelihood of this

failure occurring.

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(ii) Loss of GNSS signals: relevant independent equipage, e.g. IRS/INS, is mandated for

RNP AR APCH procedures with RF legs and approaches where the accuracy for the

missed approach is less than 1 NM. For other approaches, operating procedures are

used to approximate the published track and climb above obstacles.

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(iii) Testing of ground navigation aids in the vicinity of the approach: aircraft and

operating procedures should detect and mitigate this event.

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(9) Operating conditions

(i) Tailwind conditions: excessive speed on RF legs may result in inability to maintain

track. This is addressed through aircraft airworthiness standards on the limits of

command guidance, inclusion of 5 degrees of bank manoeuvrability margin,

consideration of speed effect and flight crew procedure to maintain speeds below

the maximum authorised for the RNP AR APCH procedure.

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(ii) Wind conditions and effect on FTE: nominal FTE is evaluated under a variety of wind

conditions, and flight crew procedures to monitor and limit deviations to ensure safe

operation.

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(iii) Extreme temperature effects of barometric altitude (e.g. extreme cold temperatures,

known local atmospheric or weather phenomena, high winds, severe turbulence,

etc.): the effect of this error on the vertical path is mitigated through the procedure

design and flight crew procedures, with an allowance for aircraft that compensate for

this effect to conduct procedures regardless of the published temperature limit. The

effect of this error on minimum segment altitudes and the DA/H are addressed in an

equivalent manner to all other approach operations.

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**AMC1 SPA.PBN.105(d) PBN operational approval**

OPERATIONAL CONSIDERATIONS FOR RNP AR APCH

(a) MEL

(1) The operator’s MEL should be developed/revised to address the equipment provisions for

RNP AR APCH operations.

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(2) An operational TAWS Class A should be available for all RNP AR APCH operations. The TAWS

should use altitude values that are compensated for local pressure and temperature effects

(e.g. corrected barometric and GNSS altitude), and include significant terrain and obstacle

data.

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(b) Autopilot and flight director

(1) For RNP AR APCH operations with RNP values less than RNP 0.3 or with RF legs, the

autopilot or flight director driven by the area navigation system should be used. Thus, the

flight crew should check that the autopilot/flight director is installed and operational.

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(c) Preflight RNP assessment

(1) The operator should have a predictive performance capability, which can determine if the

specified RNP will be available at the time and location of a desired RNP operation. This

capability can be a ground service and need not be resident in the aircraft’s avionics

equipment. The operator should establish procedures requiring use of this capability as

both a preflight preparation tool and as a flight-following tool in the event of reported

failures.

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(2) This predictive capability should account for known and predicted outages of GNSS

satellites or other impacts on the navigation system’s sensors. The prediction programme

should not use a mask angle below 5 degrees, as operational experience indicates that

satellite signals at low elevations are not reliable. The prediction should use the actual GNSS

constellation with the RAIM (or equivalent) algorithm identical to or more conservative

than that used in the actual equipment.

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(3) The RNP assessment should consider the specific combination of the aircraft capability

(sensors and integration), as well as their availability.

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(d) NAVAID exclusion

(1) The operator should establish procedures to exclude NAVAID facilities in accordance with

NOTAMs (e.g. DMEs, VORs, localisers). Internal avionics reasonableness checks may not be

adequate for RNP operations.

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(e) Navigation database currency

(1) During system initialisation, the flight crew should confirm that the navigation database is

current. Navigation databases should be current for the duration of the flight. If the AIRAC

cycle is due to change during flight, the flight crew should follow procedures established by

the operator to ensure the accuracy of navigation data.

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(2) The operator should not allow the flight crew to use an expired database.

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**AMC2 SPA.PBN.105(d) PBN operational approval**

FLIGHT CONSIDERATIONS

(a) Modification of flight plan

The flight crew should not be authorised to fly a published RNP AR APCH procedure unless it is

retrievable by the procedure name from the aircraft navigation database and conforms to the

charted procedure. The lateral path should not be modified; with the exception of accepting a

clearance to go direct to a fix in the approach procedure that is before the FAF and that does not

immediately precede an RF leg. The only other acceptable modification to the loaded procedure is

to change altitude and/or airspeed waypoint constraints on the initial, intermediate, or missed

approach segments flight plan fixes (e.g. to apply temperature corrections or comply with an ATC

clearance/instruction).

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(b) Mandatory equipment

The flight crew should have either a mandatory list of equipment for conducting RNP AR APCH

operations or alternate methods to address in-flight equipment failures that would prohibit

RNP AR APCH operations (e.g. crew warning systems, quick reference handbook).

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(c) RNP management

Operating procedures should ensure that the navigation system uses the appropriate RNP values

throughout the approach operation. If the navigation system does not extract and set the

navigation accuracy from the on-board navigation database for each segment of the procedure,

then operating procedures should ensure that the smallest navigation accuracy required to

complete the approach or the missed approach is selected before initiating the approach

operation (e.g. before the IAF). Different IAFs may have different navigation accuracy, which are

annotated on the approach chart.

