European Aviation Safety Agency — Rulemaking Directorate

Notice of Proposed Amendment (NPA) 2013-25

Revision of operational approval criteria for performance-based navigation (PBN)

RMT.0256 & RMT.0257 (MDM.062(A) & (B)) — 20.12.2013

Executive Summary

This NPA addresses an economic issue related to the administrative burden caused by specific approval (SPA) procedures for performance-based navigation (PBN), which, according to Commission Regulation (EU) No 965/2012, will be progressively applicable not only to commercial air transport (CAT) operators, but also to non-commercial operators of complex (NCC) or other than complex motor-powered (NCO) aircraft, as well as to aerial work operators (SPO).

Area Navigation (RNAV) was in fact developed in the 1960s in the USA to give aviators more flexibility in deciding their horizontal path (i.e. no longer obliged to overfly ground beacons). In time, new RNAV or required navigation performance (RNP) applications were added. The Agency is aware that requesting and obtaining a SPA for each PBN application constitutes an additional administrative task especially for non-commercial operators, but also for competent authorities.

This rulemaking task is hence necessary to review the obligation for SPA for all existing PBN applications and, where appropriate, to amend the requirement. Pilot training for instrument rating (IR) needs to be revised in parallel, since the administrative simplification shall have no adverse effect on safety.

This NPA takes into account edition 4 (2013) of the ICAO Manual on performance-based navigation (Doc 9613) to pursue the following specific objectives:

a) to develop rules on pilot training and checking requirements, which are an essential pre-requisite to remove the requirement for SPA for some PBN operations;

b) to reassess the need for a specific operational approval for each PBN operation for CAT, SPO, NCC, and NCO operators; and

c) to take into account the introduction of RNP 2, Advanced-RNP and RNP 0.3 in ICAO Doc 9613 edition 4 and the consequent possibility of 'bundling' approvals.

This NPA proposes amendments to Commission Regulations (EU) Nos 1178/2011 (Part FCL), 290/2012 (Part ARA and ORA) and 965/2012 (AIR-OPS) and related AMC/GM, and amendments to CS-FSTD(A) and (H) and to a number of AMC 20-XX related to PBN. The proposed changes are expected to maintain safety while reducing the regulatory burden, also for oversight by competent authorities.

Applicability		**Process map**	
Affected regulations and decisions:	Commission Regulation (EU) No 1178/2011 (Part FCL) and Commission Regulation (EU) No 290/2012 (Part ARA and ORA) Commission Regulation (EU) No 965/2012 (Annex I – Definition, Part ARO, ORO, CAT, SPA) Commission Regulation (EU) No 800/2013 (Annex VI Part NCC, Annex VII Part NCO); Opinion No 02/2012 on Annex VIII Part SPO and related AMC/GM CS-FSTD(A) and (H) AMC 20-4, -5, -12, -26, -27 and -28	Concept Paper: Terms of Reference: Rulemaking group: RIA type: Technical consultation during NPA drafting: Duration of NPA consultation: Review group: Focused consultation: Publication date of the Opinion (simultaneously with CRD): Publication date of the Decision:	No Issue 2 of 8 July 2013 Yes Light No 3 months Yes Depending on the comments received on the NPA 2015/Q1 2016/Q1
Affected stakeholders:	Commercial and non-commercial aircraft operators, pilots, ATO Original Equipment Manufacturers (OEM) and Flight Synthetic Traning Devices (FSTD)		
Driver/origin:	Level playing field		
Reference:	Annex V (Part SPA) to Commission Regulation (EU) No 965/2012		

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1 Procedural information

1.1 The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this Notice of Proposed Amendment (NPA) in line with Regulation (EC) 216/2008[1] (referred below as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the Agency's Rulemaking Programme 2012-15 under RMT.0256 and RMT.0257 (former task number MDM.062 a) and b)).

The text of this NPA has been developed by the Agency based on the input of a specific Rulemaking Group for the two mentioned RMTs. It is hereby submitted for consultation of all interested parties[3].

The process map on the title page contains the major milestones of this rulemaking activity to date and provides an outlook of the timescale of the next steps.

1.2 The structure of this NPA and related documents

Chapter 1 of this NPA contains the procedural information related to this task.

Chapter 2 (Explanatory Note) explains the technical content.

Chapter 3 contains the proposed text to amend:

— Commission Regulation (EU) No 1178/2011 (Part FCL) and related AMC/GM;

— Commission Regulation (EU) No 290/2012 (Part ARA and Part ORA) and related AMC/GM;

— Commission Regulation (EU) No 965/2012 (AIR-OPS: Annex I – Definitions, Part ARO, Part ORO, Part CAT and Part SPA) and related AMC/GM;

— Part NCC and Part NCO, whose text was published in Opinion 01/2012 and related AMC/GM;

— Part SPO, whose text was published in Opinion 02/2012 and related AMC/GM;

— CS-FSTD(A) and (H); and

— AMC 20-4, AMC 20-5, AMC 20-12, AMC 20-26, AMC 20-27 and AMC 20-28.

Chapter 4 contains the Regulatory Impact Assessment showing which options were compared for each of the seven issues considered and what impacts were identified, thereby providing the detailed justification for this NPA.

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[1] Regulation (EC) No 216/2008 of the European Parliament and the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1), as last amended by Commission Regulation (EU) No 6/2013 of 8 January 2013 (OJ L 4, 9.1.2013, p. 34).

[2] The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See Management Board Decision concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material (Rulemaking Procedure), AGENCY MB Decision No 01-2012 of 13 March 2012.

[3] In accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

1.3 How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.Agency.europa.eu/crt/**[4].

The deadline for submission of comments is **20 March 2014.**

1.4 The next steps in the procedure

Following the closing of the NPA public consultation period, the Agency will review all received comments, supported by a Review Group.

The outcome of the NPA public consultation will be reflected in the Comment-Response Document (CRD).

The Agency will publish the CRD simultaneously with the Opinion containing proposed changes to the EU regulations listed in paragraph 1.2. The Opinion is addressed to the European Commission, which uses it as a technical basis to prepare proposals to amend the affected Commission Regulations.

The Decision containing amendments to the Certification Specification (CS), Acceptable Means of Compliance (AMC) and Guidance Material (GM) will be published by the Agency when the Implementing Rule(s) are adopted by the Commission.

[4] In case of technical problems, please contact the CRT webmaster (crt@Agency.europa.eu).

2 Explanatory Note

2.1 Overview of issues to be addressed

Pilots holding an instrument rating (and where necessary a type rating) have the privilege to fly an aircraft under Instrument Flight Rules (IFR). This means that they may use Air Traffic Services (ATS) routes following a series of VHF Omni-Range (VOR) stations or fly Non-Precision Approaches (NPA) supported by Non-Directional Beacons (NDB), or something similar, if not more complex (or with minima lower than 200 ft) than ILS Category I.

This general principle is part of FCL.605 Implementing Rules in Commission Regulation (EU) No 1178/2011[5].

The privilege is based on several underlying assumptions, including that the aircraft and its navigation avionics have an airworthiness approval covering the type of envisaged IFR operations and that pilots have appropriate training and checking standards and procedures.

In the case of emerging 'new' concepts of operations (such as PBN) or new navigation systems, one or more of the mentioned assumptions may not be substantiated. In such a case during the last four decades, it has become customary for the operator to apply for a 'specific approval' (SPA) with the competent authority before flying these operations.

Following this principle, AIR-OPS Regulation[6] requires a SPA for the commercial and non-commercial operators wishing to fly PBN (except for Basic-RNAV alias RNAV 5).

This provision raised concerns related to the perceived huge economic and administrative burden of Part SPA on general aviation, compared with the maturity already reached by PBN, in particular by basic GNSS approach operations, which, except for specific cases, are not more complex than ILS CAT I (for which no SPA is required).

The subsequent debate showed that, since the Basic Regulation puts all the actors involved in PBN under oversight (e.g. from the EGNOS Service Provider to providers of digital data for navigation), the major remaining gap was the lack of common requirements (at EU level) for pilot training and periodic checking in relation to PBN.

For a more detailed analysis of the issues addressed by this proposal, please refer to the RIA in section 4.1 'Issues to be addressed'.

2.2 Objectives

The overall objectives of the Agency system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the overall objectives by addressing the issues outlined in Section 2 of this NPA.

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[5] Annex I (Part-FCL) to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011) as last amended by Commission Regulation (EU) No 290/2012 of 30/03/2012 (OJ L 100, 5.4.2012, p.1-56).

[6] Annex V (Part-SPA) to Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L296, 25 October 2012, page 1) as last amended by Commission Regulation (EU) No 800/2013 of 14/08/2013 (OJ L 227, 24.8.2013, p. 1-74).

The specific objectives of this proposal are to:

(a) establish safe and cost-efficient pilot training and checking requirements to remove the need of SPA for some PBN operation;

(b) reduce the number of cases in which an operational approval for PBN operation is required for CAT, SPO, NCC, and NCO operators; and

(c) take into account the introduction of RNP 2, Advanced-RNP and RNP 0.3 in the fourth edition of the ICAO PBN Manual and the consequent possibility of 'bundling' approvals to implement these safe and cost-efficient ATM procedures.

2.3 Interfaces

The following topics are out of scope of this NPA:

(a) any provision on mandatory carriage on-board and mandatory implementation by Air Navigation Service Providers (ANSP) of a given PBN application in any portion of EU airspace. This is covered by the PBN mandate issued by EC to EUROCONTROL in the frame of the 'Single European Sky' (SES);

(b) any possible rule on the performance of airborne navigation system, since this is covered by RMT.0520 (CS-ACNS);

(c) transposition of the airworthiness aspects from JAA TGL 10, since this is encompassed by the mentioned CS-ACNS under development;

(d) any amendment to AMC 20-XX related to airworthiness aspects, since this is covered by either RMT.0520 or RMT.0561;

(e) development of the Flight Examiner Manual (FEM) currently progressed through RMT.0189 (FCL.002(b));

(f) any rule on design of ATS routes or instrument procedures based on ICAO PANS-OPS, since covered by RMT.0445 and RMT.0446;

(g) any possible rule on provision of digital data for navigation since this is covered by RMT.0593 and RMT.0594, including possible alleviation of the obligation, currently put on operators (i.e. CAT.IDE.A.355 and CAT.IDE.A.355), to monitor the compliance of third party data providers;

(h) any detailed rule related to RNP 0.3 (helicopters), not yet sufficiently mature when drafting this NPA, but possibly covered by a future RMT;

(i) Further amendments concerning the new ICAO taxonomy for instrument approaches (i.e. 2D or 3D) which are expected to be introduced through RMT.0379 and RMT.0380 (Low Visibility Operations).

2.4 Summary of the Regulatory Impact Assessment (RIA)

To remove the obligation of obtaining a SPA before flying PBN applications, the instrument rated (IR) pilots must be properly trained and checked. Consequently, several interconnected issues emerge in the OPS and FCL domains.

The RIA (Chapter 4) presents a series of five cascading aspects:

(1) for which PBN applications ('what'?) is possible to safely remove the administrative SPA procedure?

(2) alleviation of the administrative burden represented by SPA for both operators and competent authorities balanced by other mitigations ('how');

(3) amending of the IR rules for 'new' pilots not yet rated for IFR;

(4) transition for 'old' pilots already holding a valid Instrument Rating (IR); and

(5) transition for the approved training organisations (ATO), for flight instructors (FI) and for flight examiners (FE).

The RIA concludes that removing the obligation for SPA is possible only for a number of selected PBN applications; however, this means that to maintain safety, PBN elements should be included into pilot training and checking for IR.

Furthermore, the RIA recommends transition for already rated pilots, ATO, instructors and examiners based on the periodic cycle of checks, audits or seminars, already established by current rules.

To include PBN aspects into the next check, audit or seminar, two new articles are necessary in Commission Regulation (EU) No 1178/2011 to govern the transition.

In the medium term, monitoring the number of Controlled Flight Into Terrain (CFIT) accidents in Europe and the number of published RNP-APCH procedures could give an indication of the effectiveness of the proposed rules.

2.5 Overview of the affected provisions and proposed amendments

2.5.1 Commission Regulation (EU) No 1178/2011

The following paragraphs of this Explanatory Note clarify why and how the theoretical knowledge (TK), learning objectives (LOs) and the content of the skill test for instrument rating are proposed to change.

The principle constantly applied by safety regulators, including the Agency, is that whenever rules are modernised to follow the state-of-the-art, existing licences, approvals and certificates are 'grand-fathered', i.e. they do not immediately lose validity.

However, the question on how to check that pilots already rated reach a sufficient TK even in respect of PBN needs to be addressed.

The fourth edition of ICAO PBN Manual (Doc 9613) does not recommend any specific training for general aviation pilots. In the case of CAT operators, this Manual requires training, but under operator's responsibility and not as part of the rules on flight crew licensing. However, this is based on the assumption that pilot training is verified by the competent authority before granting the SPA for PBN. If the obligation for SPA is removed, this assumption is no longer valid.

The scope of the changes proposed in paragraph 2.5.3 for LOs is very limited, since it concerns only one added subtopic and three dropped ones. This represents a change of 2 % of the whole LOs catalogue.

Furthermore, PBN is not new in principle because Basic-RNAV, belonging to the PBN family, was already introduced in the en-route European airspace about 15 years ago. In other words, the LOs were revised and modernised to better reflect the advancement of the state of the art on PBN and the related semantics, but the existing concepts were not drastically changed.

In conclusion, while amendment at the AMC level is necessary, the current CPL, ATPL and IR could remain valid once the amendments proposed by this NPA to Commission Regulation (EU) No 1178/2011 would become applicable (i.e. 'grand-fathering' principle applied once more).

However, for safety reasons, all currently rated pilots must be checked to demonstrate TK and practical skill at the earliest possible opportunity. Existing rule FCL.625 IR limits the validity of the IR to one year, after which a proficiency check is necessary.

A new Article 4a containing a transition rule is hence needed in the cover Commission Regulation (EU) No 1178/2011. This transition, to be achieved in conjunction with the next proficiency check, could be based, for aeroplane and helicopter pilots, on:

(a) Theoretical knowledge:

- PBN module (e.g. by distance learning, not more than 1 day); or
- evidence of equivalent training by operator (ref. ORO.FC);

(b) Flight:

- evidence of previous training under former national regulations to conduct RNP APCH; or
- conduct of PBN operations (6 RNP APCH) before first proficiency check after the amendments to Commission Regulation (EU) No 1178/2011 apply; or
- session of PBN training with the examiner at the end of the first proficiency check, with content to be determined by the examiner according to the competence of the applicant.

Similar rules exist for the revalidation of flight instructor and examiner certificates. Proposed new Article 4a should also cover these two certificates and establish proper deadlines.

Up to the introduction of this regulation, pilots may have different levels of experience of PBN operations, and in many cases they will have been using it routinely in day-to-day operations. Thus the key mechanism for ensuring competence of pilots in PBN operations will be the regular proficiency check required for all instrument rated pilots. In order to be assured of passing the proficiency check, it is anticipated that most pilots will elect to undertake relevant training.

It is recognised that checking and training fulfil different roles in the assurance of pilot competence and therefore training should not be ignored. In accordance with the option selected in the RIA, it is proposed that pilots holding an IR at some appropriate time after the entry into force of this regulation should have completed a proportionate course of theoretical knowledge appropriate to PBN operations, and either have experience of PBN flight operations or have completed some flight instruction. For the flight aspects of pilot competence, it is considered that RNP APCH operations are the most demanding aspects and incorporate the important aspects of manoeuvres conducted in other PBN operations, and therefore RNP APCH is used as the benchmark.

However, given the variation of pilot competence and experience of PBN, it is highly undesirable that pilots are required to spend time and resource on training courses that teach them what they already know, particularly for flight operations. Non-commercial pilots of non-complex motor powered aircraft, who in general take responsibility for their own on-going competence without being subject to recurrent training requirements of Part ORO.FC, interact with flight training through the annual proficiency check, which is conducted by an examiner who must also be an instructor. Thus the most efficient mechanism for any flight training required is at or around the time of the proficiency check.

Taking these into account, for administrative simplicity, it is easiest if the training requirement is checked by an examiner at a proficiency check after the date of applicability of the proposed amendment to Commission Regulation (EU) No 1178/2011, and:

(a) The theoretical knowledge training requirement is satisfied if:

(1) the pilot has undergone their initial ATPL or IR TK course after the learning objectives have been amended by this regulation; or

(2) the pilot has taken, for example by distance learning, a TK module on PBN concepts not covered in their original ATPL or IR TK;

(3) the pilot has covered PBN in recurrent training in the context of a commercial operator's programme or similar.

(b) The flight training requirement is:

(1) already satisfied if the pilot has undergone initial ATPL or IR flight training after the syllabus has been amended by this regulation;

(2) already satisfied by training conducted under national rules before the introduction of EU rules on air operations;

(3) considered unnecessary if the pilot has already been conducting RNP APCH operations in normal operations;

(4) satisfied by a short additional session of flight training conducted by the examiner at the time of a proficiency check, typically prepended or appended to the proficiency check and aimed at filling any significant gaps that are not covered by the one or two RNP APCH on the proficiency check itself.

2.5.2 Commission Regulation (EU) No 290/2012

Commission Regulation (EU) No 290/2012[7] amended Commission Regulation (EU) No 1178/2011 in particular by introducing Annex VI (Part ARA) on authority requirements related to crew licences and Annex VII (Part ORA) for organisations involved in the same domain: i.e. Approved Training Organisations (ATO) and Aeromedical Centres (AeMC).

No amendments are deemed necessary to said Annexes VI and VII, introduced by Commission Regulation (EU) No 290/2012 into Commission Regulation (EU) No 1178/2011.

However, since ATO offering training for CPL, IR and ATPL would also need to amend their respective courses to include PBN aspects, a new Article 4b is proposed in the cover Commission Regulation (EU) No 1178/2011 to mandate ATO to update their respective training programmes not later than 25 August 2016, which is the same date for the end of the derogation period for Part NCC and Part NCO.

[7] Commission Regulation (EU) No 290/2012 of 30/03/2012 amending Regulation (EU) No 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council. (OJ L 100, 5.4.2012, p.1-56).

2.5.3 Annex I to Commission Regulation (EU) No 1178/2011 (Part FCL)

2.5.3.1 New definitions (FCL.010)

The introduction of PBN leads to using new terms, most of which are listed in the fourth edition of ICAO PBN Manual (Doc 9613). Furthermore, amendment 37-B[8] to Part I of Annex 6 to the Chicago Convention has drastically changed the taxonomy of instrument approaches now based on the distinction between 2D (i.e. instrument guidance only in the horizontal plane) and 3D (i.e. providing also vertical guidance) operations.

Article 2.2(d) of the Basic Regulation mandates to duly take into account ICAO provisions when establishing implementing rules. It is hence necessary to introduce new definitions in FCL.010 for:

- Two-dimensional (2D) instrument approach operation;
- Three-dimensional (3D) instrument approach operation;
- Localizer Performance with Vertical Guidance (LPV);
- Lateral Navigation (LNAV);
- Vertical Navigation (LNAV/VNAV);
- Performance-based Navigation (PBN);
- RNP approach (APCH);
- approach operations requiring specific approval (RNP AR APCH), which implies that a SPA is not always required prior to flying PBN approaches;
- Satellite Based Augmentation System (SBAS).

The already existing definitions in FCL.010 are not affected.

2.5.3.2 Theoretical knowledge requirements (FCL.310, FCL.515(b) and FCL.615(b))

Rules FCL.310, FCL.515(b) and FCL.615(b) contain requirements for the theoretical knowledge (TK) to be demonstrated by applicants, respectively for Commercial Pilot License (CPL), Airline Transport Pilot License (ATPL) and Instrument Rating (IR). All the three rules contain a very high level and generic list of topics on which the TK shall be demonstrated. The list includes 'radio navigation'. This expression can be referred to 'traditional' instrument navigation (i.e. overflying beacons) or to PBN.

Consequently, there is no need to change such rules, but only the detailed learning objectives (LO) at the AMC level (see paragraph 2.5.4 further down).

2.5.3.3 Privileges of IR pilots (FCL.605)

The main pillars of this NPA are that:

- IR pilots properly trained and checked for PBN, on board of airworthy aircraft, should have by law the privilege of flying PBN routes and PBN procedures down a minimum decision height of 200 ft (60 m), like nowadays for ILS Cat I, without the need of any additional authorisation, approval or paperwork;
- only if this privilege is granted can the obligation for SPA be removed; and

[8] ICAO State Letter Type II AN 11/1.3.26-13/6 of 28 March 2013.

- the fact that in the EU flying certain PBN applications is a privilege granted by law, without the need of any annotation in the operations specifications (or list of approvals for non-commercial operators), should be made explicit in a footnote in the said OPS-SPECS (or list) to prevent EU operators from having problems when flying outside the European Union.

Consequently, the letter (a) in FCL.605 should be amended to clarify that the privileges of an IR holder are to fly aircraft under IFR, including PBN RNAV and RNP procedures, and in general all PBN operations not requiring specific approval.

2.5.3.4 Transition for flight instructors (FCL.940 and FCL.940.FI, FCL.940.IRI, FCL.940.SFI, FCL.940.TRI)

Rule FCL.940 in section 1 of Subpart J of Part FCL establishes that, in general, the instructor certificates shall be valid for a period of 3 years.

Rule FCL.940.FI in section 2 of the same Subpart establishes that, for revalidation of a FI certificate, the holder shall:

(a) fulfil 2 of the following 3 requirements:

(5) complete:

(i) currency: in the case of an FI(A) and (H), at least 50 hours of flight instruction in the appropriate aircraft category during the period of validity of the certificate as, FI, TRI, CRI, IRI, MI or examiner. If the privileges to instruct for the IR are to be revalidated, 10 of these hours shall be flight instruction for an IR and shall have been completed within the last 12 months preceding the expiry date of the FI certificate;

(ii) …..

(6) attend an instructor refresher seminar, within the validity period of the FI certificate;

(7) pass an assessment of competence in accordance with FCL.935, within the 12 months preceding the expiry date of the FI certificate.

(b) For at least each alternate subsequent revalidation in the case of FI(A) or FI(H), the holder shall pass an assessment of competence in accordance with FCL.935.

Similar requirements apply for the Instrument Rating Instructor (IRI), Sailplane FI (SFI) and Type Rating Instructor (TRI) which are also involved in the training for the initial issue (IRI and SFI) and the training for the revalidation and renewal of an IR (IRI, SFI and TRI).

This means that in a period of three years instructors shall either attend a refresher seminar or pass an assessment of competence. The next seminar or assessment should cover PBN matters, as established by the proposed new Article 4a in Commission Regulation (EU) No 1178/2011.

Consequently, it is not necessary to amend rules FCL.940 and FCL.940.FI, FCL.940.IRI, FCL.940.SFI, FCL.940.TRI.

2.5.3.5 Transition for flight examiners (FCL.1025)

According to FCL.1025, the flight examiner (FE) certificate is also valid for three years and revalidation is based on currency (at least two skill tests per year) and attendance to an examiner refresher seminar provided by the competent authority or by an ATO and approved by the competent authority, during the last year of the validity period.

For the same reasons explained above for the FI, it is not necessary to amend rule FCL.1025.

2.5.3.6 IR Skill test (Appendix 7 to Part FCL)

The content of the skill test for IR is contained in Appendix 7 Part FCL. The current text takes into account neither PBN nor the new ICAO classification of instrument approaches. The Appendix hence requires to be amended.

The main amendments proposed by this NPA relate to the content of the test for aeroplanes and helicopters.

In addition to demonstrating skills to follow en-route IFR procedures defined by ground beacon (e.g. NDB, VOR), the pilot is now required to demonstrate ability to follow routes defined by geographical way points (i.e. RNAV), and ability to use not only 'radio-aids', but 'navigation system', provided that the latter is available on modern aircraft (and often using several different navigation sensors).

The key skills for PBN arrival check include the loading of the correct procedure in the navigation system and a crosscheck between the navigation system display and the arrival chart.

It is also important to ensure that vertical deviation will not be more than 75 ft below the vertical path not to infringe the obstacle clearances. This is a key issue for LNAV/VNAV operations.

At the begining of the procedure (around the FAF), brief deviations above the flight path could instead be accepted, but the approach should be stabilised, since unstabilised approaches are one of the most frequent causal factors in several landing accidents, including runway excursions. For this reason, the pilot should also monitor +75 ft at 700 ft above the aerodrome elevation (where the approach has to be definitely stabilised).

Finally, in compliance with the new ICAO taxonomy, approaches are no longer classified in terms of 'precision' and 'non-precision', but as '3D' and '2D'. The pilot under test will still be required to perform only one 2D approach and one 3D approach (i.e. the duration of the test remains the same as before), but at least one of the two shall be an RNP APCH.

2.5.3.7 Cross-crediting for class or type rating proficiency check (Appendix 8 to Part FCL)

Appendix 8 to Part FCL contains criteria for cross-crediting of the IR part of a class or type rating proficiency check, based on the recent flying experience of the pilot of aeroplanes or helicopter.

In particular, for both aeroplanes and helicopters, there is a footnote below the table listing which experience can be credited. It also clarifies that the credit can be granted provided that the applicant has flown at least three IFR departures and approaches within the preceding 12 months.

This NPA proposes to add a few more words in each of these footnotes, stating that for aeroplanes, at least one approach shall be RNP APCH and for helicopters the same, noting that PinS belongs to the family of RNP APCH.

2.5.3.8 Skill test and proficiency check for MPL, ATPL, type and class ratings and proficiency check for IRs (Appendix 9 to Part FCL)

Appendix 9 to Part FCL contains requirements for the skill test and proficiency check for MPL, ATPL, type and class ratings, and proficiency check for IRs.

Even this Appendix needs amendment in relation to PBN, in particular on:

(a) Aeroplanes:

(1) Flight test tolerance for 3D 'angular' operations (e.g. LPV, ILS, MLS, GLS, etc.) which, according to the ICAO taxonomy, are no longer called 'Precision approach';

(2) Flight test tolerance for 3D 'linear' operations (i.e. LNAV/VNAV) using Baro VNAV;

(3) Flight test tolerance for 2D 'linear' operations (LNAV) without vertical guidance;

(4) Change of semantics for single-pilot aeroplanes (except for high performance complex aeroplanes) to harmonise with the mentioned new ICAO taxonomy;

(5) The same harmonisation of semantics for multi-pilot aeroplanes and single-pilot high performance complex aeroplanes;

(b) Helicopters:

(1) Similar amendments for 3D (angular and linear) and 2D (linear) operations; and

(2) The same for the semantics.

2.5.4 AMC and GM to Part FCL

The TK syllabuses for the ATPL and Instrument Rating were not set out in detail in the Annex to ED Decision 2011/016/R containing the AMC/GM for Part FCL. The topics appear at a high level and *062 05 AREA NAVIGATION SYSTEMS AND RNAV OR FMS* is the one relevant to PBN.

Detailed Learning Objectives (LOs), based on those developed by the Joint Aviation Authorities (JAA), are expected as a deliverable of the rulemaking task FCL.002 and FCL.008. In anticipation of the publication of these learning objectives as AMC1 FCL.310; FCL.515 (b); FCL.615 (b), amendments in that AMC at the level of learning objectives are therefore proposed to support the transition to PBN within the Instrument Rating.

It should be noted that there is already considerable coverage of RNAV and RNP concepts in the TK syllabus. *062 05 01 00 General philosophy and definitions* reflects RNAV and RNP before the 4th edition of the ICAO PBN Manual. Rather than editing this LO, it is proposed to add a new topic (i.e. *062 07 00 00 PBN*) with an up-to-date description of PBN concepts. This is based on the content of the 4th edition of the ICAO PBN Manual.

062 05 02 00 Simple 2D RNAV and *062 05 03 00 4D RNAV* contain dated concepts no longer relevant to modern aircraft systems. Their deletion is proposed and they can be considered superseded by *062 07 00 00 PBN*.

062 05 04 00 FMS and general terms and *062 05 05 00 Typical flight deck equipment fitted on FMS aircraft* are still relevant to modern operations and it is therefore proposed to retain them.

2.5.5 Annexes II, III, IV and V to Commission Regulation (EU) No 1178/2011

Annexes II (conversion of national licences), III (validation of non-EU licences), IV (Part MED) and V (Part CC) to Commission Regulation (EU) No 1178/2011 and related AMC/GM are not affected by this NPA.

2.5.6 Annex VI to Commission Regulation (EU) No 1178/2011 (Part ARA)

ARA.GEN.305 (Oversight programme) mandates competent authorities to establish and maintain an oversight programme including audits, inspections and meetings at the level of the accountable manager within each oversight planning cycle.

The same rule establishes that the oversight planning cycle shall normally not exceed 24 months, with the possibility of extension to a maximum of 36 months under defined conditions, or even to a maximum of 48 months, if the organisation has established and the competent authority has approved an effective continuous reporting system to the competent authority on the safety performance and regulatory compliance of the organisation itself.

Specifically, ARA.ATO.105 establishes that the oversight programme for ATOs shall include monitoring of course standards, including the sampling of training flights with students, if appropriate to the aircraft used.

These rules are not linked to the specific content of the courses, so it is not necessary to amend them, also because the transition would be mandated by Article 4b of Commission Regulation (EU) No 1178/2011, as mentioned in paragraph 2.5.2 above.

2.5.7 AMC and GM to Part ARA

In the table for FSTD evaluation report AMC5 ARA.FSTD.100(a)(1), the RNP APCH capability of the simulators is not clearly mentioned; instead, there is only a generic reference to 'GPS'.

This NPA suggests to use a more modern PBN terminology and to replace 'GPS' by 'RNP APCH' in the said table.

Corresponding amendments to *AMC1 ARA.FCL.300(b) Examination procedures* are required. Currently, subject 062 05 is allocated 10 questions for the IR, and 15 for the ATPL(A) and ATPL(H)/IR. It is recommended that 5 questions be asked on *062 07 00 00 PBN*, and therefore that the allocation to 062 05 is reduced to 5 questions for the IR, and 10 for the ATPL(A) and ATPL(H)/IR.

2.5.8 Annex VII to Commission Regulation (EU) No 1178/2011 (Part ORA)

2.5.8.1 Transition for ATO (ORA.GEN.135)

Courses of theoretical knowledge for the IR are approved in accordance with the continued validity requirements of ORA.GEN.135. Competent authorities are therefore in a position to ensure that ATOs have implemented the requirements of the modifications to the theoretical knowledge and flight training syllabi on suitable timescales.

Rule ORA.GEN.135 (Continued validity of the ATO certificate) already stipulates that the organisation's certificate shall remain valid subject, inter alia, to:

(a) the organisation remaining in compliance with the relevant requirements of the Basic Regulation and its Implementing Rules, taking into account the provisions related to the handling of findings;

(b) the competent authority being granted access to determine continued compliance with the relevant requirements.

With the proposed new Article 4b in Commission Regulation (EU) No 1178/2011 and ARA.GEN.305 mentioned above, it is not deemed necessary to amend ORA.GEN.135.

2.5.8.2 Training aircraft and FSTDs (ORA.ATO.135)

ORA.ATO.135 prescribes that the ATO shall use an adequate fleet of training aircraft or FSTDs appropriate to the courses of training provided. This rule is however not explicit on PBN. In order to offer a clear basis for transition to PBN, the proposed additional sentence will clarify that, in case of IR training, training aircraft and FSTDs shall include the elements required for PBN.

2.5.9 AMC and GM to Part ORA

The Agency, supported by the Rulemaking Group for the subject, has identified no need to amend AMC/GM to Part ORA, in relation to PBN operational approval.

2.5.10 Commission Regulation (EU) No 965/2012 (AIR-OPS)

This NPA assumes that – at least for some PBN operations – future rules provide appropriate alternatives to the requirement of holding a specific approval, e.g. an IR for pilots, additional operational requirements in the organisation requirements (Part ORO) or technical requirements (Part CAT, Part NCC, Part NCO, Part SPO).

Furthermore, PBN operations are relevant:

- for all air operation categories: commercial air transport (CAT), non-commercial with complex motor-powered aircraft (NCC), non-commercial with non-complex motor-powered aircraft (NCO) and aerial work, alias specialised operations (SPO);
- with complex and non-complex aeroplanes and complex and non-complex helicopters.

Based on the principles already applied for drafting the initial OPS rules, any new developed rule should be performance-based, a safety objective should be at the level of implementing rule, while the means to comply with a safety objective should be at the AMC level.

In its final structure, Commission Regulation (EU) 965/2012 on AIR-OPS is envisaged to contain eight annexes. However, only seven of them have been adopted and published, while the last one is under consideration by the European Commission, following a specific Agency's Opinion.

The following figure 2 provides an overview of the annexes of the Regulation AIR-OPS and their current status:

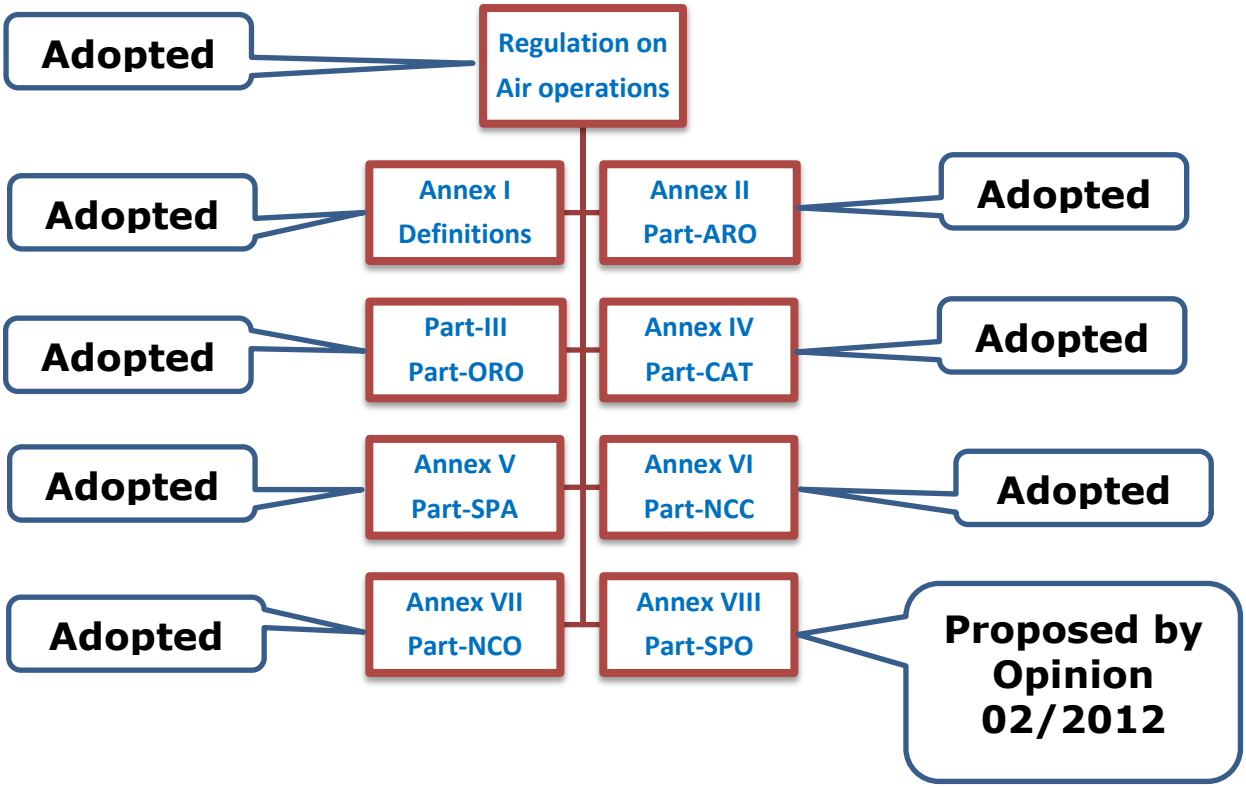

Figure 2: Status of the AIR-OPS Regulation

Annexes I to V have in fact been included in the first edition of Commission Regulation (EU) 965/2012, while Annexes VI and VII have been added by Commission Regulation (EU) No 800/2013[9].

Publication of Annex VIII in the Official Journal of the EU is expected in the following months.

There is no need to amend the Articles of the cover Commission Regulation (EU) No 965/2012. However, several annexes, whether already adopted or not, require amendment in relation to PBN and its specific approval, as explained in the paragraphs below.

2.5.11 Annex I to Commission Regulation (EU) No 965/2012 (Definitions)

Annex I contains definitions of terms used in the Implementing Rules of Annexes II to VIII.

The definition for the term 'Required navigation performance (RNP) specification' has been added. The definition is aligned with the definition in ICAO Doc 9613 PBN Manual 4th edition.

[9] Commission Regulation (EU) No 800/2013 of 14/08/2013 amending Regulation (EU) No 965/2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council *(OJ L 227, 24.8.2013, p. 1).*

2.5.12 GM to definitions

The GM to Annex I contains definitions of terms used in the AMC and GM material of the Annexes II to VIII.

The following seven definitions have been added: 'Area Navigation (RNAV)', 'Accuracy', 'Availability', 'Continuity of function', 'Integrity', 'RAIM' and 'Vertical navigation'. AMC 20-26 are the sources of these definitions.

2.5.13 Annex II to Commission Regulation (EU) No 965/2012 (Part ARO)

2.5.13.1 ARO.OPS.200 Specific approval procedure

Current rule ARO.OPS.200 establishes that:

(a) upon receiving an application for the issue of a specific approval or changes thereof, the competent authority shall assess the application in accordance with the relevant requirements of Annex V (Part SPA) and conduct, where relevant, an appropriate inspection of the operator.

(b) when satisfied that the operator has demonstrated compliance with the applicable requirements, the competent authority shall issue or amend the approval. The approval shall be specified in the operations specifications, as established in Appendix II.

No change is required since no specific PBN applications are mentioned in ARO.OPS.200.

In fact, it refers to Part SPA for the list of operations (including but not limited to PBN) for which a SPA is required. This list can be longer or shorter, but its content does not affect the wording of ARO.OPS.200.

The statement immediately above is confirmed by the fact that the obligation for SPA in relation to RNAV 5 (B-RNAV) has already been removed by Commission Regulation (EU) 965/2012 and in this case the text of ARO.OPS.200 was not perceived as an obstacle for this removal by any stakeholder.

2.5.13.2 Appendix II – OPS SPCS template

The text of Appendix II to Part ARO is open to list one or more PBN specifications in the OPS SPECS, without the need to amend the template each time.

Inspectors all around the world may expect that all allowed PBN applications are listed in the OPS SPECS accompanying aircraft registered in the EU, since this practice is by now common in most ICAO contracting States.

Once some PBN applications would have been removed from Part SPA, rule ARO.OPS.200 would no longer apply to them and hence they would not be listed in the OPS SPECS.

In order to avoid problems to EU operators flying outside the Union, a note to the OPS SPECS should be added to explain that the EU Regulations on air operations confer to the IR pilots flying suitably equipped and airworthy aircraft the privilege of flying certain PBN applications (ref. to GM1 to SPA.PBN.100), without any specific approval and without any entry in the OPS SPECS.

2.5.13.3 Appendix V – list of specific approvals

For the same reasons explained in the paragraph above for the OPS SPECS, a similar footnote should be added to the list of specific approvals in Appendix V to Part ARO.

2.5.14AMC and GM to Part ARO

A new AMC3 ARO.OPS.200 is proposed for authorities, clarifying that, in some cases, the approval can be granted based only on the documentation provided by the operator.

Conversely, it is left at the discretion of the competent authority whether a practical demonstration in a Full Flight Simulator (FFS) or in real flight is necessary before granting the approval.

In any case, the approval should list all affected aircraft types.

Furthermore, a new GM1 ARO.OPS.230 refers to ICAO Doc 9997, where authorities and inspectors can find additional guidance on PBN oversight of PBN operations.

This ICAO Manual is composed of 168 pages and contains material not only addressing the inspectors evaluating the applications for operational approval of PBN, but also the rulemaking authorities, the aircraft manufacturers and operators.

The entire Manual has been considered by the Agency when compiling this NPA. Some of the recommendations or text contained in Doc 9997 is not directly transposed into the amendments proposed by this NPA, since:

a) a number of paragraphs in the Doc are descriptive, tutorial or contain definitions;

b) the paragraphs related to system and requirements for initial airworthiness are covered by the series of AMC 20 listed in paragraph 2.5.29 below;

c) no specific requirements for continuous airworthiness are necessary in case of PBN (i.e. the avionics has to be maintained like any other navigation system);

d) the Manual requests States (or Regional Safety Oversight Organisations like the Agency) to include PBN in their respective regulations, which is already the case in the EU and which is not a requirement addressed to inspectors or operators;

e) the requirement is sound, but already covered elsewhere in the EU rules on aviation safety (e.g. mutual recognition of certificates in Article 11 Basic Regulation);

f) the requirement (or job aid) is not applicable (N.A.) since for that PBN application no SPA is required in the EU, according to this NPA (e.g. RNP 1);

g) the competence on that matter is not at Agency level, but at national level (e.g. forms for application);

h) the job aid to assess applications for RNP AR APCH is explicitly referred in GM1 to ARO.OPS.230, while it is considered not appropriate to include that level of detail in regulatory material;

i) guidance on the flight operational safety assessment (FOSA), contained in Appendix E to Doc 9997, is explicitly referred (but not unnecessarily copied) into GM1 to SPA.PBN.105(c).

Finally, it is important to note that Doc 9997 states that rulemaking authorities should consider whether or not a specific approval is necessary for certain PBN operations, which is in fact the main purpose of this NPA, as better described in paragraph 2.5.19 below.

In conclusion, the proposals contained in this NPA do not diverge significantly from Doc 9997, as detailed in Appendix 3. In any case, a Manual published under the authority of the ICAO Secretary General, does not have the mandatory status of standards adopted by the Council and published in the Annexes to the Chicago Convention.

2.5.15 Annex III to Commission Regulation (EU) No 965/2012 (Part ORO)

No need has been identified to amend Annex III (Part ORO) to Commission Regulation (EU) No 965/2012.

2.5.16 AMC and GM to Part ORO

AMC 2 was added to *ORO.GEN.160 Occurrence reporting*. This AMC contains a list of reportable events of PBN operations. The source of this AMC is AMC 20-26. Although the original text was drafted for RNP AR APCH operations, the AMC is considered to be appropriate and applicable to any PBN operation.

Subpart Flight crew, Section II – Additional requirements for commercial air transport operations

The rules for the recurrent checking in AMC1 ORO.FC.230 in Subpart Flight crew, Section II – Additional requirements for commercial air transport operations, have been slightly modified to align with the new approach classification and the proposed amendments to the checking rules of the instrument rating (IR) of Commission Regulation Aircrew.

In line with the new approach classification adopted by ICAO, the term 'precision instrument approach' has been replaced with '3D approach operation' and the term 'non-precision approach' with '2D approach operation'.

In order to align the IR checking rules, the AMC specifies that at least one of the 3D or 2D approach operations should be an RNP APCH operation.