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(d) Loss of RNP

The flight crew should ensure that no loss of RNP annunciation is received prior to commencing

the RNP AR APCH operation. During the approach operation, if at any time a loss of RNP

annunciation is received, the flight crew should abandon the RNP AR APCH operation unless the

pilot has in sight the visual references required to continue the approach operation.

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(e) Radio updating

Initiation of all RNP AR APCH procedures is based on GNSS updating. The flight crew should

comply with the operator’s procedures for inhibiting specific facilities.

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(f) Approach procedure confirmation

The flight crew should confirm that the correct procedure has been selected. This process includes

confirmation of the waypoint sequence, reasonableness of track angles and distances, and any

other parameters that can be altered by the flight crew, such as altitude or speed constraints. A

navigation system textual display or navigation map display should be used.

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(g) Track deviation monitoring

(1) The flight crew should use a lateral deviation indicator, flight director and/or autopilot in

lateral navigation mode on RNP AR APCH operations. The flight crew of an aircraft with a

lateral deviation indicator should ensure that lateral deviation indicator scaling (full-scale

deflection) is suitable for the navigation accuracy associated with the various segments of

the RNP AR APCH procedure. The flight crew is expected to maintain procedure centrelines,

as depicted by on-board lateral deviation indicators and/or flight guidance during the entire

RNP AR APCH operations unless authorised to deviate by ATC or demanded under

emergency conditions. For normal operations, cross-track error/deviation (the difference

between the area-navigation-system-computed path and the aircraft position relative to

the path) should be limited to the navigation accuracy (RNP) associated with the procedure

segment.

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(2) Vertical deviation should be monitored above and below the glide-path; the vertical

deviation should be within ±75 ft of the glide-path during the final approach segment.

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(3) Flight crew should execute a missed approach operation if:

(i) the lateral deviation exceeds one time the RNP value; or

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(ii) the deviation below the vertical path exceeds 75 ft or half-scale deflection where

angular deviation is indicated, at any time; or

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(iii) the deviation above the vertical path exceeds 75 ft or half-scale deflection where

angular deviation is indicated; at or below 1 000 ft above aerodrome level;

unless the pilot has in sight the visual references required to continue the approach

operation.

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(4) Where a moving map, low-resolution vertical deviation indicator (VDI), or numeric display

of deviations are to be used, flight crew training and procedures should ensure the

effectiveness of these displays. Typically, this involves demonstration of the procedure with

a number of trained flight crew members and inclusion of this monitoring procedure in the

recurrent RNP AR APCH training programme.

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(5) For installations that use a CDI for lateral path tracking, the AFM should state which

navigation accuracy and operations the aircraft supports and the operational effects on the

CDI scale. The flight crew should know the CDI full-scale deflection value. The avionics may

automatically set the CDI scale (dependent on phase of flight) or the flight crew may

manually set the scale. If the flight crew manually selects the CDI scale, the operator should

have procedures and training in place to assure the selected CDI scale is appropriate for the

intended RNP operation. The deviation limit should be readily apparent given the scale (e.g.

full-scale deflection).

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(h) System cross-check

(1) The flight crew should ensure the lateral and vertical guidance provided by the navigation

system is consistent.

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(i) Procedures with RF legs

(1) When initiating a missed approach operation during or shortly after the RF leg, the flight

crew should be aware of the importance of maintaining the published path as closely as

possible. Operating procedures should be provided for aircraft that do not stay in LNAV

when a missed approach is initiated to ensure the RNP AR APCH ground track is maintained.

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(2) The flight crew should not exceed the maximum airspeed values shown in Table 1

throughout the RF leg. For example, a Category C A320 should slow to 160 KIAS at the FAF

or may fly as fast as 185 KIAS if using Category D minima. A missed approach operation

prior to DA/H may require compliance with speed limitation for that segment.

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(j) Temperature compensation

For aircraft with temperature compensation capabilities, the flight crew may disregard the

temperature limits on RNP procedures if the operator provides pilot training on the use of the

temperature compensation function. It should be noted that a temperature compensation by the

system is applicable to the VNAV guidance and is not a substitute for the flight crew compensating

for temperature effects on minimum altitudes or DA/H. The flight crew should be familiar with the

effects of the temperature compensation on intercepting the compensated path as described in

EUROCAE ED-75C/RTCA DO-236C Appendix H.

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(k) Altimeter setting

Due to the performance-based obstruction clearance inherent in RNP instrument procedures, the

flight crew should verify that the most current aerodrome altimeter is set prior to the FAF. The

operator should take precautions to switch altimeter settings at appropriate times or locations

and request a current altimeter setting if the reported setting may not be recent, particularly at

times when pressure is reported or expected to be rapidly decreasing. Execution of an RNP

operation necessitates the current altimeter setting for the aerodrome of intended landing.