The proposed amendments would be applicable to commercial air transport operations with aeroplanes and helicopters.

2.5.17 Annex IV to Commission Regulation (EU) No 965/2012 (Part CAT)

Even using conventional navigation, the navigation performance of aircraft operating within the ATM system is important for system-level safety. However, the regulatory aspect of this tends to be set out in the rules of the air rather than AIR-OPS, and the procedures that operators use to achieve the performance (e.g. tolerances for deviations on an ILS or the requirement to identify navaids before use) are either in an operations manual, or are implicit in the airmanship of crews, and there is little detail in implementing rules or AMC/GM. The same approach could be considered for PBN.

Since PBN was originally introduced by specific approval as a novel technology of which operators and authorities had little experience compared to conventional navigation, the relevant AMCs set out operational procedures and flight crew knowledge and competence in much greater detail (much derived from the ICAO PBN Manual) than is present in AIR-OPS for conventional navigation. That material delivers value by providing harmonisation of procedures between operators as well as giving non-European authorities confidence that the recommendations of the PBN Manual are being adopted.

It is therefore helpful to retain much of that regulatory material as AMC. In order to do so, an implementing rule is required, and so a new implementing rule at a high level is introduced as *CAT.OP.MPA.127 Performance-based navigation*. The fundamental safety objective is that the aircraft is operated in a way that conforms to the assumptions of the PBN specification required.

Other implementing rules relevant to PBN are modified as required to make them suitable for PBN.

CAT.OP.MPA.135 and CAT.OP.MPA.175 on route planning and flight preparation are amended to include the necessary considerations for GNSS use. AMC1 addresses procedures for RNAV10 using inertial sensors.

CAT.OP.MPA.185 and CAT.OP.MPA.186 on planning minima for IFR flights are adapted so that sole reliance on GNSS to complete the flight safely is not permitted in case GNSS capability is completely lost (either through equipment failure or failure of the signal in space). The principle chosen is to consider the possibility of a single low probability event, not a simultaneous loss of GNSS capability and an extraordinary deterioration in weather. On this basis, the decision was made not to transpose from AMC 20-27 the requirement that a conventional approach must be available at the destination if an alternate is not required. Nor does the requirement apply to enroute or take-off alternates.

The fundamental critical role played by the navigational database in most PBN operations is reflected by the introduction of an extra item in CAT.OP.MPA.175 on flight preparation, which is analogous to the requirement for suitable and current charts.

Airworthiness compliance with the required PBN specification is mandated in CAT.IDE.A.345 and CAT.IDE.H.345.

CAT.IDE.A.355 on electronic navigation data management is modified to require reporting of navigation-related occurrences. Although other rules required operators to report significant hazards, this rule is designed to create a rapid feedback to the supplier of electronic navigation data.

Finally, CAT.IDE.A.355 is transposed to CAT.IDE.H.355 for helicopters as they also use navigation data for PBN.

2.5.18 AMC and GM to Part CAT

As discussed in the corresponding note above on amendments to the implementing rules, appropriate material on operating procedures from the AMC 20 series is mostly retained as AMC to Part CAT.

Comparison of the PBN specifications (in particular RNAV 5, RNAV/RNP 2, RNAV/RNP 1, and RNP APCH) suggests that there is a great deal of common material. Several AMCs contain their own sections on similar operating procedures, but sometimes with different terminology and occasionally with inconsistencies. So the modification made to the material from the AMC 20 series is of three broad classes.

1) The structure of the AMC is therefore aimed at general PBN operating procedures, and the individual specifications are mentioned only where it is necessary to make a distinction. The text from the AMC 20 series has been consolidated into this structure.

2) The rulemaking group that worked on this task included several experts from both operators and NAAs who have been closely involved in the development of procedures for everyday PBN operations. It therefore took the opportunity to make any minor updates it deemed appropriate based on operational experience of PBN.

3) The language describing approach operations was updated for consistency with recent developments at ICAO.

Most of the AMC material describes the way that the aircraft is operated, and it therefore is AMC to the new high-level implementing rule CAT.OP.MPA.127.

GM1 describes the interpretation of the requirement for Total System Error in navigation specifications in terms of the PBN, i.e. how to interpret the X of RNAV X or RNP X.

AMC1 describes monitoring and verification procedures appropriate to each stage of flight.

AMC2 addresses the integrity of PBN routes retrieved from the database.

AMC3 addresses the displays to be used while using PBN, and the permitted tolerances in FTE. The requirements for vertical deviation during BARO VNAV operations were carefully considered, and the upper limit in AMC 20-27 was removed, because there is no obstacle clearance issue above the vertical profile.

AMC4 addresses issues associated with ATM interaction, such as vectoring to the final approach segment.

AMC5 addresses discontinuance of RNP APCH and is drawn principally from AMC 20-27 and 20-28.

AMC6 and GM2 set out the requirements for contingency procedures. The possibility of recommending generic procedures was examined, but it was concluded that contingency procedures should be considered on a case-by-case basis, and the text of the AMC and GM reflects this.

2.5.19 Annex V to Commission Regulation (EU) No 965/2012 (Part SPA)

Subpart B – Performance-based navigation (PBN) operations

Part SPA contains rules for operations which require operational approval. The current rule text of SPA.PBN.100 specifies that all PBN operations except B RNAV (RNAV 5) require an operational approval. The amended text would require an operational approval only for RNP AR APCH operations, RNP 0.3 helicopter operations and the advanced RNP function time of arrival control.

The rationale behind the proposed amendment was already explained above. In other words, for the remaining PBN specifications and functions, it is assumed that during the initial instrument rating (IR) training, these operations cannot be sufficiently covered. It will neither be possible to include such operations during the checking exercise.

The new proposed rules would allow a single approval for each of the PBN specifications, when so required, conferring the privilege of flying such operations at any geographical location. An individual approval (site specific) would only be necessary if the AIP or the competent authority required so.

It should be noted that this approach creates a content change to AMC 20-26 for RNP AR APCH operations which mandates individual operational approvals. The rulemaking group, however, considered that the design of most RNP AR APCH procedures are standardised in accordance with ICAO Doc 9905. For this reaons the rulemaking group proposed a generic operational approval. For those procedures which do not meet the criteria of ICAO Doc 9905 an individual operational approval for the specifc procedure would be required.

Furthermore, the competent authority could specify that individual approvals are necessary for certain RNP AR APCH operations. The rationale behind this rule is that the authority could specify that RNP AR APCH operations on aerodromes, which are classified by the operator or considered by the authority as C aerodromes, require an individual approval.

The proposed amendments to SPA.PBN.105 containing the high level criteria for the operational approval are either of editorial nature or were added to better transpose the relevant operational rules from AMC 20-26.

Readers may note that paragraph 2.3.3 of ICAO Doc 9997 (PBN OPS approval Manual) recommends that States decide whether or not a SPA is required for each PBN type, balancing the efficient use of available regulatory resources, to ensure proper initial operator compliance and to promote on-going operational safety, while also enabling the use of new technologies and operations in the interest of enhanced safety and efficiency; in other words, ICAO does not always consider the SPA mandatory.

The previous paragraph 2.3.2 in the same ICAO Manual recommends in fact that the following factors be considered, before State or regional decisions to require or not a formal operational approval process:

(a) the degree of linkage to the basis for aircraft/avionics certification, i.e. whether the aircraft, including its RNAV or RNP navigation system, has an airworthiness approval covering the type of envisaged PBN operations, which in the EU is satisfied by applying one or more AMCs;

(b) the complexity of the PBN operation and the level of associated challenges to operators, which in the EU is considered not significant for modern aircraft (except for very peculiar PBN operations like e.g. RNP AR APCH), also taking into account that RNAV has been introduced in the European airspace since 1996 and so all IR pilots have acquired sufficient experience;

(c) the maturity of related operational concept and systems and, specifically, whether the issues are well understood and relatively stable, which is now satisfied, after more than twenty years of experience on RNAV/RNP/PBN;

(d) the risk associated with improper conduct of operation and operator-specific safety expectations, as well as those of third parties in the air and on the ground, which is not greater than for any other instrument operation;

(e) the availability of appropriate training, checking standards and procedures for the respective type of PBN operations (mainly for pilots but also for maintenance and dispatcher personnel, as appropriate), which is now satisfied in the EU, where the FCL requirements are amended in parallel; and

(f) the promulgation of information from holders of Type Certificates (TC) to air operators (e.g. MMEL and training requirements), throughout the life cycle of the aircraft, which is covered by the rules on Operational Suitability Data (OSD).

In conclusion, in the EU, all the ICAO suggestions are verified for several PBN types and therefore the obligation for SPA can be removed, without contrasting the provisions in ICAO Doc 9997.

The rulemaking group considered the purpose of specific approvals and the criteria for removal of particular PBN specifications from the requirement for an operational approval under Part SPA.

Specific PBN operations do require an operational approval for any of the following reasons:

- these operations represent novel procedures and activities which require greater flexibility for various operating procedures and practices;
- these operations require case-by-case analysis to determine best practices in operations because of variations in equipment, environment and external factors;
- pilot training requires access to equipment that is not available to the majority of flight training organisations and/or operators;
- these operations are of interest to such a small proportion of operators that it would be disproportionate to incorporate the relevant theoretical knowledge into the standard learning objectives.

The corollary is that activities may be removed from Part SPA and incorporated in the technical part of Air OPS and Part FCL if the following criteria are met:

(1) The operating procedures associated with the activities can be written in a sufficiently generic way that they are applicable to the majority of situations without the need for a case-by-case analysis;

AND

(2) The competence required of flight crew conducting the activity falls into one of the following categories:

(a) it is identical or analogous to activities carried out in operations that do not require specific approval and therefore it requires no extra training; or

(b) it requires only additional theoretical knowledge beyond such identical or analogous activities and only to an extent that it is reasonable to introduce that TK into the standard learning objectives; or

(c) it requires flight training either in aircraft or in FSTDs and it is reasonable for the majority of training organisations to provide equipment in which the relevant activities can be conducted or simulated.

The drafting group agreed that the following PBN specifications meet the criteria:

RNP APCH: standard procedures can be used to ensure safe operation (criterion 1), and an aircraft equipped to conduct RNP APCH operations (either using BaroVNAV or SBAS VNAV) can be reasonably expected to be provided by a training organisation (criterion 2c).

RNAV1, RNAV2, RNP1, RNP2: standard procedures can be used to ensure safe operation (criterion 1), and only TK is required for the competences beyond what is expected of a pilot capable of conducting RNAV5 and RNP APCH operations. The TK is significant, but it will be required for the vast majority of IFR operations over the relevant timescales (criterion 2b).

RNAV10, RNP4: standard procedures can be used to ensure safe operation (criterion 1) and only TK is required for the competences beyond what is expected of a pilot capable of conducting RNAV5 operations. RNAV10 and RNP4 are only required by operators who operate in oceanic or remote environments, but the additional TK required is relatively small (criterion 2b).

Advanced RNP includes the navigation specifications RNAV5, RNAV1, RNAV2, RNP1, RNP2 and RNP APCH for which the analysis above is applicable. It also has the following extra features:

For **RNP Scalability, Higher continuity, Radius to Fix (RF), Fixed Radius Transition (FRT),** criteria 1 and 2b apply.

For **Barometric VNAV,** criteria 1 and 2c apply as for RNP APCH.

However, the final optional feature **Time of Arrival Control** does not meet criterion 1 as the associated procedures are still in development, and its fit to criteria 2 is also doubtful. Depending on how it develops, it may require flight training that is as yet undefined.

For **RNP AR APCH**, the rulemaking group felt that case-by-case analysis of the operating procedures might still be required, and that criterion 2 was not met in any of its options. However, as RNP AR APCH becomes more broadly adopted, the generic approval for RNP AR APCH (but not the aerodrome-specific approvals required for some aerodromes and procedures) might eventually satisfy criterion 1. While the pilot competency requirements are unlikely ever to meet criterion 2 in general because most IR training will continue to be carried out in aircraft incapable of RNP AR APCH, it may be possible that flight training could be included in the type rating training for capable types.

For **RNP 0.3**, the group was concerned that the immaturity of the PBN specification made it difficult to write generic operating procedures with confidence. Moreover, the nature of the flight training elements required was sufficiently unclear that the group was unable to determine with confidence that the criteria were met. It therefore recommended a further rulemaking task to consider the issue in more detail.

The rulemaking group also recommends that these criteria should be used to determine suitability of future PBN navigation specifications to migrate from specific approval to the core OPS and FCL rules.

2.5.20 AMC and GM to Part SPA

Subpart B – Performance-based navigation (PBN) operations

GM1 SPA.PBN.100 has been amended so as to provide references to other related materials. The very general overview for each PBN specifications has not been maintained since PBN specifications are well described in ICAO Doc 9613 PBN Manual.

The GM contains also a revised overview table which shows the applicability of PBN specifications for different phases of flight and describes which PBN specifications would require an operational approval. Furthermore, the GM provides references to relevant AMC 20 material in which the current rules for the airworthiness rules can be found.

Finally, seven new AMCs have been proposed on the following issues: training and crew qualification for RNP AR APCH, safety assessment, operational considerations, flight considerations, navigation database management, reportable events and the RNP monitoring programme. The origin of these AMCs is AMC 20-26. There are no major content changes to the original text. However, the language of the text has been amended to ensure consistency with existing AMC and GM material of Part SPA.

2.5.21 Annex VI to Commission Regulation (EU) No 965/2012 (Part NCC) as amended by Commission Regulation (EU) No 800/2013

The proposed amendments to the implementing rules in Part NCC are analogous to those set out for Part CAT in section 2.5.17. Consistent with the rest of Part NCC, some requirements are addressed to the pilot-in-command rather than the operator.

2.5.22 AMC and GM to Part NCC

The proposed amendments to the AMC/GM in Part NCC are analogous to those set out for Part CAT in section 2.5.18.

2.5.23 Annex VII to Commission Regulation (EU) No 965/2012 (Part NCO) as amended by Commission Regulation (EU) No 800/2013

The proposed amendments to the implementing rules in Part NCO are analogous to those set out for Part CAT in section 2.5.17. Consistent with the rest of Part NCC, the requirements are addressed to the pilot-in-command rather than the operator.

New implementing rules (NCO.IDE.A.196 and NCO.IDE.H.196) on electronic data management are introduced with a subset of the requirements imposed on CAT.

2.5.24 AMC and GM to Part NCO

The proposed amendments to the AMC/GM in Part NCO are analogous to those set out for Part CAT in section 2.5.18.

2.5.25 Annex VIII to Commission Regulation (EU) No 965/2012 (Part SPO)

The proposed amendments to the implementing rules in Part SPO are analogous to those set out for Part CAT in section 2.5.17.

New implementing rules (SPO.IDE.A.230 and SPO.IDE.H.230) on electronic data management are introduced with the requirements as for Part CAT.

2.5.26 AMC and GM to Part SPO

The spirit of proposed amendments to the AMC/GM in Part SPO, and most often even the wording, are analogous to those proposed for AMC/GM to Part CAT in paragraph 2.5.18.

2.5.27 Certification Specifications CS-FSTD(A)

CS-FSTD(A), published in 2012, introduced two new devices: Flight and Navigation Procedures Trainer (FNPT) I and FNPT II. The FNPT I device is essentially a replacement for the traditional instrument flight ground training device taking advantage of recent technologies and having a more objective design basis.

The FNPT II device is the more advanced of the two defined standards and fulfils the wider requirements of the various Part FCL professional pilot training modules up to and including (optionally with additional features) multi-crew cooperation (MCC) training.

In Book 1 of this CS, CS FSTD(A).300 (Qualification basis) in Subpart C (aeroplane flight simulation training devices) requires that:

(a) Any FSTD submitted for initial evaluation shall be evaluated against applicable CS–FSTD(A) criteria for the qualification levels applied for. Recurrent evaluations of an FSTD shall be based on the same version of CS-FSTD(A) that was applicable for its initial evaluation. An upgrade shall be based on the currently applicable version of CS-FSTD(A).

(b) An FSTD shall be assessed in those areas that are essential to completing the flight crew member training, testing and checking process as applicable.

(c) The FSTD shall be subjected to:

(1) validation tests; and

(2) functions and subjective tests.

(d) The QTG, including all data, supporting material and information should be submitted in a format to allow efficient review and evaluation before the FSTD can gain a qualification level. Where applicable, the QTG should be based on the aircraft validation data as defined by the operational suitability data (OSD) established in accordance with Part 21.

The functions and subjective tests are described in detail in Book 2 (Acceptable Means of Compliance) and in particular in the table included in paragraph (c) in AMC1 FSTD(A).300 (Qualification basis).

In the current initial issue of CS-FSTD, the capability to support raining for RNP APCH is not required for FNPT I or for FNPT II.

In the light of current development of the state of the art and the need to improve pilot training for PBN, as proposed by this NPA, adding the capability for RNP APCH at least to FNPT II is considered necessary.

2.5.28 Certification Specifications CS-FSTD(H)

For the same reasons described in the paragraph above, the table on page 87 of CS-FSTD(H), paragraph (c) in AMC1 FSTD(H).300 (Qualification basis) should be amended in order to align its terminology to PBN.

2.5.29 AMC 20

In addition to the rules of Flight Crew Licensing, Air operations and simulators, it is necessary to review the relevant AMC 20 material.

In fact, the Agency foresees a progressive migration of all OPS-related material into AMC/GM to AIR-OPS, while leaving in AMC 20 only provisions related to airworthiness. In other words, AMC 20 will progressively become a 'horizontal' certification specification applicable to different aircraft category (e.g. navigation systems on board large and CS-23 aeroplanes).

This NPA hence proposes to transpose material from the following AMC 20s to the OPS rules:

- AMC 20-4 Airworthiness Approval and Operational Criteria for the use of navigation systems in European airspace designated for Basic RNAV operations;
- AMC 20-5 Airworthiness Approval and Operational Criteria for the use of the NavStar Global Positioning System (GPS);
- AMC 20-12 Recognition of FAA Order 8400.12a for RNP 10 Operations;
- AMC 20-26 Airworthiness Approval for RNP Authorisation Required (RNP AR) operations;
- AMC 20-27 Airworthiness Approval and Operational Criteria for RNP Approach (RNP APCH) Operations including APV Baro VNAV Operations;
- AMC 20-28 Airworthiness Approval and Operational Criteria for Localiser Performance and Vertical Guidance (LPV) Approach Operations (NPA 2009-04).

2.5.29.1 AMC 20-4

AMC 20-4 was published in 2003 to support the implementation of Basic RNAV in Europe as decided by the Ministers of the European Civil Aviation Conference (ECAC). At the time, it included criteria not only for airworthiness, but also for operational approval of Basic RNAV.

There are three main reasons to update this AMC:

- the operational specific approval for Basic RNAV is no longer required by AIR-OPS;
- the operational criteria have anyway to be removed since this NPA proposes to include them in AMC to Part CAT, Part NCC, Part NCO and Part SPO;
- fourth edition of ICAO Doc 9613 considers the terms 'Basic RNAV' and 'RNAV 5' totally equivalent, but prefers to use the latter.

The main changes proposed by this NPA for new issue A of AMC 20-4 are:

- use the term RNAV 5 instead of Basic RNAV;
- limit the scope of the AMC to only airworthiness aspects covering in particular navigation performance, availability, integrity, functional requirements, system limitations and Master Minimum Equipment List (MMEL);
- eliminate any reference to the European airspace, since the airworthiness approval is related to the design of an aircraft model and not to where the future operator may fly one physical instantiation of that design;
- equally eliminate any reference to coverage of ground-based or space-based navigation infrastructure, since this is not related to aircraft design.

2.5.29.2 AMC 20-5

AMC 20-5 on Airworthiness Approval and Operational Criteria for the use of the NavStar Global Positioning System (GPS) was published in 2003, when GNSS supported approaches were more or less at beginning of their development.

The Agency considers that this AMC has served its purpose, but now it is obsolete, in particular due to publication of AMC 20-26, -27 and -28.

This NPA hence proposes to delete AMC 20-5 entirely, since the related navigation systems are not expected to be inocoporated into a significant number of new aircraft designs. Furthermore, instrument rated pilots will have the privilege to fly the related procedures without the need to apply and obtain a SPA.

2.5.29.3 AMC 20-12

AMC 20-12 on the recognition of FAA order 8400.12a for RNP 10 operations was published in 2006 in amendment 1 to AMC 20, to support approvals to enter oceanic airspace where this navigation specification was introduced. At the time, it included criteria not only for airworthiness, but also for the operational approval of RNP 10.

There are four main reasons to update this AMC:

- fourth edition of ICAO Doc 9613 clearly states that the term RNP 10 is not appropriate, since the related specifications do not include a monitoring function; therefore, it is more appropriate to speak about RNAV 10;
- the FAA has cancelled its mentioned order in January 2010;
- this NPA proposes to remove the operational specific approval for RNAV 10; and
- the operational criteria have anyway to be removed since this NPA proposes to include them in AMC to Part CAT, Part NCC, Part NCO and Part SPO.

The main changes proposed by this NPA for the new issue A of AMC 20-12 are:

- replace the term RNP 10 by RNAV 10 throughout the document, however clarifying that the two terms are technically and operationally absolutely equivalent; and
- limit the scope of this AMC to airworthiness or aircraft approval aspects.

2.5.29.4 AMC 20-26

AMC 20-26 was published in 2009 to support the implementation of RNP AR APCH. At the time, it included criteria not only for airworthiness, but also for the operational approval of such operations.

There are two main reasons to update this AMC:

- the operational specific approval for RNAV AR RNP is proposed by this NPA to be based on rule SPA.PBN.105 and related AMC/GMs;
- consequently, the operational criteria must be removed from AMC 20-26.

The main changes proposed by this NPA for the new issue A of AMC 20-26 are:

- limit the scope of the AMC to only airworthiness aspects covering in particular navigation performance, availability, integrity, functional requirements, system limitations and Master Minimum Equipment List (MMEL);
- however, maintain therein some guidance material e.g. on the 'assumptions', since RNP AR APCH may be aircraft/site specific and not only manufacturers and operators are involved, but also procedure designers;

- make reference to SPA.PBN.105 and related AMC/GMs;
- remove reference to European airspace blocks, since the airworthiness approval is airspace independent;
- remove Appendix 2 (training and crew qualification) since transposed in AMC to Part SPA;
- remove paragraph 10 (operational criteria) since transposed into AMC1 SPA.PBN.105;
- remove Appendix 5 (Flight Operation Safety Assessment) since transposed in AMC to Part SPA and responsibility of the operator;
- remove paragraph 4.2 (Communication & ATS Surveillance Considerations) since not related to airworthiness aspects of the navigation system;
- clarify that RNP AR APCH procedures may be published in AIP, but may also not be public (e.g. for use by by the operator which paid for their development), but in any case need to be designed by an organisation certified for this purpose according to Article 8b of Basic Regulation;
- remove requirements on the integrity of the database, since under responsibility of data providers certified according to Article 8b of Basic Regulation.

2.5.29.5 AMC 20-27A

AMC 20-27 was published in 2009 to support the implementation of RNP APCH supported by BARO VNAV. At the time, it included criteria not only for airworthiness, but also for the operational approval of such operations. In 2013, edition A was published, but only to refer to AMC 20-115C for software matters.

There are three main reasons to update this AMC:

- this NPA proposes to remove the operational specific approval for RNP APCH;
- the training and checking criteria for Instrument Rated pilots should be extensively changed and aligned with the needs of RNP APCH; and
- the operational criteria have to be removed anyway since they would be included in AMC to Part CAT, Part NCC, Part NCO and Part SPO.

The main changes proposed by this NPA for new issue B of AMC 20-27 are:

- limit the scope of this AMC to the airworthiness approval aspects;
- do not refer to any specific airspace, since airworthiness approval is airspace independent;
- remove paragraph 10 (RNP APCH operational criteria) completely since this NPA transposes these aspects into the AIR OPS rules;
- remove Appendix 2 (Operational characteristics of the procedure and its operational use) completely since made redundant by the proposed rules in Part CAT, Part NCC, Part NCO and Part SPO;
- Appendix 3 (Alternate navigation database integrity check) is equally entirely removed since not related to airworthiness aspects and since data providers are under safety oversight based on Article 8b of Basic Regulation;
- also Appendix 4 (Operational procedures) is removed for the same reason as Appendix 2;
- finally, Appendix 5 (flight crew training syllabus) is removed as well, since replaced by Part FCL provisions proposed by this NPA.

2.5.29.6 AMC 20-28

AMC 20-28 was published in 2012 to support the implementation of RNP APCH supported in particular by Space-Based Augmentation Systems (SBAS), like e.g. WAAS in the USA and EGNOS in the EU. At the time, it included criteria not only for airworthiness, but also for the operational approval of such operations.

There are three main reasons to update this AMC:

- this NPA proposes to remove the operational specific approval for RNP APCH LPV supported by SBAS;
- the training and checking criteria for Instrument Rated pilots should be extensively changed and aligned with the needs of RNP APCH; and
- the operational criteria have to be removed anyway since they would be included in AMC to Part CAT, Part NCC, Part NCO and Part SPO.

The main changes proposed by this NPA for the new issue A of AMC 20-28 are:

- limit the scope of this AMC to the airworthiness approval aspects;
- do not refer to any specific airspace, since airworthiness approval is airspace independent;
- remove paragraph 10 (RNP APCH operational criteria) completely since this NPA transposes these aspects into the AIR OPS rules;
- remove Appendices 2 (Operational characteristics of the procedure and its operational use) and 3 (LPV approach operational procedures) completely since made redundant by the proposed rules in Part CAT, Part NCC, Part NCO and Part SPO;
- finally, Appendix 4 (flight crew training syllabus) is removed as well since replaced by the Part FCL provisions proposed by this NPA.

3 Proposed amendments

The text of the amendment is arranged to show deleted text, new or amended text as shown below:

(a) deleted text is marked with ~~strikethrough~~;

(b) new or amended text is highlighted in grey;

(c) an ellipsis (…) indicates that the remaining text is unchanged in front of or following the reflected amendment.

3.1 Proposed amendments to Commission Regulation (EU) No 1178/2011 and to Commission Regulation (EU) No 965/2012 (AIR-OPS) (Draft EASA Opinion)

COMMISSION IMPLEMENTING REGULATION (EU) No …/…

of …

amending Regulation (EU) No 1178/2011 of 03/11/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council

and

amending Commission Regulation (EU) No 965/2012 of 05/10/2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC[10], and in particular Articles 7(6) 8(5) thereof,

Whereas:

(1) Operators and personnel involved in the operation of certain aircraft have to comply with the relevant essential requirements set out in Annex IV to Regulation (EC) No 216/2008.

(2) In accordance with Regulation (EC) No 216/2008 the Commission should adopt the necessary implementing rules for establishing the conditions for the safe operation of aircraft.

[10] OJ L 79, 13.3.2008, p.1.

(3) The present Regulation amends Commission Regulation (EU) No 1178/2011 to include particular aspects related to Flight Crew Licensing (FCL) concerning pilot training and periodic checking for Performance-based Navigation (PBN). Existing pilot licences and ratings should remain valid; however commercial pilots, instrument rated pilots and airline transport pilots, should demonstrate a sufficient level of theoretical knowledge and practical skill for PBN operations at the next periodic proficiency check.

(4) The European Aviation Safety Agency (the 'Agency') prepared draft Implementing Rules and submitted them as an Opinion to the European Commission in accordance with Article 19(1) of Regulation (EC).

(5) The present Regulation also amends Commission Regulation (EU) No 965/2012 laying down technical requirements and administrative procedures related to air operations to include particular aspects related to PBN.

(6) In order to ensure a high and uniform level of civil aviation safety in the European Union, implementing measures should reflect the state of the art, including best practices, and scientific and technical progress in the field of air operations. Accordingly, technical requirements and administrative procedures agreed under the auspices of the International Civil Aviation Organisation (ICAO) and the European Joint Aviation Authorities (JAA) until 30 June 2009, as well as existing legislation pertaining to a specific national environment, should be considered.

(7) The European Aviation Safety Agency (the 'Agency') prepared draft Implementing Rules and submitted them as an Opinion to the European Commission in accordance with Article 19(1) of Regulation (EC) No 216/2008.

(8) The measures provided for in this Regulation are in accordance with the Opinion of the Committee established by Article 65 of Regulation (EC) No 216/2008.

HAS ADOPTED THIS REGULATION:

Article 1

Commission Regulation (EU) No 1178/2011 is amended as follows:

1. The following Articles 4a and 4b are inserted:

'Article 4a

Conversion of pilots, instructors and examiners to PBN

(1) Pilots exercising the privileges of an instrument rating after [2 years after this Regulation applies] shall have satisfied the requirements of paragraph (2) at a skills test for the issue of an IR in accordance with FCL.620.A or FCL.620.H or at a proficiency check for the revalidation or renewal of an IR in accordance with FCL.625.A or FCL.625.H.

(2) The applicant shall, in addition to the requirements of Appendix 7 or 9 (as appropriate) to Annex I of Commission Regulation (EU) No 1178/2011 of 3 November 2011:

(a) provide evidence of either:

(i) successful completion of a course of theoretical knowledge in accordance with FCL.615 where that course includes Performance-based Navigation as amended by this Regulation, or

(ii) successful completion of a course of theoretical knowledge at an ATO in the subject of Radio Navigation for Performance-based Navigation, or

(iii) successful completion of theoretical knowledge training equivalent to (ii) as part of an operator training programme conducted under subpart FC of Annex III of Commission Regulation (EU) No 965/2012 of 5 October 2012 and

(b) either:

(i) provide evidence of training in RNP APCH operations as part of an integrated or modular course for the ATPL or IR compliant with Annex I of this Regulation or

(ii) provide evidence of training in RNP APCH or RNP AR APCH under national regulations, or

(iii) provide evidence of six RNP APCH operations conducted as pilot-in-command prior to the date this Regulation applies, or

(iv) complete training in PBN operations as determined by the examiner, including at least one additional RNP APCH operation.

(3) Where an authority authorises certain examiners to revalidate or renew ratings or certificates in accordance with ARA.FCL.200, the evidence required by paragraph (2) may be provided to the examiner, and the examiner may endorse the licence to indicate compliance with paragraph (2).

(4) Flight examiners shall, before examining a pilot who wishes to demonstrate compliance with paragraph (2), have themselves complied with the requirements of paragraph (2), not later than the date of applicability of this Regulation.

(5) After [1 year after the date this regulation applies], flight instructors shall, before giving instruction in a course of training an integrated or modular course for the ATPL or IR in accordance with Annex I of this regulation, have themselves complied with the requirements of paragraph (2).

Article 4b

Conversion of training organisations to PBN

ATOs offering training for an integrated ATPL or for a modular IR course in accordance with Annex I of this Regulation shall ensure that the course includes instruction on Performance-based Navigation as amended by this Regulation not later than the date of applicability of this Regulation.'

2. Annexes I and VII to Commission Regulation (EU) No 1178/2011 are amended in accordance with Annex I to this Regulation.

Article 2

Annexes I, II, V, VI, VII and VIII to Commission Regulation (EU) No 965/2012 are amended in accordance with Annex II to this Regulation.

Article 3

This Regulation shall enter into force on the [20th] day following its publication in the *Official Journal of the European Union*.

It shall apply from 25 August 2016.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Annex I – Amendments to Commission Regulation (EU) No 1178/2011

1. In Annex I, the following definitions are inserted in paragraph FCL.010:

'LNAV' means Lateral Navigation see RNP APCH definition.

'LPV' means Localizer Performance with Vertical Guidance, see RNP APCH definition.

'Performance-based Navigation (PBN)' means area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

'RNP APCH' is a PBN specification used for approach operations.

'RNP APCH operation down to LNAV minima' is a 2D operation for which the lateral guidance is based on GNSS positioning.

'RNP APCH operation down to LNAV/VNAV minima' is a 3D operation for which the lateral guidance is based on GNSS positioning and the vertical guidance is provided either by the Baro VNAV function or by the GNSS positioning including SBAS.

'RNP APCH operation down to LPV minima' is a 3D operation for which both lateral and vertical guidance are based on GNSS positioning including SBAS.

'RNP AR APCH' is a navigation specification used for approach operations requiring a specific approval.

'Three-dimensional (3D) instrument approach operation' means an instrument approach operation using both lateral and vertical navigation guidance.

'Two-dimensional (2D) instrument approach operation' means an instrument approach operation using lateral navigation guidance only;

'VNAV' means Vertical Navigation see RNP APCH definition.

2. In Annex I, letter (a) in paragraph FCL.605 is amended as follows:

(a) The privileges of a holder of an IR are to fly aircraft under IFR:

(1) with a minimum decision height of 200 feet (60 m);

(2) PBN operations for which a specific approval is not required; and

(3) any other PBN operation for which the competent authority defined in Commission Regulation (EU) No 965/2012 granted a specific approval to the operator.

(b) ….

3. In Annex I, Appendix 7 is amended as follows:

(1) An applicant for an IR shall have received instruction on the same class or type of aircraft to be used in the test.

….

(10) The applicant shall demonstrate the ability to:

- operate the aircraft within its limitations;
- complete all manoeuvres with smoothness and accuracy;
- exercise good judgment and airmanship;

- apply aeronautical knowledge; and
- maintain control of the aircraft at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

(11) The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the aircraft used:

Height	Generally: ± 100 feet Starting a go-around at decision height/altitude: + 50 feet/– 0 feet Minimum descent height/MAP/altitude: + 50 feet/– 0 feet
Tracking	On radio aids: ± 5° ~~Precision approach:~~ ~~half scale deflection, azimuth and glide path~~ For angular deviations: Half scale deflection, azimuth and glide path (e.g. LPV, ILS, MLS, GLS,…), or as stated in the OEM instructions. For linear lateral deviations: < RNP value (e.g. RNP APCH(LNAV)) For linear vertical deviations (e.g. RNP APCH (LNAV/VNAV) using BaroVNAV): not more than –75 ft below the vertical profile, and not more than +75 ft above the vertical profile at or below 700 ft above aerodrome level
Heading	all engines operating: ± 5° with simulated engine failure: ± 10°
Speed	all engines operating: ± 5 knots with simulated engine failure: + 10 knots/– 5 knots

CONTENT OF THE TEST

Aeroplanes

SECTION 1 — PRE-FLIGHT OPERATIONS AND DEPARTURE Use of checklist, airmanship, anti-icing/de-icing procedures, etc., apply in all sections	
a	Use of flight manual (or equivalent) especially a/c performance calculation, mass and balance
b	Use of Air Traffic Services document, weather document
c	Preparation of ATC flight plan, IFR flight plan/log
d	Identification of the required navaids for departure, arrival and approach procedures

ed	Pre-flight inspection
fe	Weather Minima
gf	Taxiing
hg	Pre-take-off briefing, Take-off
ih°	Transition to instrument flight
ji°	Instrument departure procedures, altimeter setting
kj°	ATC liaison - compliance, R/T procedures
SECTION 2 — GENERAL HANDLING°	
	……
SECTION 3 — EN-ROUTE IFR PROCEDURES°	
a	Tracking, including interception, e.g. NDB, VOR, or track between Waypoints
b	Use of navigation system and radio aids
	……
SECTION 4 — ARRIVAL PROCEDURE	
a	Setting and checking of navigational aids if applicable,
b	Arrival procedures, altimeter checks
c	Altitude and speed constraints if applicable
d	If applicable (PBN arrival): Check that the correct procedure has been loaded in the navigation system Reasonableness check between the navigation system display and the arrival chart
SECTION 5 ~~4 —~~ 3D OPERATIONS ++ ~~PRECISION APPROACH PROCEDURES~~°	
a	Setting and checking of navigational aids~~, identification of facilities~~ Check Vertical Path angle; and for RNP APCH Check that the correct procedure has been loaded in the navigation system Reasonableness check between the navigation system display and the approach chart
~~b~~	~~Arrival procedures, altimeter checks~~
bc	Approach and landing briefing, including descent/approach/landing checks, including identification of facilities
c+d+	Holding procedure
de	Compliance with published approach procedure
ef	Approach timing
fg	Altitude, speed heading control (stabilised approach)

g+~~h+~~	Go-around action
h+~~I~~+	Missed approach procedure/landing
i~~j~~	ATC liaison – compliance, R/T procedures
SECTION 6~~5~~ — 2D OPERATIONS ++ ~~NON-PRECISION APPROACH PROCEDURES~~°	
a	Setting and checking of navigational aids~~, identification of facilities~~ And for RNP APCH: Check that the correct procedure has been loaded in the navigation system Reasonableness check between the navigation system display and the approach chart
~~b~~	~~Arrival procedures, altimeter checks~~
b~~c~~	Approach and landing briefing, including descent/approach/landing checks, including identification of facilities
c+~~d~~+	Holding procedure
d~~e~~	Compliance with published approach procedure
e~~f~~	Approach timing
f~~g~~	Altitude/Dist to MAPT, speed, heading control (stabilised approach), SDF(s) if applicable
g+~~h+~~	Go-around action
h+~~i~~+	Missed approach procedure/landing
i~~j~~	ATC liaison – compliance, R/T procedures
SECTION 7~~6~~ — FLIGHT WITH ONE ENGINE INOPERATIVE (multi-engine aeroplanes only)°	
	.....

* May be performed in an FFS, FTD 2/3 or FNPT II.
\+ May be performed in either section 4 or section 5.
° Must be performed by sole reference to instruments.
++ One approach in either section 5 or section 6 shall be an RNP APCH

Helicopters

SECTION 1 — DEPARTURE Use of checklist, airmanship, anti-icing/de-icing procedures, etc., apply in all sections	
a	Use of flight manual (or equivalent) especially aircraft performance calculation; mass and balance
b	Use of Air Traffic Services document, weather document
c	Preparation of ATC flight plan, IFR flight plan/log
d	Identification of the required navaids for departure, arrival and approach procedures
~~d~~e	Pre-flight inspection
~~e~~f	Weather minima
~~f~~g	Taxiing/Air taxy in compliance with ATC or instructions of instructor
~~g~~h	Pre-take-off briefing, procedures and checks
~~h~~i	Transition to instrument flight
~~i~~j	Instrument departure procedures
SECTION 2 — GENERAL HANDLING	
	…..
SECTION 3 — EN-ROUTE IFR PROCEDURES	
	……
SECTION 4 — ARRIVAL PROCEDURE	
a	Setting and checking of navigational aids if applicable,
b	Arrival procedures, altimeter checks
c	Altitude and speed constraints if applicable
d	If applicable (PBN arrival): Check that the correct procedure has been loaded in the navigation system Reasonableness check between the navigation system display and the arrival chart
SECTION 5~~4~~ — 3D OPERATIONS ~~+PRECISION APPROACH~~	
a	Setting and checking of navigational aids, ~~identification of facilities~~ Check Vertical Path angle; and For RNP APCH Check that the correct procedure has been loaded in the navigation system Reasonableness check between the navigation system display and the approach chart
~~b~~	~~Arrival procedures, altimeter checks~~
b	Approach and landing briefing, including descent/approach/landing checks
c*	Holding procedure

d	Compliance with published approach procedure
e	Approach timing
f	Altitude, speed, heading control (stabilised approach)
g*	Go-around action
h*	Missed approach procedure/landing
i	ATC liaison – compliance, R/T procedures
* To be performed in section ~~4~~5 or section ~~5~~6. + One approach in either section 5 or section 6 shall be an RNP APCH	
SECTION 6~~5~~ — ~~NON-PRECISION APPROACH~~ 2D OPERATIONS +	
a	Setting and checking of navigational aids~~, identification of facilities~~ And, For RNP APCH: Check that the correct procedure has been loaded in the navigation system Reasonableness check between the navigation system display and the approach chart
~~b~~	~~Arrival procedures, altimeter checks~~
b	Approach and landing briefing, including descent/approach/landing checks and identification of facilities
c*	Holding procedure
d	Compliance with published approach procedure
e	Approach timing
f	Altitude, speed, heading control (stabilised approach)
g*	Go-around action
h*	Missed approach procedure*/landing
i	ATC liaison – compliance, R/T procedures
* To be performed in section 5 ~~4~~ or section 6 ~~5~~. + One approach in either section 5 or section 6 shall be an RNP APCH	
SECTION 7~~6~~ — ABNORMAL AND EMERGENCY PROCEDURES This section may be combined with sections 1 through 5. The test shall have regard to control of the helicopter, identification of the failed engine, immediate actions (touch drills), follow-up actions and checks and flying accuracy, in the following situations:	
a	Simulated engine failure after take-off and on/during approach* (at a safe altitude unless carried out in an FFS or FNPT II/III, FTD 2,3) *Multi-engine helicopter only.
b	Failure of stability augmentation devices/hydraulic system (if applicable)
c	Limited panel
d	Autorotation and recovery to a pre-set altitude

e	~~Precision approach~~ 3D operations manually without flight director* 3D operations ~~Precision approach~~ manually with flight director* *Only one item to be tested.

4. In Annex I, Appendix 8 is amended as follows:

A. Aeroplanes

Credits shall be granted only when the holder is revalidating IR privileges for single-engine and single-pilot multi-engine aeroplanes, as appropriate.

When a proficiency check including IR is performed, and the holder has a valid:	Credit is valid towards the IR part in a proficiency check for:
….;	……
SP SE type rating	SE class and type rating

* Provided that within the preceding 12 months the applicant has flown at least three IFR departures and approaches including one RNP APCH approach on an SP class or type of aeroplane in single pilot operations, or, for multi-engine non-high performance non-complex aeroplanes, the applicant has passed section 6 of the skill test for single-pilot non-high performance non-complex aeroplanes flown solely by reference to instruments in single-pilot operation.

B. Helicopters

Credits shall be granted only when the holder is revalidating IR privileges for single-engine and single-pilot multi-engine helicopters as appropriate.

When a proficiency check, including IR, is performed and the holder has a valid:	Credit is valid towards the IR part in a proficiency check for:
….	…..
SP ME type rating, restricted to multi-pilot operation	SE type rating, * SP ME type rating. *

* Provided that within the preceding 12 months at least 3 IFR departures and approaches including one RNP APCH approach (could be a PinS approach) have been performed on an SP type of helicopter in an SP operation.

5. In Annex I, Appendix 9 is amended as follows:

A. General

…

B. Specific requirements for the aeroplane category

PASS MARKS

1. ….

2. ….

FLIGHT TEST TOLERANCE

3. The applicant shall demonstrate the ability to:

….

4. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the aeroplane used:

Height

Generally ±100 feet
Starting a go-around at decision height + 50 feet/-0 feet
Minimum descent height/altitude + 50 feet/-0 feet

Tracking on radio aids ± 5°

3D 'angular' operations (e.g. LPV, ILS, MLS, GLS,…) : ~~Precision approach~~ half scale deflection, azimuth and glide path, or as stated in the OEM instructions.

3D 'linear' operations (LNAV/VNAV) using BaroVNAV: Lateral deviations < RNP value and Vertical deviations not below - 75ft.