Remote altimeter settings should not be allowed.

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(l) Altimeter cross-check

(1) The flight crew should complete an altimetry cross-check ensuring both pilots’ altimeters

agree within 100 ft prior to the FAF but no earlier than when the altimeters are set for the

aerodrome of intended landing. If the altimetry cross-check fails, then the approach

operation should not be continued.

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(2) This operational cross-check should not be necessary if the aircraft systems automatically

compare the altitudes to within 75 ft.

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(m) Missed approach operation

Where possible, the missed approach operation should necessitate RNP 1.0. The missed approach

portion of these procedures should be similar to a missed approach of an RNP APCH procedure.

Where necessary, navigation accuracy less than RNP 1.0 may be used in the missed approach

segment.

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(1) In many aircraft, executing a missed approach activating take-off/go-around (TOGA) may

cause a change in lateral navigation. In many aircraft, activating TOGA disengages the

autopilot and flight director from LNAV guidance, and the flight director reverts to trackhold

derived from the inertial system. LNAV guidance to the autopilot and flight director

should be re-engaged as quickly as possible.

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(2) Flight crew procedures and training should address the impact on navigation capability and

flight guidance if the pilot initiates a missed approach while the aircraft is in a turn. When

initiating an early missed approach operation, the flight crew should follow the rest of the

approach track and missed approach track unless a different clearance has been issued by

ATC. The flight crew should also be aware that RF legs are designed based on the maximum

true airspeed at normal altitudes, and initiating an early missed approach operation will

reduce the manoeuvrability margin and potentially even make holding the turn impractical

at missed approach speeds.

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(n) Contingency procedures

(1) Failure while en route

The flight crew should be able to assess the impact of GNSS equipment failure on the

anticipated RNP AR APCH operation and take appropriate action.

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(2) Failure on approach

The operator’s contingency procedures should address at least the following conditions:

(i) failure of the area navigation system components, including those affecting lateral

and vertical deviation performance (e.g. failures of a GPS sensor, the flight director or

autopilot);

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(ii) loss of navigation signal-in-space (loss or degradation of external signal).

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**AMC3 SPA.PBN.105(d) PBN operational approval**

NAVIGATION DATABASE MANAGEMENT

(a) The operator should validate every RNP AR APCH procedure before using the procedure in

instrument meteorological conditions (IMC) to ensure compatibility with their aircraft and to

ensure the resulting path matches the published procedure. As a minimum, the operator should:

(1) compare the navigation data for the procedure(s) to be loaded into the FMS with the

published procedure.

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(2) validate the loaded navigation data for the procedure, either in an FSTD or in the actual

aircraft in VMC. The depicted procedure on the map display should be compared to the

published procedure. The entire procedure should be flown to ensure the path is flyable,

does not have any apparent lateral or vertical path disconnects and is consistent with the

published procedure.

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(3) Once the procedure is validated, a copy of the validated navigation data should be retained

for comparison with subsequent data updates.

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(4) For published procedures, where FOSA demonstrated that the procedure is not in a

challenging operational environment, the flight or FSTD validation may be credited from

already validated equivalent RNP AR APCH procedures.

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(b) If an aircraft system required for RNP AR APCH operations is modified, the operator should assess

the need for a validation of the RNP AR APCH procedures with the navigation database and the

modified system. This may be accomplished without any direct evaluation if the manufacturer

verifies that the modification has no effect on the navigation database or path computation. If no

such assurance from the manufacturer is available, the operator should conduct initial data

validation with the modified system.

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(c) The operator should implement procedures that ensure timely distribution and insertion of

current and unaltered electronic navigation data to all aircraft that require it.

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**AMC1 SPA.PBN.105(e) PBN operational approval**

REPORTABLE EVENTS

The operator should report events which are listed in AMC2 ORO.GEN.160.

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**AMC1 SPA.PBN.105(f) PBN operational approval**

RNP MONITORING PROGRAMME

(a) The operator approved to conduct RNP AR APCH operations, should have an RNP monitoring

programme to ensure continued compliance with applicable rules and to identify any negative

trends in performance.

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(b) During an interim approval period, which should be at least 90 days, the operator should at least

submit the following information every 30 days to the competent authority.

(1) Total number of RNP AR APCH operations conducted;

(2) Number of approach operations by aircraft/system which were completed as planned

without any navigation or guidance system anomalies;

(3) Reasons for unsatisfactory approaches, such as:

(i) UNABLE REQ NAV PERF, NAV ACCUR DOWNGRAD, or other RNP messages during

approaches;

(ii) excessive lateral or vertical deviation;

(iii) TAWS warning;

(iv) autopilot system disconnect;

(v) navigation data errors; or

(vi) flight crew reports of any anomaly;

(4) Flight crew comments.

(c) Thereafter, the operator should continue to collect and periodically review this data to identify

potential safety concerns, and maintain summaries of this data.

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**-END-**