2D 'linear" operations (LNAV): Lateral deviations < RNP value

Heading

all engines operating ± 5°
with simulated engine failure ± 10°

Speed

all engines operating ± 5 knots
with simulated engine failure +10 knots/-5 knots

CONTENT OF THE TRAINING/SKILL TEST/PROFICIENCY CHECK

5. Single-pilot aeroplanes, except for high performance complex aeroplanes

(a) ……

SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH PERFORMANCE COMPLEX AEROPLANES	PRACTICAL TRAINING				CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures				Instructor initials when training completed	Chkd in	Examiner initials when test completed
	FTD	FFS	A		FFS A	

SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH PERFORMANCE COMPLEX AEROPLANES	PRACTICAL TRAINING				CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures				Instructor initials when training completed	Chkd in	Examiner initials when test completed
	FTD	FFS	A		FFS A	
SECTION 1						
…..						
SECTION 3B						
3B.4 * 3D operations to DH/A of 200' (60m) or to higher minima if required by the approach procedure ~~ILS to DH/A of 200' (60 m) or to procedure minima~~ (autopilot may be used to ~~glideslope~~ the final approach segment vertical path intercept)		P---->	---->		M	
3B.5 * 2D operations to MDH/A ~~Non-precision approach to MDH/A and MAP~~		P---->	---->		M	
SECTION 4						
…..						
SECTION 6						
…..						

6. Multi-pilot aeroplanes and single-pilot high performance complex aeroplanes

(a) ….

MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES	PRACTICAL TRAINING					ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures					Instructor initials when training completed	Chkd in	Examiner initials when test completed
	OTD	FTD	FFS	A		FFS A	
SECTION 1							
……							

MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES	PRACTICAL TRAINING					ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures					Instructor initials when training completed	Chkd in	Examiner initials when test completed
	OTD	FTD	FFS	A		FFS A	
SECTION 3							
3 Flight Manoeuvres and Procedures 3.1 Turns with and without spoilers			P----->	---->			
……							
3.9 Instrument flight procedures							
….							
3.9.3* ~~Precision approaches down to a decision height (DH) not less than 60 m (200 ft~~) 3D operations to DH/A of 200' (60m) or to higher minima if required by the approach procedure							
…..;							
Note: According to the Aircraft Flight Manual, RNP APCH procedures may require the use of autopilot or Flight director. The procedure to be flown manually should be chosen taken into account such limitations (example choose an ILS for 3.9.3.1 in case of such AFM limitation)							
…..							
3.9.3.4* manually, with one engine simulated inoperative; engine failure has to be simulated during final approach before passing 1000ft above aerodrome level ~~the outer marker (OM)~~ until touchdown or through the complete missed approach procedure In aeroplanes …. ….. with 3.9.3.4.			P----->	----->		M	

MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES	PRACTICAL TRAINING					ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures					Instructor initials when training completed	Chkd in	Examiner initials when test completed
	OTD	FTD	FFS	A		FFS A	
3.9.4* ~~Non-precision approach~~ 2D operations down to the MDH/A			P*--->	----->		M	
3.9.5 Circling approach under following conditions: …..							
SECTION 4							
4 Missed Approach Procedures 4.1 Go-around with all engines operating* ~~after an ILS approach~~ during a 3D operation on reaching decision height			P*--->	----->			
……							
SECTION 5							
5 Landings 5.1 Normal landings* ~~also after an ILS approach with transition to visual flight on reaching DH~~ with visual reference established when reaching DA/H following an instrument approach.			P				
5.2 ……							
SECTION 6							
Additional authorisation on a type rating for instrument approaches down to a decision height of less than 60 m (200 ft) (CAT II/III) The following manoeuvres ….							

MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES	PRACTICAL TRAINING					ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures					Instructor initials when training completed	Chkd in	Examiner initials when test completed
	OTD	FTD	FFS	A		FFS A	
6.1* Rejected take-off …..							
6.2* CAT II/III ~~ILS~~ approaches: in simulated ….			P----->	----->		M	

7. Class ratings - sea

C. Specific requirements for the helicopter category

1. ….

2. …

FLIGHT TEST TOLERANCE

3. ….

4. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the aeroplane used.

(a) IFR flight limits

Height:

Generally ±100 feet

Starting a go-around at decision height/altitude +50 feet/-0 feet

Minimum descent height/altitude +50 feet/-0 feet

Tracking:

On radio aids ±5°

3D 'angular' operations (e.g LPV, ILS, MLS, GLS) ~~Precision approach~~ half scale deflection, azimuth and glide path

3D 'linear' operations (LNAV/VNAV) using BaroVNAV:

Lateral deviations < RNP value and Vertical deviations not below -75ft

2D 'linear' operations (LNAV)

Lateral deviations < RNP value

Heading:

……

CONTENT OF THE TRAINING/SKILL TEST/PROFICIENCY CHECK

GENERAL

5. …..

10. …..

MULTI-PILOT HELICOPTERS

11. ….

12. ….

SINGLE/MULTI-PILOT HELICOPTERS		PRACTICAL TRAINING				SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		FTD	FFS	H	Instructor initials when training completed	Chkd in FFS H	Examiner initials when test completed
SECTION 1 — Pre-flight preparations and checks							
	……						
SECTION 5 — Instrument Flight Procedures (to be performed in IMC or simulated IMC)							
5.1	….						
5.4	~~ILS approaches down to CAT I decision height~~ 3D operations to DH/A of 200' (60m) or to higher minima if required by the approach procedure	P*	---->*	---->*			
5.4.1	Manually, without flight director	P*	---->*	---->*		M*	
	Note: According to the Aircraft Flight Manuual, RNP APCH procedures may require the use of autopilot or Flight director. The procedure to be flown manually should be chosen taken into account such limitations (example choose an ILS for 5.4.1 in case of such AFM limitation)						
5.4.2	~~Precision approach m~~Manually, with ~~or without~~ flight director	P*	---->*	---->*		M*	
5.4.3	With coupled autopilot	P*	---->*	---->*			

SINGLE/MULTI-PILOT HELICOPTERS		PRACTICAL TRAINING				SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		FTD	FFS	H	Instructor initials when training completed	Chkd in FFS H	Examiner initials when test completed
5.4.4	Manually, with one engine simulated inoperative. (Engine failure has to be simulated during final approach before passing 1000ft above aerodrome level ~~passing the outer marker (OM)~~until touchdown or until completion of the missed approach procedure)	P*	---->*	---->*		M*	
5.5	~~Non-precision approach~~ 2D operations down to the minimum descent altitude MDA/H	P*	---->*	---->*		M*	
5.6	….						
SECTION 6 — Use of Optional Equipment							
	……						

D. Specific requirements for the powered-lift aircraft category

1. ….

E. Specific requirements for the airship category

1. ….

6. In Annex VII, letter (a) in paragraph ORA.ATO.135 is amended as follows:

(a) The ATO shall use an adequate fleet of training aircraft or FSTDs appropriate to the courses of training provided. In case of IR training will include elements required for PBN.

Annex II – Amendments to Commission Regulation (EU) No 965/2012.

(5)

1. In Annex I, the following definitions are inserted:

'Required navigation performance (RNP) specification' means a navigation specification for PBN operations which includes a requirement for on-board navigation performance monitoring and alerting.

2. In Annex II (Part ARO), the table (EASA FORM 139 Issue 1) in Appendix II is amended as follows:

Appendix II

OPERATIONS SPECIFICATIONS (subject to the approved conditions in the operations manual)				
Issuing Authority Contact Details Telephone[1]: _____; Fax: _____; E-mail: _____				
AOC#[2]: Operator Name[3]: Date[4]: Signature: Dba Trading Name Operations Specifications#:				
Aircraft Model[5]: Registration Marks[6]:				
Commercial operations				
Area of operation[7]:				
Special Limitations[8]:				
Specific Approvals:	Yes	No	Specification[9]	Remarks
Dangerous Goods	☐	☐		
Low Visibility Operations Take-off Approach and Landing	☐	☐	RVR[11]: m CAT[10].... RVR: m DH: ft	
RVSM[12] ☐ N/A	☐	☐		
ETOPS[13] ☐ N/A	☐	☐	Maximum Diversion Time[14]: min.	
Navigation specifications for PBNOperations[15]	☐	☐		[16]
Minimum navigation performance specification	☐	☐		
Helicopter operations with the aid of night vision imaging systems	☐	☐		
Helicopter hoist operations	☐	☐		
Helicopter emergency medical service operations	☐	☐		
Cabin crew training[17]	☐	☐		
Issue of CC attestation[18]	☐	☐		
Continuing airworthiness	☐	☐	[19]	
Others[20]				

▼**A2**

1. Telephone and fax contact details of the competent authority, including the country code. E-mail to be provided if available.
2. Insertion of associated air operator certificate (AOC) number.
3. Insertion of the operator's registered name and the operator's trading name, if different. Insert 'Dba' before the trading name (for 'Doing business as').
4. Issue date of the operations specifications (dd-mm-yyyy) and signature of the competent authority representative.
5 Insertion of ICAO designation of the aircraft make, model and series, or master series, if a series has been designated (e.g. Boeing-737-3K2 or Boeing-777-232).
6. Either the registration marks are listed in the operations specifications or in the operations manual. In the latter case the related operations specifications must make a reference to the related page in the operation manual. In case not all specific approvals apply to the aircraft model, the registration marks of the aircraft could be entered in the remark column to the related specific approval.
7. Listing of geographical area(s) of authorised operation (by geographical coordinates or specific routes, flight information region or national or regional boundaries).
8. Listing of applicable special limitations (e.g. VFR only, Day only, etc.).
9. List in this column the most permissive criteria for each approval or the approval type (with appropriate criteria).

▼**A2**

10. Insertion of applicable precision approach category: LTS CAT I, CAT II, OTS CAT II, CAT IIIA, CAT IIIB or CAT IIIC. Insertion of minimum runway visual range (RVR) in meters and decision height (DH) in feet. One line is used per listed approach category.
11. Insertion of approved minimum take-off RVR in meters. One line per approval may be used if different approvals are granted.
12. Not Applicable (N/A) box may be checked only if the aircraft maximum ceiling is below FL290.
13. Extended range operations (ETOPS) currently applies only to two-engined aircraft. Therefore, the Not Applicable (N/A) box may be checked if the aircraft model has more or less than two engines.
14. The threshold distance may also be listed (in NM), as well as the engine type.
15. Performance-based navigation (PBN): one line is used for each PBN approval (e.g. ~~area navigation (RNAV) 10, RNAV 1, required navigation performance (RNP) 4,…~~RNP AR APCH, RNP 0.3 helicopter operations), with appropriate limitations or conditions listed in the 'Specifications' and/or 'Remarks' columns. Individual approvals of specific RNP AR APCH procedures may be listed in the operations specifications or in the operations manual. In the latter case the related operations specifications should have a reference to the related page in the operation manual. Regulations of the European Union on air operations confer to instrument rated pilots on board suitably equipped and airworthy aircraft, the privilege of flying certain PBN applications, (ref. to GM1 to SPA.PBN.100), without any specific approval and without any entry in the OPS SPECS.

16. Limitations, conditions and regulatory basis for operational approval associated with the RNP AR APCH ~~PBN~~ approval (e.g. RF legs, RNP value for each segment, ~~global navigation satellite system (GNSS), distance measuring equipment/DME/inertial reference unit (DME/DME/IRU), …~~).
17. Approval to conduct the training course and examination to be completed by applicants for a cabin crew attestation as specified in Annex V (Part CC) to Commission Regulation (EU) No 1178/2011.
18. Approval to issue cabin crew attestations as specified in Annex V (Part CC) to Commission Regulation (EU) No 1178/2011.

3. Note 16 to the table (EASA FORM 140 Issue 1) in Appendix V to Annex II (Part ARO) is amended as follows:

List in this column any approved operations, e.g. dangerous goods, LVO, RVSM, ~~RNP,~~ MNPS, NVIS, HHO. Regulations of the European Union on air operations confer to instrument rated pilots on board suitably equipped and airworthy aircraft, the privilege of flying certain PBN applications (ref. to GM1 to SPA.PBN.100), without any specific approval and without any entry in the list of specific approvals.

4. In Annex II, a new rule is inserted in section II (Approvals) of Subpart OPS:

ARO.OPS.230 Specific approval of RNP AR APCH

(a) When compliance with the requirements in SPA.PBN.105 has been demonstrated by the applicant, the competent authority shall grant an operational approval or a procedure-specific approval for RNP AR APCH.

(b) In the case of a procedure specific approval, the competent authority shall:

1. List the authorised procedures at specific aerodromes in the PBN approval;
2. Establish coordination with the competent authority for the aerodrome, if appropriate;
3. Take into account the possible credit stemming from RNP AR APCH specific approvals already issued to the applicant.

5. Annex IV (Part CAT) is amended as follows:

Subpart B — Operational procedures

…

CAT.OP.MPA.126 Performance-based navigation

The operator shall ensure that, when performance-based navigation (PBN) is required for the route or procedure to be flown, the aircraft is operated in conformance with the appropriate navigation specification.

CAT.OP.MPA.135 Routes and areas of operation — general

(a) The operator shall ensure that operations are only conducted along routes, or within areas, for which:

(1) space-based facilities, ground facilities and services, including meteorological services, adequate for the planned operation are provided;

…

CAT.OP.MPA.175 Flight preparation

…

(b) The flight shall not be commenced unless the commander is satisfied that:

…

(6) space-based facilities, ground facilities and services that are required for the planned flight are available and adequate;

(7) the provisions specified in the operations manual in respect of fuel, oil, oxygen, minimum safe altitudes, aerodrome operating minima and availability of alternate aerodromes, where required, can be complied with for the planned flight;

(8) any navigational database required for performance-based navigation is suitable and current; and

(9) any additional operational limitation can be complied with.

…

CAT.OP.MPA.185 Planning minima for IFR flights - aeroplanes

…

(d) The operator shall only select an aerodrome as a destination alternate aerodrome if an approach procedure that does not rely on GNSS is used for planning minima either at that aerodrome or at the destination aerodrome.

…

CAT.OP.MPA.186 Planning minima for IFR flights - helicopters

…

(c) The operator shall only select an aerodrome as a destination alternate aerodrome if an approach procedure that does not rely on GNSS is used for planning minima either at that aerodrome or at the destination aerodrome.

…

Subpart D — Instruments, data and equipment

Section 1 — Aeroplanes

…

CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

…

(f) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

CAT.IDE.A.355 Electronic navigation data management

(a) The operator shall only ….

(d) …..

(e) Notwithstanding any other occurrence reporting requirements, the operator shall report to the supplier of electronic navigation data products any observed failure of the data to meet appropriate standards of accuracy and integrity where the failure might reasonably be expected to constitute a hazard to flight.

…

Section 2 — Helicopters

…

CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

…

(e) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

CAT.IDE.H.355 Electronic navigation data management

(a) The operator shall only use electronic navigation data products that support a navigation application meeting standards of integrity that are adequate for the intended use of the data.

(b) When the electronic navigation data products support a navigation application needed for an operation for which Annex V (Part SPA) requires an approval, the operator shall demonstrate to the competent authority that the process applied and the delivered products meet standards of integrity that are adequate for the intended use of the data.

(c) The operator shall continuously monitor the integrity of both the process and the products, either directly or by monitoring the compliance of third party providers.

(d) The operator shall ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aeroplanes that require it.

(e) Notwithstanding any other occurrence reporting requirements, the operator shall report to the supplier of electronic navigation data products any observed failure of the data to meet appropriate standards of accuracy and integrity where the failure might reasonably be expected to constitute a hazard to flight.

…

6. Annex V (Part SPA), Subpart B (Performance-based navigation (PBN) operations) is amended as follows:

SPA.PBN.100 PBN operations

~~Aircraft shall only be operated in designated airspace, on routes or in accordance with procedures where performance-based navigation (PBN) specifications are established if the operator has been granted an approval by the competent authority to conduct such operations. No specific approval is required for operations in area navigation 5 (RNAV5 (basic area navigation, B-RNAV)) designated airspace.~~

(a) An approval is required for each of the following performance-based navigation (PBN) specifications:

(1) RNP AR APCH;

(2) RNP 0.3 for helicopter operation; and

(3) the Advanced RNP function Time of Arrival Control.

(b) An approval for RNP AR APCH operations shall allow operations on procedures which meet the applicable design criteria. A procedure-specific approval shall be required for any procedure that does not meet the applicable design criteria or where required by the Aeronautical Information Publication (AIP) or the competent authority.

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 ~~RNAV~~ RNP operation, is stated in the AFM;

(b) a training programme for the flight crew members and relevant personnel involved in ~~these operations~~ the flight preparation has been established;

(c) a safety assessment has been carried out;

(~~c~~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);

(2) flight crew composition, qualification and experience ~~requirements~~;

(3) normal, abnormal and contingency procedures; and

(4) ~~contingency procedures~~ electronic navigation data management;

(~~5~~e) ~~monitoring and incident reporting~~ a list of ~~reportable~~ events has been specified; and

(~~6~~f) ~~electronic navigation data management~~ a management RNP monitoring programme has been established.

7. Annex VI (Part NCC) is amended as follows:

…

Subpart A – General Requirements

…

NCC.GEN.106 Pilot-in-command responsibilities and authority

(a) The pilot-in-command shall be responsible for:

…

(4) only commencing a flight if he/she is satisfied that all operational limitations referred to in 2.a.3 of Annex IV to Regulation (EC) No 216/2008 are complied with, as follows:

…

(ix) any navigational database required for performance-based navigation is suitable and current;

…

Subpart B — Operational procedures

…

NCC.OP.116 Performance-based navigation - aeroplanes and helicopters

The operator shall ensure that, when performance-based navigation is required for the route or procedure to be flown, the aircraft is operated in conformance with the appropriate navigation specification.

…

NCC.OP.145 Flight preparation

(a) Before commencing a flight, the pilot-in-command shall ascertain by every reasonable means available that the space-based facilities, ground and/or water facilities, including communication facilities and navigation aids available and directly required on such flight, for the safe operation of the aircraft, are adequate for the type of operation under which the flight is to be conducted.

…

NCC.OP.153 Destination alternate aerodromes – approaches relying on GNSS

The pilot-in-command shall only select an aerodrome as a destination alternate aerodrome if an approach procedure that does not rely on GNSS is available either at that aerodrome or at the destination aerodrome.

…

Subpart D — Instruments, data and equipment

Section 1 — Aeroplanes

…

NCC.IDE.A.250 Navigation equipment

…

(d) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

NCC.IDE.A.260 Electronic navigation data management

…

(e) Notwithstanding any other occurrence reporting requirements, the operator shall report to the supplier of electronic navigation data products, any observed failure of the data to meet appropriate standards of accuracy and integrity, where the failure might reasonably be expected to constitute a hazard to flight.

…

Section 2 — Helicopters

…

NCC.IDE.H.250 Navigation equipment

…

(d) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

NCC.IDE.H.260 Electronic navigation data management

(a) The operator shall only use electronic navigation data products that support a navigation application meeting standards of integrity that are adequate for the intended use of the data.

(b) When the electronic navigation data products support a navigation application needed for an operation for which Annex V (Part SPA) requires an approval, the operator shall demonstrate to the competent authority that the process applied and the delivered products meet standards of integrity that are adequate for the intended use of the data.

(c) The operator shall continuously monitor the integrity of both the process and the products, either directly or by monitoring the compliance of third party providers.

(d) The operator shall ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aeroplanes that require it.

(e) Notwithstanding any other occurrence reporting requirements, the operator shall report to the supplier of electronic navigation data products, any observed failure of the data to meet appropriate standards of accuracy and integrity, where the failure might reasonably be expected to constitute a hazard to flight.

8. Annex VII (Part NCO) is amended as follows:

…

Subpart A – General Requirements

…

NCO.GEN.105 Pilot-in-command responsibilities and authority

(a) The pilot-in-command shall be responsible for:

…

(4) only commencing a flight if he/she is satisfied that all operational limitations referred to in 2.a.3. of Annex IV to Regulation (EC) No 216/2008 are complied with, as follows:

…

(vii) any navigational database required for performance-based navigation is suitable and current;

…

Subpart B — Operational procedures

…

NCO.OP.116 Performance-based navigation - aeroplanes and helicopters

The pilot-in-command shall ensure that, when performance-based navigation is required for the route or procedure to be flown, the aircraft is operated in conformance with the appropriate navigation specification.

…

NCO.OP.135 Flight preparation

(a) Before commencing a flight, the pilot-in-command shall ascertain by every reasonable means available that the space-based facilities, ground and/or water facilities, including communication facilities and navigation aids available and directly required on such

flight, for the safe operation of the aircraft, are adequate for the type of operation under which the flight is to be conducted.

…

NCO.OP.142 Destination alternate aerodromes – approaches relying on GNSS

The pilot-in-command shall only select an aerodrome as a destination alternate aerodrome if an approach procedure that does not rely on GNSS is available either at that aerodrome or at the destination aerodrome.

…

Subpart D — Instruments, data and equipment

Section 1 — Aeroplanes

…

NCO.IDE.A.195 Navigation equipment

…

(d) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

NCO.IDE.A.196 Electronic navigation data management

(a) The pilot-in-command shall only use electronic navigation data products that support a navigation application meeting standards of integrity that are adequate for the intended use of the data.

(b) When the electronic navigation data products support a navigation application needed for an operation for which Annex V (Part SPA) requires an approval, the operator shall demonstrate to the competent authority that the process applied and the delivered products meet standards of integrity that are adequate for the intended use of the data.

(c) Notwithstanding any other occurrence reporting requirements, the pilot-in-command shall report to the supplier of electronic navigation data products, any observed failure of the data to meet appropriate standards of accuracy and integrity, where the failure might reasonably be expected to constitute a hazard to flight.

…

Section 2 — Helicopters

…

NCO.IDE.H.195 Navigation equipment

…

(d) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

NCO.IDE.H.196 Electronic navigation data management

(a) The pilot-in-command shall only use electronic navigation data products that support a navigation application meeting standards of integrity that are adequate for the intended use of the data.

(b) When the electronic navigation data products support a navigation application needed for an operation for which Annex V (Part SPA) requires an approval, the operator shall

demonstrate to the competent authority that the process applied and the delivered products meet standards of integrity that are adequate for the intended use of the data.

(c) Notwithstanding any other occurrence reporting requirements, the pilot-in-command shall report to the supplier of electronic navigation data products, any observed failure of the data to meet appropriate standards of accuracy and integrity, where the failure might reasonably be expected to constitute a hazard to flight.

9. Annex VIII (Part SPO) is amended as follows:

…

Subpart A — General requirements

…

SPO.GEN.107 Pilot-in-command responsibilities and authority

(a) The pilot-in-command shall be responsible for:

…

(4) only commencing a flight if he/she is satisfied that all operational limitations referred to in 2.a.3. of Annex IV to Regulation (EC) No 216/2008 are complied with, as follows:

…

(vii) any navigational database required for performance-based navigation is suitable and current;

…

Subpart B — Operational procedures

…

SPO.OP.116 Performance-based navigation - aeroplanes and helicopters

The operator shall ensure that, when performance-based navigation is required for the route or procedure to be flown, the aircraft is operated in conformance with the appropriate navigation specification.

…

SPO.OP.140 Flight preparation

(a) Before commencing a flight, the pilot-in-command shall ascertain by every reasonable means available that the space-based facilities, ground and/or water facilities, including communication facilities and navigation aids available and directly required on such flight, for the safe operation of the aircraft, are adequate for the type of operation under which the flight is to be conducted.

…

SPO.OP.152 Destination alternate aerodromes – approaches relying on GNSS

The pilot-in-command shall only select an aerodrome as a destination alternate aerodrome if an approach procedure that does not rely on GNSS is available either at that aerodrome or at the destination aerodrome.

Subpart D — Instruments, data and equipment

Section 1 — Aeroplanes

…

SPO.IDE.A.220 Navigation equipment

…

(d) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

SPO.IDE.A.230 Electronic navigation data management

(a) The operator shall only use electronic navigation data products that support a navigation application meeting standards of integrity that are adequate for the intended use of the data.

(b) When the electronic navigation data products support a navigation application needed for an operation for which Annex V (Part SPA) requires an approval, the operator shall demonstrate to the competent authority that the process applied and the delivered products meet standards of integrity that are adequate for the intended use of the data.

(c) The operator shall continuously monitor the integrity of both the process and the products, either directly or by monitoring the compliance of third party providers.

(d) The operator shall ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aeroplanes that require it.

(e) Notwithstanding any other occurrence reporting requirements, the operator shall report to the supplier of electronic navigation data products, any observed failure of the data to meet appropriate standards of accuracy and integrity, where the failure might reasonably be expected to constitute a hazard to flight.

…

Section 2 — Helicopters

…

SPO.IDE.H.220 Navigation equipment

…

(d) When performance-based navigation is required, the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

…

SPO.IDE.H.230 Electronic navigation data management

(a) The operator shall only use electronic navigation data products that support a navigation application meeting standards of integrity that are adequate for the intended use of the data.

(b) When the electronic navigation data products support a navigation application needed for an operation for which Annex V (Part SPA) requires an approval, the operator shall demonstrate to the competent authority that the process applied and the delivered products meet standards of integrity that are adequate for the intended use of the data.

(c) The operator shall continuously monitor the integrity of both the process and the products, either directly or by monitoring the compliance of third party providers.

(d) The operator shall ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aeroplanes that require it.

(e) Notwithstanding any other occurrence reporting requirements, the operator shall report to the supplier of electronic navigation data products, any observed failure of the data to meet appropriate standards of accuracy and integrity where, the failure might reasonably be expected to constitute a hazard to flight.

3.2 Proposed amendments to Certification Specification CS-FSTD(A) (Draft EASA Decision)

BOOK 2 (Acceptable Means of Compliance)

SUBPART C – AEROPLANE FLIGHT SIMULATION TRAINING DEVICES

AMC1 FSTD(A).300 Qualification basis

(a) Introduction

(1) Purpose

This AMC establishes the criteria that define the performance and documentation requirements for the evaluation of FSTDs used for training, testing and checking of flight crew members. These test criteria and methods of compliance were derived from extensive experience of competent authorities and the industry.

…….

(b) FSTD Validation Tests

(1) General

(i) FSTD performance and system operation should be objectively evaluated by comparing the results of tests conducted in the FSTD with aeroplane data ….

(c) Functions and subjective tests

(1) Discussion

(i) Accurate replication of aeroplane systems functions should be checked at each flight crew member position. This includes procedures ……

(2) Test requirements

(i) The ground and flight tests and other checks required for qualification….

Functions and subjective tests

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS	**FFS**				**FTD**		**FNPT**			**BITD**
	A	**B**	**C**	**D**	**1**	**2**	**I**	**II**	**MCC**	
a PREPARATION FOR FLIGHT										
(1) Preflight. …..										
b SURFACE OPERATIONS (PRE-TAKE-OFF)										
…..										
c TAKE-OFF										
…..										
d CLIMB										
…..										
e CRUISE										
…..										
f MANOEUVRES										
…..										
g DESCENT										
….										
h INSTRUMENT APPROACHES AND LANDING										

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS	FFS				FTD		FNPT			BITD
	A	**B**	**C**	**D**	**1**	**2**	**I**	**II**	**MCC**	
Only those instrument approach and landing tests relevant to the simulated aeroplane type or class should be selected from the following list, where tests should be made with limiting wind velocities, wind shear and with relevant system failures, including the use of flight director.										
(1) Precision										
…..	✓	✓	✓	✓			✓	✓	✓	✓
(2) Non-precision		✓	✓	✓	✓	✓			✓	✓
(a) NDB	✓	✓	✓	✓	✓	✓	✓	✓		
(b) VOR, VOR/DME, VOR/TAC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(c) ~~RNAV (GNSS)~~ RNP-APCH	✓	✓	✓	✓	✓	✓		✓	✓	
(d) ILS LLZ (LOC), LLZ(LOC)/BC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(e) ILS offset localizer	✓	✓	✓	✓						
(f) direction finding facility	✓	✓	✓	✓						
(g) surveillance radar	✓	✓	✓	✓						
NOTE: If Standard operating procedures are to use autopilot for non-precision approaches then these should be evaluated.										
i **VISUAL APPROACHES (SEGMENT) AND LANDINGS**										
…….										

3.3 Proposed amendments to Certification Specification CS-FSTD(H) (Draft EASA Decision)

BOOK 2 (Acceptable Means of Compliance)

SUBPART C – HELICOPTER FLIGHT SIMULATION TRAINING DEVICES

AMC1 FSTD(H).300 Qualification basis

(a) Introduction

(1) Purpose

This AMC establishes the criteria that define the performance and documentation requirements for the evaluation of FSTDs ……

(b) FSTD validation tests

(1) General

(i) FSTD performance and system operation should be objectively evaluated by comparing the results of tests conducted in the FSTD with helicopter data unless …..

(c) Functions and subjective tests

(1) Discussion

(i) Accurate replication of helicopter systems functions should be checked at each flight crew …..

Functions and subjective tests

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS		**FFS**				**FTD**			**FNPT**			
		A	**B**	**C**	**D**	**1**	**2**	**3**	**I**	**II**	**III**	**MCC**
a	**PREPARATION FOR FLIGHT**											
	…..											
j	**INSTRUMENT APPROACHES**											
	Only those instrument approach tests relevant to the simulated helicopter type or system(s) and MCC training should be selected from the following list.											
	(1) Non-precision:											
	(a) All engines operating	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(b) One or more engines inoperative	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(c) Approach procedures:											
	(i) NDB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(ii) VOR/DME, ~~RNAV~~	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(iii) ARA (Airborne radar approach)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(iv) ~~GPS~~ RNP APCH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(v) Other	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(d) Missed approach:											
	……											
k	**APPROACH TO LANDING AND TOUCH DOWN**											
	…..											

3.4 Proposed amendments to AMC /GM to Part FCL (Draft EASA Decision)

The following GM2 is added to FCL.010:

GM2 FCL.010 (lateral and vertical navigation)

Lateral and vertical navigation guidance refers to the guidance provided either by:

(a) a ground-based radio navigation aid; or

(b) computer-generated navigation data from ground-based, space-based, self-contained navigation aids or a combination of these).

DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES FOR SUBJECT 062 - RADIO NAVIGATION

Insert the following:

Appendix 1.062 Alternative MC1 FCL.310; FCL.515(b); FCL.615(b)

Delete 062 05 01, 062 05 02, 062 05 03.

062 07 00 00	**PBN**						
062 07 01 00	PBN concept (as described in ICAO doc 9613)						
062 07 01 01	PBN principles						
LO	List the factors used to define RNAV or RNP system performance requirements (accuracy, integrity, continuity and functionality)	x		x			x
LO	Explain the concept of continuity	x		x			x
LO	Explain the concept of integrity	x		x			x
LO	State that, unlike conventional navigation, performance-based navigation is not sensor specific.	x		x			x
LO	Explain the difference between raw data and computed data						
062 07 01 02	PBN components						
LO	List the components of PBN as NAVAID infrastructure, navigation specification and navigation application	x		x			x
LO	Identify the components from an example	x		x			x
062 07 01 03	PBN scope						
LO	State that in oceanic/remote, en-route and terminal phases of flight, PBN is limited to operations with linear lateral performance requirements and time constraints	x		x			x
LO	State that in the approach phases of flight, PBN accommodates both linear and angular laterally guided operations.	x		x			x

062 07 02 00	Navigation Specifications						
062 07 02 01	RNAV and RNP						
LO	State the difference between RNAV and RNP in terms of the requirement for on-board performance monitoring and alerting	x		x			x
062 07 02 02	Navigation functional requirements						
LO	List the basic functional requirements of RNAV and RNP specifications (continuous indication of lateral deviation, distance/bearing to active waypoint, g/s or time to active waypoint, navigation data storage and failure indication)	x		x			x
062 07 02 03	Designation of RNP and RNAV specifications						
LO	Interpret X in RNAV X or RNP X as the lateral navigation accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route or procedure.	x		x			x
LO	State that aircraft approved to the more stringent accuracy requirements may not necessarily meet some of the functional requirements of the navigation specification having a less stringent accuracy requirement.	x		x			x
LO	State that RNAV10 and RNP4 are used in the oceanic/remote phase of flight	x		x			x
LO	State that RNAV5 is used in the enroute and arrival phase of flight	x		x			x
LO	State that RNAV2 and RNP2 are also used as navigation specifications	x		x			x
LO	State that RNP2 is used in the enroute, and oceanic/remote phases of flight	x		x			x
LO	State that RNAV1 and RNP1 are used in the arrival and departure phases of flight	x		x			x
LO	State that RNP APCH is used in the approach phase of flight	x		x			x
LO	State that RNP AR APCH is used in the approach phase of flight	x		x			x
LO	State that RNP 0.3 navigation specification is used in all phases of flight except for oceanic/remote and final approach, primarily for helicopters	x		x			x
062 07 03 00	Use of PBN						
062 07 03 01	Airspace Planning						

LO	State that navigation performance is one factor used to determine minimum route spacing	x		x			x
062 07 03 02	Approval						
LO	State that the airworthiness approval process assures that each item of the area navigation equipment installed is of a type and design appropriate to its intended function and that the installation functions properly under foreseeable operating conditions	x		x			x
LO	State that some PBN specifications require operational approval	x		x			x
062 07 03 03	Specific RNAV and RNP system functions						
LO	Recognise the definition of an RF leg	x		x			x
LO	Recognise the definition of a fixed radius transition	x		x			x
LO	Recognise the definition of a fly-by turn and a fly-by turn	x		x			x
LO	Recognise the definition of a holding pattern	x		x			x
LO	Recognise the definition of an 'ARINC 424 path terminator'	x		x			x
LO	Recognise the definition of the following path terminators: IF, TF, CF, DF, FA, CA	x		x			x
LO	Recognise the definition of an offset flight path	x		x			x
062 07 03 04	Data processes						
LO	State that the safety of the application is contingent upon the accuracy, resolution and integrity of the data.	x		x			x
LO	State that the accuracy of the data depends upon the processes applied during the data origination.	x		x			x
062 07 04 00	PBN operations						
062 07 04 01	PBN principles						
LO	Recognise the definition of path definition error	x		x			x
LO	Recognise the definition of flight technical error	x		x			x
LO	Recognise the definition of navigation system error	x		x			x
LO	Recognise the definition of total system error	x		x			x
062 07 04 02	On-board performance monitoring and alerting						
LO	State that on board performance monitoring and alerting of flight technical error is managed by on board systems or crew procedures.	x		x			x
LO	State that on board performance monitoring and alerting of navigation system error is a requirement of on-board equipment for RNP.	x		x			x
LO	State that on board performance monitoring and alerting of path definition error are managed by gross reasonableness checks of navigation data.	x		x			x

062 07 04 03	Abnormal situations						
LO	State that abnormal and contingency procedures are to be used in case of the loss of PBN capability.	x		x			x
062 07 04 04	Database management						
LO	State that, unless otherwise specified in operations documentation or AMC, the navigational database must be valid for the current AIRAC cycle.	x		x			x
062 07 05 00	Requirements of specific RNAV and RNP specifications						
062 07 05 01	RNAV10						
LO	State that RNAV 10 requires that aircraft operating in oceanic and remote areas be equipped with at least two independent and serviceable LRNSs comprising an INS, an IRS FMS or a GNSS,	x		x			x
LO	State that aircraft incorporating dual inertial navigation systems (INS) or inertial reference units (IRU) have a standard time limitation	x		x			x
LO	State that operators may extend their RNAV10 navigation capability time by updating.	x		x			x
062 07 05 02	RNAV5						
LO	State that manual data entry is acceptable for RNAV5	x		x			x
062 07 05 03	RNAV/RNP1/2						
LO	State that pilots must not fly an RNAV/RNP1/2 SID or STAR unless it is retrievable by route name from the on- board navigation database and conforms to the charted route.	x		x			x
LO	State that the route may subsequently be modified through the insertion (from the database) or deletion of specific waypoints in response to ATC clearances.	x		x			x
LO	State that the manual entry, or creation of new waypoints by manual entry, of latitude and longitude or place/bearing/distance values is not permitted.	x		x			x
062 07 05 04	RNP4						
LO	State that at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, must be operational at the entry point of the RNP airspace	x		x			x
062 07 05 05	RNP APCH						
LO	State that pilots must not fly an RNP APCH unless it is retrievable by procedure name from the on- board navigation database and conforms to the charted procedure.	x		x			x
LO	State that an RNP APCH to LNAV minima is a non-precision instrument approach procedure designed for 2D approach operations	x		x			x
LO	State that an RNP APCH to LNAV/VNAV minima has lateral guidance based on GNSS and vertical guidance based on either SBAS or BaroVNAV	x		x			x

LO	State that an RNP APCH to LNAV/VNAV minima may only be conducted with vertical guidance certified for the purpose	x		x			x
LO	Explain why an RNP APCH to LNAV/VNAV minima based on BaroVNAV may only be conducted when the aerodrome temperature is within a promulgated range	x		x			x
LO	State that the correct altimeter setting is critical for the safe conduct of an RNP APCH using BaroVNAV	x		x			x
LO	State that an RNP APCH to LNAV/VNAV minima is a 3D operation	x		x			x
LO	State that an RNP APCH to LPV minima is a 3D operation	x		x			x
LO	State that RNP APCH to LPV minima requires a FAS datablock	x		x			x
062 07 05 06	RNP AR APCH						
LO	State that RNP AR APCH requires authorisation	x		x			x
062 07 05 07	A-RNP						
LO	State that Advanced RNP incorporates the navigation specifications RNAV5, RNAV2, RNAV1, RNP2, RNP1 and RNP APCH	x		x			x
LO	State that Advanced RNP may be associated with other functional elements	x		x			x
062 07 05 08	PBN Point in Space (PinS) Departure						
LO	State that a PinS departure is a departure procedure designed for helicopter only	x		x			x
LO	State that a PinS departure procedure includes either a 'proceed VFR' or a 'proceed visually' instruction from landing location to IDF	x		x			x
LO	Recognise the differences between 'proceed VFR' and 'proceed visually' instruction.	x		x			x
062 07 05 09	PBN Point in Space (PinS) Approach						
LO	State that a PinS approach is an instrument RNP APCH procedure designed for helicopter only and that may be published with LNAV minima or LPV minima	x		x			x
LO	State that a PinS approach procedure includes either a 'proceed VFR' or a 'proceed visually' instruction from the MAPt to a landing location	x		x			x
LO	Recognise the differences between 'proceed VFR' and 'proceed visually' instruction.	x		x			x

3.5 Proposed amendments to AMC/GM Part ARA (Draft EASA Decision)

AMC5 ARA.FSTD.100(a)(1) Initial evaluation procedure

3.6.1.1 FSTD evaluation report for initial and recurrent evaluation

FSTD Evaluation Report

Date:……..

[competent authority]
FSTD EVALUATION REPORT

[Member State] FSTD code (if applicable):
EASA FSTD code (if applicable):
Aircraft type and variant:
Class of aeroplane / type of helicopter:
Engine fit(s) simulated:

Contents
1. Flight simulation training device (FSTD) characteristics
2. Evaluation details
3. Supplementary information
4. Training, testing and checking considerations
5. Classification of items
6. Results
7. Evaluation team

The conclusions presented are those of the evaluation team. The competent authority reserves the right to change these after internal review.

1. Flight simulation training device (FSTD)					
…..					
2. Evaluation details					
…..					
3. Supplementary information					
….					
4. Training, testing and checking considerations					
CAT I	RVR	m	DH	ft	
CAT II	RVR	m	DH	ft	
CAT III (lowest minimum)	RVR	m	DH	ft	
LVTO	RVR	m			
Recency					
IFR-training/check					
Type rating					
Proficiency checks					
Autocoupled approach					

Autoland/Roll out guidance	
ACAS I / II	
Windshear warning system/predictive windshear	
WX-Radar	
HUD/HUGS	
FANS	
GPWS/EGPWS	
ETOPS capability	
~~GPS~~ RNP APCH LNAV	
RNP APCH LNAV/VNAV	
RNP APCH LPV	
RNP AR APCH	
Other	

Subject: 062 – RADIO NAVIGATION						
Theoretical knowledge examination Exam length, total questions and distribution of questions						
	ATPL(A)	CPL(A)	ATPL(H) /IR	ATPL(H)	CPL(H)	IR(A) & (H)
Time allowed (hours)	1:30	0:30	1:30	1:00	0:30	1:00
Distribution of questions with regard to the topics of the syllabus						
062 01	07	04	07	05	04	02
062 02	21	12	21	15	12	23
062 03	12	02	12	08	02	05
062 04	XX	XX	XX	XX	XX	XX
062 05	10	XX	10	XX	XX	05
062 06	11	04	11	06	04	04
062 07	05	XX	05	XX	XX	05
Total questions	66	22	66	34	22	44

5. Classification of items

UNACCEPTABLE

An item ……

3.6 Proposed amendments to AMC /GM to Annex I to AIR-OPS (definitions) (Draft EASA Decision)

Definitions for terms used in Annexes II-VII

GM1 Annex I Definitions

DEFINITIONS FOR TERMS USED IN ACCEPTABLE MEANS OF COMPLIANCE AND GUIDANCE MATERIAL

(a) For the purpose of Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 965/2012, the following definitions should apply:

…

'Accuracy' means in the context of PBN operations the degree of conformance between the estimated, measured or desired position and/or the velocity of a platform at a given time, and its true position or velocity. Navigation performance accuracy is usually presented as a statistical measure of system error and is specified as predictable, repeatable and relative.

'Aircraft-based augmentation system (ABAS)' means an augmentation system that augments and/or integrates the information obtained from the other GNSS elements with information available on board the aircraft. The most common form of ABAS is receiver autonomous integrity monitoring (RAIM).

'Area Navigation (RNAV)' means a method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

'Availability' means in the context of PBN operations an indication of the ability of the system to provide usable service within the specified coverage area and is defined as the portion of time during which the system is to be used for navigation during which reliable navigation information is presented to the crew, automatic pilot or other system managing the flight of the aircraft.

'Continuity of function' means in the context of PBN operations the capability of the total system, comprising all elements necessary to maintain aircraft position within the defined airspace, to perform its function without non-scheduled interruptions during the intended operation.

'Integrity' means in the context of PBN operations the ability of a system to provide timely warnings to users when the system should not be used for navigation.

'RAIM' means a technique whereby a GNSS receiver/processor determines the integrity of the GNSS navigation signals using only GNSS signals or GNSS signals augmented with altitude. This determination is achieved by a consistency check among redundant pseudo-range measurements. At least one satellite in addition to those required for navigation has to be in view for the receiver to perform the RAIM function.

'Vertical navigation' means a method of navigation which permits aircraft operation on a vertical flight profile using altimetry sources, external flight path references, or a combination of these.

…

2) GM2 Annex I was amended as follows. The following abbreviations and acronyms should be added in alphabetical order:

GM2 Annex I Definitions

ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in the Annexes to this Regulation:

…

ABAS	aircraft based augmentation system

…

A-RNP	advanced required navigation performance

…

FOSA	flight operational safety assessment

…

FTE	flight technical error

…

PC/PT	proficiency check / proficiency training

…

RAIM	receiver autonomous integrity monitoring

…

RF	radius to fix

…

TLS	target level of safety

…

TOGA	take-off / go around

3.7 Proposed amendments to AMC /GM to Part ARO (Draft EASA Decision)

GM1 ARO.OPS.230 Temporary limitation on RVR

Where operators are new to RNP operations and whose initial application is for RNP < 0.3, it is appropriate to establish a temporary limitation for minima consistent with RNP 0.3, until operational experience is gained. This period could be based upon time (e.g., 90 days) and/or a number of conducted operations (e.g., 100 RNP approach operations), as agreed by the competent authority and operator.

GM2 ARO.OPS.230 Specific approval of RNP AR APCH

PROCEDURE-SPECIFIC APPROVAL

The following criteria could be taken into consideration by the competent authority to require a procedure-specific RNP AR APCH approval:

(a) RNP lower than 0.3 along the RF leg; or

(b) Missed approach with RNP value below 1 with RF leg.

GM3 ARO.OPS.230 Specific approval of RNP AR APCH

REFERENCES

Guidance material for the operational approval of PBN operations, when required, can be found in ICAO Doc 9997 Performance-Based Navigation (PBN) Operational Approval Manual.

In particular a job aid can be found in paragraph 4.7 therein for assessment of applications for RNP AR APCH.

3.8 Proposed amendments to AMC /GM to Part ORO (Draft EASA Decision)

AMC2 ORO.GEN.160 was added as follows:

Subpart GEN – General requirements

Section I - General

AMC2 ORO.GEN.160 Occurrence reporting

REPORTABLE EVENTS OF PBN OPERATIONS

(a) A reportable event should be an event that adversely affects the safety of the operation and may be caused by actions or events external to the operation of the aircraft navigation system.

(b) Technical defects and the exceeding of technical limitations should be considered as reportable events, including:

(1) significant navigation errors attributed to incorrect data or a database coding error;

(2) unexpected deviations in lateral/vertical flight path not caused by flight crew input or erroneous operation of equipment;

(3) significant misleading information without a failure warning;

(4) total loss or multiple navigation equipment failure; and

(5) loss of integrity, e.g. RAIM function, whereas integrity was predicted to be available during the pre-flight planning.

(c) The operator should have in place a system for investigating such an event to determine if it is due to an improperly coded procedure or a navigation data base error. The operator should initiate corrective actions for such events.

…

Subpart FC – Flight crew

…

Section II – Additional requirements for commercial air transport operations

…

2) AMC1 ORO.FC.230 was amended as follows:

AMC1 ORO.FC.230 Recurrent training and checking

RECURRENT TRAINING SYLLABUS

…

(b) Recurrent checking

Recurrent checking should comprise the following:

(1) Operator proficiency checks

(i) Aeroplanes

Where applicable, operator proficiency checks should include the following manoeuvres as pilot flying:

(A) rejected take-off when an FSTD is available to represent that specific aeroplane, otherwise touch drills only;

(B) take-off with engine failure between V1 and V2 (take-off safety speed) or, if carried out in an aeroplane, at a safe speed above V2;

(C) ~~precision instrument~~ 3D approach operation to minima with, in the case of multi-engine aeroplanes, one-engine-inoperative;

(D) ~~non-precision~~ 2D approach operation to minima;

(E) at least one of the 3D or 2D approach operations should be an RNP APCH operation;

(~~E~~F) missed approach on instruments from minima with, in the case of multi-engined aeroplanes, one-engine-inoperative;

(~~F~~G) landing with one-engine-inoperative. For single-engine aeroplanes a practice forced landing is required.

(ii) Helicopters

…

(B) For pilots required to engage in IFR operations, proficiency checks include the following additional abnormal/emergency procedures:

- ~~precision instrument~~ 3D approach operation to minima;
- go-around on instruments from minima with, in the case of multi-engined helicopters, a simulated failure of one engine;
- ~~non-precision~~ 2D approach operation to minima;
- at least one of the 3D or 2D approach operations should be an RNP APCH operation;
- in the case of multi-engined helicopters, a simulated failure of one engine to be included in either the ~~precision or non-precision~~ 3D or 2D approach operation to minima;
- landing with a simulated failure of one or more engines;
- where appropriate to the helicopter type, approach with flight control system/flight director system malfunctions, flight instrument and navigation equipment failures.

…

3.9 Proposed amendments to AMC /GM to Part CAT (Draft EASA Decision)

…

Subpart B – Operating procedures

Section 1 – Motor-powered aircraft

…

AMC1 CAT.OP.MPA.127 Performance-based navigation

MONITORING AND VERIFICATION

(a) Pre-flight and general considerations

At navigation system initialisation, the flight crew should confirm that the navigation database is current and verify that the aircraft position, if required, has been entered correctly.

The active flight plan, if applicable, should be checked by comparing the charts or other applicable documents with navigation equipment and displays. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. Where relevant, the RF leg arc radii should be confirmed.

If required by a procedure established by the operator, a check should be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid.

A procedure should not be used if doubt exists as to the validity of the procedure in the navigation database.

During the PBN operation, where feasible, flight progress should be monitored by cross-checks, with conventional navigation aids:

1) for navigational reasonableness, and

2) so as to allow immediate cross-checking or reversion in the event of loss of GPS GNSS navigation capability.

Where applicable and when used (e.g. in RNAV 10), the flight crew should monitor automatic updating of the inertial systems to ensure the period without updating does not exceed any permitted limit.

(b) Departure

Prior to commencing a take-off on a PBN procedure, the flight crew should verify that the RNAV system is available and operating correctly and, where applicable, the correct airport and runway data have been loaded.

A positive check should be made that the indicated aircraft position is consistent with the actual aircraft position at the start of the take-off roll.

For non-GNSS systems, unless automatic updating of the actual departure point is provided, the flight crew should ensure initialisation on the runway or FATO either by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent position shift after a take-off. Where GNSS is used, the signal should be acquired before the take-off roll commences and GNSS position may be used in place of the runway update.

(c) Arrival and approach

Flight crew should verify that their aircraft navigation system is operating correctly and the correct arrival procedure and runway (including any applicable transition) are entered and properly depicted.

Although a particular method is not mandated, any published altitude and speed constraints should be observed.

Flight crew should check approach procedures (including alternate aerodromes if needed) as extracted by the system (e.g. CDU flight plan page) or presented graphically on the moving map, in order to confirm the correct loading and the reasonableness of the procedure content.

For PBN systems without GNSS updating, a navigation accuracy check is required during the descent phase before reaching the Initial Approach Fix. For GNSS based systems, absence of an integrity alarm is considered sufficient. If the check fails, a conventional procedure should be flown.

In addition to normal procedure prior to commencing the approach (before the IAF and in compatibility with crew workload), the flight crew should verify the correctness of the loaded procedure by comparison with the appropriate approach charts. This check should include:

1) The waypoint sequence.

2) Reasonableness of the tracks and distances of the approach legs, and the accuracy of the inbound course and mileage of the final approach segment.

3) The vertical path angle if applicable.

For RNP APCH operations using BARO VNAV, the flight crew should check that the two altimeters provide equivalent altitude (difference of 100 feet max) at or before FAF. This check should be made after the flight crew has set the correct altimeter setting.

The flight crew should also check the consistency between the VNAV guidance and the primary altimeters indications commensurate with pilot workload (e.g. after the aircraft is established on the vertical path).

During the descent, flight crew should check that the vertical speed is consistent with the VNAV angle to be flown.

(d) Barometric input and altimetry

For an RNP system with ABAS requiring barometric corrected altitude, the current aerodrome barometric altimeter setting should be input at the appropriate time and location, consistent with the performance of the flight operation.

For RNP APCH operations using BARO VNAV, the flight crew should confirm the correct altimeter setting. The procedure should only be flown with:

1) a current local altimeter setting source available; and

2) the QNH/QFE, as appropriate, set on the aircraft's altimeters.

The flight crew should not use a remote or regional altimeter setting source for RNP APCH using BARO VNAV to LNAV/VNAV minima.

RNP APCH operations to LNAV/VNAV minima are not permitted when the aerodrome temperature is outside the promulgated aerodrome temperature limits for the procedure, unless the PBN system is equipped with approved cold temperature compensation for the final approach. Only the final approach segment is protected by the promulgated aerodrome temperature limits, and the flight crew should consider the effect of temperature on terrain and obstacle clearance in other phases of flight.

Where BARO VNAV is used in other operations, the flight crew should consider the effect of temperature on terrain and obstacle clearance in all phases of flight, in particular on any step-down fix.

(e) Sensor and RNP selection

For multi-sensor systems, the flight crew should verify, during the approach, that the GNSS sensor is used for position computation.

Flight crew of aircraft with RNP input selection capability should confirm that the indicated RNP value is appropriate for the PBN operation.

AMC2 CAT.OP.MPA.127 Performance-based navigation

For RNAV 1/2, RNP 1/2 and RNP APCH, the flight crew should not insert nor modify waypoints by manual entry into a procedure or route that has been retrieved from the database, and manual entry of coordinates is not permitted.

For RNP 4 operations, the flight crew should not modify waypoints that have been retrieved from the database. User defined data (e.g. for flex-track routes) may be entered and used.

The lateral and vertical definition of the flight path between the FAF and the Missed Approach Point (MAPt) retrieved from the database should not be revised by the flight crew.

AMC3 CAT.OP.MPA.127 Performance-based navigation

DISPLAYS AND AUTOMATION

During an RNAV 1, RNP 1 or RNP APCH procedure, flight crew should use a lateral deviation indicator, flight director or autopilot in lateral navigation mode.

The appropriate displays should be selected so that the following information can be monitored:

a) The RNAV computed desired path (DTK), and

b) Aircraft position relative to the lateral path (CrossTrack Deviation) for FTE monitoring,

c) Aircraft position relative to the vertical path (for a 3D operation).

Flight crew of aircraft with a lateral deviation indicator (e.g. CDI) should ensure that lateral deviation indicator scaling (fullscale deflection) is suitable for the navigation accuracy associated with the various segments of the procedure.

Flight crew should maintain procedure centrelines, as depicted by on board lateral deviation indicators and/or flight guidance during all the approach procedure unless authorised to deviate by ATC or under emergency conditions.

Crosstrack error/deviation (the difference between the RNAV system computed path and the aircraft position relative to the path) should normally be limited to ± ½ the RNAV/RNP value associated with the procedure. Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after turns, up to a maximum of 1 times the RNAV/RNP value are allowable.

For a 3D approach operation, flight crew should use a vertical deviation indicator and, where required by AFM limitations, a flight director or autopilot in vertical navigation mode. Deviations below the vertical path should not exceed 75 feet, or half-scale deflection where angular deviation is indicated. The flight crew should execute a missed approach if the vertical deviation exceeds this criterion, unless the flight crew has in sight the visual references required to continue the approach.

AMC4 CAT.OP.MPA.127 Performance-based navigation

VECTORING AND POSITIONING

ATC tactical interventions in the terminal area may include radar headings, 'direct to' clearances which bypass the initial legs of an approach, interceptions of an initial or intermediate segments of an approach or the insertion of additional waypoints loaded from the data base. In complying with ATC instructions, the flight crew should be aware of the implications for the navigation system.

'Direct to' clearances may be accepted to the Intermediate Fix (IF) provided that it is clear to the crew that the aircraft will be established on the final approach track at least 2 miles from the FAF.

'Direct to' clearance to FAF is not acceptable. Modifying the procedure to intercept the final approach course prior to the FAF is acceptable for radar vectored arrivals or at other times with ATC approval.

The final approach trajectory should be intercepted no later than the FAF in order for the aircraft to be correctly established on the final approach course before starting the descent (to ensure terrain and obstacle clearance).

'Direct to' clearances to a fix that immediately precede an RF leg are not permitted.

For parallel offset operations enroute (in RNP 4 and Advanced RNP), transitions to and from the offset track should maintain an intercept angle of between 30 and 45° unless specified otherwise by ATC.

AMC5 CAT.OP.MPA.127 Performance-based navigation

ALERTING AND ABORT

A RNP APCH procedure should be discontinued:

a) if navigation system failure is annunciated (e.g. warning flag);

b) if lateral or vertical (if provided) FTE exceeds the tolerances of AMC3 CAT.OP.MPA.127;

c) if, where applicable, VNAV trajectory is not consistent with aircraft altimetry system information or vertical speed information;

d) if integrity failure is annunciated (e.g. RAIM alert);

e) if integrity monitoring is lost (e.g. RAIM loss);

unless the pilot has sufficient visual reference to continue the approach to a safe landing.

Discontinuing the procedure may not be necessary for a multisensor navigation system that includes demonstrated RNP capability without GNSS in accordance with the AFM.

Where vertical guidance is lost while the aircraft is still above 1 000 ft AGL, the flight crew may decide to continue the approach to LNAV minima, when supported by the navigation system.

The missed approach should be flown in accordance with the published procedure. Use of PBN navigation during the missed approach procedure is acceptable, provided:

a) the navigation system enabling PBN is operational (e.g. no loss of function, no RAIM alert, no failure indication, etc.). Where the missed approach is triggered by the failure or failure of integrity of one sensor system, it does not preclude the use of a different sensor for the missed approach procedure.

b) the whole procedure (including the missed approach) is loaded from the navigation data base.

AMC6 CAT.OP.MPA.127 Performance-based navigation

CONTIGENCY PROCEDURES

The operator should develop contingency procedures for the contingencies set out in GM2 CAT.OP.MPA.127 using the guidance therein.

Where the contingency to revert to a conventional arrival procedure is required, the flight crew should make the necessary preparation. The following conditions should be considered:

(a) failure of the navigation system components including those affecting flight technical error (e.g. failures of the flight director or autopilot);

(b) multiple system failures;

(c) failure of the navigation sensors;

(d) coasting on inertial sensors beyond a specified time limit;

(e) RAIM (or equivalent) alert or loss of integrity function.

In the event of loss of PBN capability, the flight crew should invoke contingency procedures and navigate using an alternative means of navigation which may include the use of an inertial system. The alternative means need not be a PBN system.

Flight crew should ensure sufficient means are available to navigate and land at the destination or at an alternate aerodrome in the case of loss of RNP APCH capability.

In the event of failure of one PBN system during a procedure where two systems are necessary, the flight crew should abort the procedure if the failure occurs before FAF but may continue the approach if the failure occurs after FAF.

The flight crew should notify ATC of any problem with PBN navigation capability.

In the event of communications failure, the flight crew should continue with procedures in accordance with published lost communication procedures.

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GM1 CAT.OP.MPA.127 Performance-based navigation

DESCRIPTION

For both RNP X and RNAV X designations, the 'X' (where stated) refers to the lateral navigation accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route or procedure. For RNP APCH and Advanced RNP, the lateral navigation accuracy depends on the leg.

Performance-based navigation (PBN) may be required on notified routes, for notified procedures and in notified airspace.

AMC1 CAT.OP.MPA.135 Routes and areas of operation — general

RNAV 10

(a) Operating procedures and routes should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace. Where an extension to the time limit is permitted, the flight crew should ensure en-route radio facilities are serviceable prior to entering RNAV 10 airspace, and to apply radio updates in accordance with any Aircraft Flight Manual limits.

(b) Operators may extend their RNAV 10 inertial navigation time by position updating. An operator should calculate, using statistically based typical winds for each

planned route, points at which updates can be made, and the points at which further updates will not be possible.

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GM1 CAT.OP.MPA.135 Routes and areas of operation — general

RNAV 10

The designation RNP 10, used before the publication of the fourth edition of ICAO Doc 9613 in 2013, was inconsistent with PBN RNP and RNAV specifications. RNP 10 did not in fact include requirements for on-board performance monitoring and alerting.

For purposes of consistency with the PBN concept, RNP 10 is referred to as RNAV 10 in Part CAT. Renaming current RNP 10 routes to an RNAV 10 designation would be an extensive and expensive task, which is not cost-effective.

Consequently, the terms RNP 10 (obsolete) and RNAV 10 can be considered equivalent in any regulatory material, approval or aeronautical chart or publication.

AMC1 CAT.OP.MPA.175 Flight preparation

FLIGHT PREPARATION FOR PBN OPERATIONS

(a) Flight crew should ensure that RNAV 1/2, RNP 1/2 and RNP APCH procedures to be used for the intended flight, including alternates aerodromes, are selectable from the navigation database and are not prohibited by a company instruction or NOTAM.

(b) Flight crews should take account of any NOTAMs or operator briefing material that could adversely affect the aircraft system operation, or the availability or suitability of the procedures at the airport of landing, or any alternate airport.

(c) When PBN relies on GNSS systems for which RAIM is required for integrity, its availability should be verified during the prefight planning. In the event of a predicted continuous loss of fault detection of more than 5 minutes, the flight planning should be revised to reflect the lack of full PBN capability for that period.

(d) For RNP 4 operations with only GNSS sensors, a Fault Detection and Exclusion (FDE) check should be accomplished. The maximum allowable time for which FDE capability is projected to be unavailable on any one event is 25 minutes. If predictions indicate that the maximum allowable FDE outage will be exceeded, the operation should be rescheduled to a time when FDE is available.

(e) For RNAV 10 operations, the flight crew should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure en-route radio facilities are serviceable before departure, and to apply radio updates in accordance with any Flight Manual limits.

AMC2 CAT.OP.MPA.175 Flight preparation

DATABASE SUITABILITY

The flight crew should check that any navigational database required for PBN operations includes the routes and procedures required for the flight.

DATABASE CURRENCY

Where a navigation database is required for PBN operations, the database validity (current AIRAC cycle) should be checked before the flight.

Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle is due to change during flight, operators and flight crew should establish procedures to ensure the accuracy of navigation data, including the suitability of navigation facilities used to define the routes and procedures for the flight.

An expired database may only be used if following conditions are satisfied:

(a) the operator confirms that the parts of the database which are intended to be used during the flight and any contingencies that it is reasonable to expect are not changed in the current version;

(b) any NOTAMs associated with the navigational data is taken into account;

(c) the paper (or electronic) maps and charts corresponding to those parts of the flight are current and have not been amended since the last cycle;

(d) any aircraft MEL limitations are observed;

(e) the database is expired by no more than 28 days.

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Subpart D – Instruments, data and equipment

Section 1 – Aeroplanes

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AMC5 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route or diversion for repairs. For multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

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GM2 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not

automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 CAT.IDE.A.355 Electronic navigation data management

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DATABASE SUITABILITY

The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) or equivalent certificate issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with Agency Opinion 01/2005).

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Section 2 – Helicopters

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AMC4 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route or diversion for repairs. Note that for multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

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GM2 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 CAT.IDE.H.355 Electronic navigation data management

ELECTRONIC NAVIGATION DATA PRODUCTS

(a) When the operator of a helicopter uses a navigation database that supports an airborne navigation application as a primary means of navigation, the navigation database supplier should hold a Type 2 letter of acceptance (LoA), or equivalent.

(b) If this airborne navigation application is needed for an operation requiring a specific approval in accordance with Annex V (Part SPA), the operator's procedures should be based upon the Type 2 LoA acceptance process.

DATABASE SUITABILITY

The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) or equivalent certificate issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with Agency Opinion 01/2005).

GM1 CAT.IDE.H.355 Electronic navigation data management

LETTERS OF ACCEPTANCE AND STANDARDS FOR ELECTRONIC NAVIGATION DATA PRODUCTS

(a) A Type 2 LoA is issued by the Agency in accordance with the Agency's Opinion No 01/2005 on The Acceptance of Navigation Database Suppliers. The definitions of navigation database, navigation database supplier, data application integrator, Type 1 LoA and Type 2 LoA can be found in Opinion No 01/2005.

(b) Equivalent to a Type 2 LoA is the FAA Type 2 LoA, issued in accordance with the Federal Aviation Administration (FAA) Advisory Circular AC 20-153 or AC 20-153A, and the Transport Canada Civil Aviation (TCCA) 'Acknowledgement Letter of an Aeronautical Data Process', which uses the same basis.

(c) EUROCAE ED-76/Radio Technical Commission for Aeronautics (RTCA) DO-200A Standards for Processing Aeronautical Data contains guidance relating to the processes that the supplier may follow.

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3.10 Proposed amendments to AMC/GM to Part SPA (draft EASA Decision)

SUBPART B — PERFORMANCE-BASED NAVIGATION (PBN) OPERATIONS

1) GM1 SPA.PBN.100 was amended as follows:

GM1 SPA.PBN.100 PBN Operations

GENERAL

The text of GM1 SPA.PBN.100 is proposed to be entirely replaced by the following text:

(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.

(b) Table 1 provides an overview of:

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

(2) PBN specifications requiring an operational approval.

(c) Guidance material for the operational use of PBN applications can be found in ICAO Doc 9613 Performance-Based Navigation (PBN) 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.

(e) AMC for the relevant airworthiness approvals can be found for:

(1) RNAV 10 (designated also as RNP 10) in AMC 20-12;

(2) RNAV 5 in AMC 20-4;

(3) RNAV 1 in JAA TGL10, whose paragraphs related to operational approval of PRNAV are however no longer applicable;

(4) RNP APCH (LNAV and LNAV/VNAV) in AMC 20-27;

(5) RNP APCH (LPV) in AMC 20-28; and

(6) RNP AR APCH in AMC 20-26.

Table 1: Overview of PBN specifications

Navigation Specification	Flight Phase							
	En route		Arrival	Approach				Departure
	Oceanic/ remote	Continental		Initial	Intermediate	Final	Missed	
RNAV 10	10							
RNAV 5		5	5					
RNAV 2		2	2					2
RNAV 1		1	1	1	1		1	1
RNP 4	4							
RNP 2	2	2						
RNP 1			1	1	1		1	1
A-RNP: except time of arrival control function	2	2 or 1	1	1	1	0.3	1	1
RNP APCH (LNAV)				1	1	0.3	1	
RNP APCH (LNAV/VNAV)				1	1	0.3	1	
RNP APCH (LP)				1	1	0.3	1	
RNP APCH (LPV)				1	1		1	
RNP AR APCH				1-0.1	1-0-1	0.3-0.1	1-0.1	
RNP 0.3 helicopter operations								
A-RNP: time of arrival control function								

x numbers specify the accuracy level

No operational approval required

Operational approval required

2) AMC1 SPA.PBN.105(b) was added:

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

TRAINING AND CREW QUALIFICATION for RNP AR APCH

(a) Introduction

(1) General

(i) The operator should provide training for key personnel, e.g. flight crew members and personnel involved in the pre-flight preparation, in the use and application of RNP AR APCH operations. A thorough understanding of the operational procedures and best practices is critical to the safe operation of aircraft during RNP AR APCH operations.

(ii) This training programme should provide sufficient detail on the aircraft's navigation and flight control systems to enable the flight crew to identify failures affecting the aircraft's RNP capability and the appropriate abnormal/emergency procedures. The training should include both knowledge and skill assessments of the crew members and flight operations officers/dispatchers duties.

(2) Flight crew training

(i) Each operator is responsible for the training of flight crews for the specific RNP AR APCH operations exercised by the operator. The operator should include training on the different types of RNP AR APCH procedures and mandated equipment. Training should include discussion of RNP AR APCH regulatory requirements. The operator should include these requirements and procedures in their flight operations and training manuals, as applicable. This material should cover all aspects of the operator's RNP AR APCH operations, including the applicable individual RNP AR APCH approvals. Flight crew members should have completed the appropriate ground and or flight training segment before engaging in RNP AR APCH operations.

(ii) Flight training segments should include training and checking modules representative of the type of RNP AR APCH operations the operator conducts. An operator may conduct evaluations in line oriented flight training (LOFT) scenarios, selected event training scenarios or in a combination of both. The operator may conduct required flight-training modules in FSTDs and other enhanced training devices as long as these training mediums accurately replicate the operator's equipment and RNP AR APCH operations.

(3) Flight crew qualification training

(i) Operators should address initial RNP AR APCH training and qualifications during initial, conversion, upgrade, recurrent, differences, or stand-alone training and qualification programmes in a respective qualification category. The qualification standards assess each flight crew member's ability to properly understand and use RNP AR APCH operating procedures. The operator should also develop recurrent qualification standards to ensure their flight crews maintain appropriate RNP AR APCH knowledge and skills (RNP AR APCH recurrent qualification).

(ii) Operators may address RNP AR APCH operation topics separately or integrate them with other curriculum elements. For example, an RNP AR APCH flight crew qualification may key on a specific aircraft during transition, upgrade, or differences courses. General training may also address RNP AR APCH qualification (e.g. during recurrent training or checking events such as recurrent proficiency check/proficiency training (PC/PT), line-oriented

evaluation (LOE) or special purpose operational training. A separate, independent RNP AR APCH qualification programme may also address RNP AR APCH training, e.g. by completion of a special RNP AR APCH curriculum at an operator's training centre or at designated flight crew bases.

(iii) Operators intending to receive credit for RNP training, when their proposed programme relies on previous training (e.g. Special RNP IAP's) should be an element of the operational approval process. In addition to the current RNP training programme, the operator should provide differences training between existing training programmes and the RNP AR APCH training requirements.

(4) Training for personnel involved in the flight preparation

(i) Training for personnel involved in the flight preparation should include training on the different types of RNP AR APCH procedures, the importance of specific navigation equipment and other equipment during RNP AR APCH operations and discuss RNP AR APCH regulatory requirements and procedures.

(ii) Procedures for the personnel and training manuals should include these provisions, as applicable. This material should cover all aspects of the operator's RNP AR APCH operations including the applicable individual operational approvals.

(iii) An individual should have completed the appropriate training course before engaging in RNP AR APCH operations.

(iv) Additionally, the training should address how to determine RNP AR APCH availability (considering aircraft equipment capabilities), MEL requirements, aircraft performance, and navigation signal availability (e.g. GNSS RAIM/predictive RNP capability tool) for destination and alternate aerodromes.

(b) Theoretical knowledge

(1) Theoretical knowledge training should address the following subjects as training modules 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.

(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.

(ii) The training should include general knowledge and operational application of RNP AR APCH instrument approach procedures. This training module should address the following specific elements:

(A) definitions of RNAV, RNAV (GNSS), RNP, RNP AR APCH, RAIM, and containment areas;

(B) the differences between RNAV and RNP;

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

(D) the programming and display of RNP and aircraft specific displays (e.g. Actual Navigation Performance);

(E) the method to enable and disable the navigation updating modes related to RNP;

(F) RNP values appropriate for different phases of flight and RNP AR APCH instrument procedures and how to select (if mandated);

(G) the use of GNSS RAIM (or equivalent) forecasts and the effects of RAIM 'holes' on RNP AR APCH procedures (flight crew and personnel involved in the flight preparation);

(H) when and how to terminate RNP navigation and transfer to traditional navigation due to loss of RNP and/or required equipment;

(I) the method to determine if the navigation database is current and contains required navigational data;

(J) explanation of the different components that contribute to the total system error and their characteristics (e.g. effect of temperature on BARO-VNAV, drift characteristics when using IRU with no radio updating, considerations in making suitable temperature corrections for altimeter systems);

(K) temperature compensation. Flight crews 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 cold temperature effects on minimum altitudes or the DA/H;

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

(M) the effect of groundspeed on compliance with RNP AR APCH procedures and bank angle restrictions that may impact the ability to remain on the course centreline. For RNP procedures aircraft are expected to maintain the standard speeds associated with applicable category;

(N) 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 procedures outside the final approach fix (FAF) versus inside the FAF);

(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;

(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;

(Q) the events that trigger a missed approach when using the aircraft's RNP capability to complete an RNP AR APCH procedure;

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

(S) ensuring flight crews understand the performance issues associated with reversion to radio updating, know any limitations on the use of DME and VOR updating;

(T) familiarisation with the terrain and obstacles representations on navigation displays and approach charts.

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

(i) Theoretical training should instruct the flight crews on proper flight plan classifications and any air traffic control (ATC) procedures applicable to RNP AR APCH operations. The flight crews should receive instruction on the need to advise ATC immediately when the performance of the aircraft's navigation system is no longer suitable to support continuation of an RNP AR APCH operation. Flight crews 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.

(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.

(ii) The flight crews and personnel involved in the flight preparation should achieve a thorough understanding of the equipment used in RNP operations and any limitations on the use of the equipment during those operations.

(5) AFM information and operating procedures

(i) The AFM or other aircraft eligibility evidence should address normal and abnormal flight crew operating procedures, responses to failure alerts, and any limitations, including related information on RNP modes of operation. Training should also address contingency procedures for loss or degradation of RNP capability. The manuals used by the flight crew (e.g. operations manual (OM) or pilot operating handbook (POH)) should contain this information.

(ii) Temporary limitations on RVR. Where operators are new to RNP operations and whose initial application is for RNP < 0.3, it is appropriate to establish a temporary limitation for minima consistent with RNP 0.3, until operational experience is gained. This period could be based upon time (e.g., 90 days) and/or number of conducted operations (e.g., 100 RNP approach operations), as agreed by the competent authority and operator.

(6) MEL operating provisions

(i) Flight crews should have a thorough understanding of the MEL entries supporting RNP AR APCH operations.

(c) Practical skill training

(1) Practical skill training should use FSTDs.

(2) In addition to the theoretical knowledge training, the flight crew members should receive appropriate practical skill training. Training programmes should cover the proper execution of RNP AR APCH operations in compliance with the manufacturer's documentation. The training should include RNP AR APCH procedures and limitations; standardisation of the set-up of the cockpit's electronic displays during an RNP AR APCH operation; recognition of the aural advisories, alerts and other annunciations that can impact compliance with an RNP AR APCH procedure; detection of incorrect/inconsistent information and 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.

(3) This training should address the following specific elements:

(i) procedures for verifying that each flight crew member's altimeter has the current setting before the beginning of the final approach of an RNP AR APCH procedure, including any operational limitations associated with the source(s) for the altimeter setting and the latency of checking and setting the altimeters for landing;

(ii) use of aircraft RADAR, TAWS, GPWS, or other avionics systems to support the flight crew's track monitoring and weather and obstacle avoidance;

(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;

(iv) the importance of aircraft configuration to ensure the aircraft maintains any mandated speeds during RNP AR APCH operations;

(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;

(vi) development of flight crew knowledge and skills necessary to properly conduct RNP AR APCH operations (RNP AR APCH procedure training);

(vii) flight crews understand and are capable of programming and operating the FMC, autopilot, autothrottles, RADAR, GNSS, INS, EFIS (including the moving map), and TAWS in support of RNP AR APCH operations;

(viii) handling of TOGA to LNAV transition;

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

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

(xi) flight crew 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;

(xii) As a minimum, each flight crew member should complete two RNP approach procedures that employ the unique RNP AR APCH characteristics of the operator's approved procedures (i.e., RF legs, RNP missed). One procedure should culminate in a transition to landing and one procedure should culminate in execution of an RNP missed approach procedure.

(d) Evaluation

(1) Initial evaluation of RNP AR APCH knowledge and procedures

(i) The operator should evaluate each individual flight crew member on their knowledge of RNP AR APCH procedures prior to employing RNP AR APCH operations. As a minimum, the review should include a thorough evaluation of flight crew procedures and specific aircraft performance requirements for RNP AR APCH operations.

(ii) This initial assessment should include one of the following:

(A) An evaluation by an examiner using an FSTDs.

(B) An evaluation 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 approved procedures.

(C) 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) of the operator's approved procedures.

(2) Specific elements that should be addressed in this evaluation module are:

(i) demonstrate the use of any RNP AR APCH limits/minimums that may impact various RNP AR APCH operations;

(ii) demonstrate 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. If the aircraft's avionics do not include the capability to disable radio updating, then the training should ensure the flight crew is able to accomplish the operational actions that mitigate the lack of this feature;

(iii) demonstrate 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;

(iv) demonstrate the ability to read and adapt to a RAIM (or equivalent) forecast, including forecasts predicting a lack of RAIM availability;

(v) demonstrate the proper setup of the FMC, the weather RADAR, TAWS, and moving map for the various RNP AR APCH operations and scenarios the operator plans to implement;

(vi) demonstrate the use of flight crew briefings and checklists for RNP AR APCH operations with emphasis on CRM;

(vii) demonstrate 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);

(viii) demonstrate speed control during segments requiring speed restrictions to ensure compliance with an RNP AR APCH procedure;

(ix) demonstrate competent use of RNP AR APCH approach plates, briefing cards, and checklists;

(x) demonstrate the ability to complete a stable RNP AR APCH approach operation: bank angle, speed control, and remaining on the procedure's centreline;

(xi) know the operational limit for deviation below the desired flight path and how to accurately monitor the aircraft's position relative to vertical flight path.

(e) Recurrent training of RNP AR APCH knowledge and procedures

(1) The operator should incorporate recurrent RNP training that employs the unique RNP AR APCH characteristics of the operator's approved procedures as part of the overall programme.

(2) A minimum of two RNP AR APCH approaches should be flown by each flight crew member 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.

(3) In case of several complex RNP AR APCH within the area of operation, the recurrent training should focus on the most demanding RNP AR APCH procedures giving credit on the less demanding ones.

3) AMC1 SPA.PBN.105(c) was added:

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

SAFETY ASSESSMENT

(a) Safety Assessment

(1) Safety of RNP AR APCH approach operations rests with the operator and the air navigation service provider.

(2) A flight operational safety assessment (FOSA) should be conducted for each RNP AR APCH approach procedure where more stringent aspects of the nominal procedure design criteria are applied (e.g. RNP AR APCH procedures with RNP values less than 0.3, RF legs, and RNP missed approaches less than 1.0) or where the application of the default procedure design criteria is in an operating environment with special challenges or demands to ensure that for each specific set of operating conditions, aircraft, and environment that all failure conditions are assessed and where necessary mitigations implemented to meet the operational safety objective. The assessment should give proper attention to the inter-dependence of the elements of design, aircraft capability, crew procedures and operating environment.

GM1 SPA.PBN.105(c) 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. For RNP AR APCH approaches a flight operational safety assessment (FOSA) methodology may be used. 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 for navigation systems, aircraft systems, operational procedures, hazards, failure mitigations, normal, rare-normal and abnormal conditions, hazards, and the operational environment. The FOSA relies on the detailed criteria for aircraft qualification, operator approval and instrument procedure design to address the majority of general technical, procedure and process factors. Additionally, technical and operational expertise and experience are essential to the conduct and conclusion of the FOSA.

(b) The following hazard conditions are examples of some of the more significant hazards and mitigations addressed in the aircraft, operational and procedure criteria:

(1) Normal performance: lateral and vertical accuracy are addressed in the aircraft requirements, aircraft and systems operate normally in standard configurations and operating modes, and individual error components are monitored/truncated through system design or crew procedure.

(2) Rare-normal and abnormal performance: lateral and vertical accuracy are evaluated for aircraft failures as part of the determination of aircraft qualification. Additionally, other rare-normal and abnormal failures and conditions for ATC operations, crew procedures, infrastructure and operating environment are also assessed. Where the failure or condition results are not acceptable for continued operation, mitigations are developed or limitations established for the aircraft, crew and/or operation.

(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 operational procedure to cross-check guidance (e.g. dual equipage for lateral errors, use of terrain awareness and warning system).

(ii) Malfunction of air data system or altimetry: Crew procedure cross-check between two independent systems mitigates this risk.

(4) Aircraft performance

(i) Inadequate performance to conduct the approach operation: the aircraft qualification and operational 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).

(ii) Loss of engine: loss of an engine while on an RNP AR APCH approach operation is a rare occurrence due to high engine reliability and the short exposure time. Operators will take appropriate action to mitigate the effects of loss of engine, initiating a go-around and manually taking control of the aircraft if necessary.

(5) Navigation services

(i) Use of a navigation aid outside of designated coverage or in test mode: aircraft requirements and operational procedures have been developed to address this risk.

(ii) Navigation database errors: 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.

(6) ATC operations

(i) Procedure assigned to incapable aircraft: operators are responsible for declining the clearance.

(ii) ATC vectors aircraft onto approach such that performance cannot be achieved.

(7) Flight crew operations

(i) Erroneous barometric altimeter setting: crew entry and cross-check procedures mitigate this risk.

(ii) Incorrect procedure selection or loading: crew procedure to verify loaded procedure matches published procedure, aircraft requirement for map display.

(iii) Incorrect flight control mode selected: training on importance of flight control mode, independent procedure to monitor for excessive path deviation.

(iv) Incorrect RNP entry: crew procedure to verify RNP loaded in system matches the published value.

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

(vi) Poor meteorological conditions: loss or significant reduction of visual reference that may result in or require a go-around.

(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.

(ii) Loss of GNSS signals: relevant independent equipage, e.g. IRS/INS, is mandated for RNP AR APCH approaches with RF legs and approaches where the accuracy for the missed approach is less than 1 NM. For other approaches, operational procedures are used to approximate the published track and climb above obstacles.

(iii) Testing of ground navigation aids in the vicinity of the approach: aircraft and operational procedures should detect and mitigate this event.

(9) Operating Conditions

(i) Tailwind conditions: excessive speed on RF legs will result in inability to maintain track. This is addressed through aircraft requirements on the limits of command guidance, inclusion of 5 degrees of bank manoeuvrability margin, consideration of speed effect and crew procedure to maintain speeds below the maximum authorised.

(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.

(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 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.

4) AMC1 SPA.PBN.105(d) was added:

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

OPERATIONAL CONSIDERATIONS

(a) Minimum Equipment List

(1) The operator's minimum equipment list should be developed/revised to address the equipment provisions for RNP AR APCH operations. The necessary equipment may depend on the intended navigation accuracy and whether or not the missed approach requires RNP less than 1.0. For example, GNSS and autopilot are typically required for small navigation accuracy. Dual equipment is typically required for approach operations when using a line of minima less than RNP 0.3 or where the missed approach has an RNP value less than 1.0.

(2) An operable class A terrain awareness warning system (TAWS) 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.

(b) Autopilot and flight director

(1) RNP AR APCH operations with RNP values less than RNP 0.3 or with RF legs require the use of autopilot or flight director driven by the RNP system in all cases. Thus, the autopilot/flight director should operate with suitable accuracy to track the lateral and vertical paths required by a specific RNP AR APCH operation.

(2) When a flight is predicated on using RNP AR APCH which requires an autopilot at the destination and/or alternate aerodrome, the flight crew should determine that the autopilot is installed and operational.

(c) Pre-flight 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 pre-flight preparation tool and as a flight-following tool in the event of reported failures. The RNP assessment should consider the specific combination of the aircraft capability (sensors and integration), as well as their availability.

(2) RNP assessment when GNSS updating

(i) 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 GPS constellation with the (RAIM) (or equivalent) algorithm identical to that used in the actual equipment. For RNP AR APCH operations with high terrain, use a mask angle appropriate to the terrain.

(ii) Initially, RNP AR APCH procedures require GNSS updating.

(d) NAVAID exclusion

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.

(e) Navigation database currency

During system initialisation the flight crew of aircraft equipped with an RNP-certified system should confirm that the navigation database is current. Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle will change during flight, operators and flight crews should establish procedures to ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. Traditionally, this has been accomplished by verifying electronic data against paper products. One method is to compare aeronautical charts (new and old) to verify navigation fixes prior to dispatch. If an amended chart is published for the procedure, the database should not be used to conduct the operation.

5) AMC1 SPA.PBN.105(d) was added:

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 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 cold temperature corrections or comply with an ATC clearance/instruction).

(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).

(c) RNP management

The flight crew's 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 leg of the procedure, then the flight crew's 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 initial approach fix (IAF)). Different IAF's may have different navigation accuracy, which are annotated on the approach chart.

(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.

(e) Radio updating

Initiation of all RNP AR APCH procedures is based on GNSS updating. Except where specifically designated on a procedure as 'not authorised', DME/DME updating can be used as a reversionary mode during the approach or missed approach operation when the system complies with the navigation accuracy. VOR updating is not authorised at this time. The flight crew should comply with the operator's procedures for inhibiting specific facilities.

(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 procedure should not be used if validity of the navigation database is in doubt. A navigation system textual display or navigation map display should be used.

(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 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 onboard lateral deviation indicators and/or flight guidance during all RNP AR APCH operations unless authorised to deviate by ATC or under emergency conditions. For normal operations, cross-track error/deviation (the difference between the RNP system computed path and the aircraft position relative to the path) should be limited to the navigation accuracy (RNP) associated with the procedure segment.

(2) Vertical deviation should be monitored above and below the glide-path; the vertical deviation should be within ±75 feet of the glide-path during the final approach segment.

(3) Flight crew should execute a missed approach operation if the lateral deviation exceeds 1xRNP or the vertical deviation exceeds 75 feet below, unless the pilot has in sight the visual references required to continue the approach operation.

(i) 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 crews and inclusion of this monitoring procedure in the recurrent RNP AR APCH training programme.

(ii) 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).

(h) System cross-check

(a) For approach operations with RNP values less than RNP 0.3, the flight crew should ensure the lateral and vertical guidance provided by the navigation system is consistent with other available data and displays provided by an independent means.

(b) This cross-check may not be necessary if the lateral and vertical guidance systems have been developed and/or evaluated consistent with extremely remote failure conditions and if the normal system performance supports 1xRNP containment.

(i) Procedures with RF legs

(1) An RNP AR APCH procedure may require the ability to execute an RF leg to avoid terrain or obstacles. As not all aircraft have this capability, flight crews should be aware of whether or not they can conduct these procedures.

(2) If 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. Operational procedures are required for aircraft that do not stay in LNAV when a missed approach is initiated to ensure the RNP AR APCH ground track is maintained.

(3) The flight crew should not exceed the maximum airspeed values shown in Table 1 throughout the RF leg segment. 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.

Table 1: Maximum airspeed by segment and category

Indicated airspeed (Knots)					
Segment	Indicated airspeed by aircraft category				
	Cat A	Cat B	Cat C	Cat D	Cat E

Initial & intermediate (IAF to FAF)	150	180	240	250	250
Final (FAF to DA)	100	130	160	185	as specified
Missed approach (DA/H to MAHP)	110	150	240	265	as specified
Airspeed Restriction*	as specified				

*Airspeed restrictions may be used to reduce turn radius regardless of aircraft category.

(j) Temperature compensation

For aircraft with temperature compensation capabilities, flight crews may disregard the temperature limits on RNP procedures if the operator provides pilot training on the use of the temperature compensation function. Temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the flight crew compensating for the cold temperature effects on minimum altitudes or DA/H. Flight crews should be familiar with the effects of the temperature compensation on intercepting the compensated path described in EUROCAE ED-75B/RTCA DO-236B Appendix H.

(k) Altimeter setting

Due to the performance-based obstruction clearance inherent in RNP instrument procedures, the flight crew should verify the most current aerodrome altimeter is set prior to the final approach fix (FAF). Operators 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 is expected to be rapidly decreasing. Execution of an RNP operation necessitates the current altimeter setting for the aerodrome of intended landing. Remote altimeter settings are not allowed.

(l) Altimeter cross-check

(1) The flight crew should complete an altimetry crosscheck ensuring both pilots' altimeters agree within ±100 feet 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.

(2) This operational cross-check is not necessary if the aircraft systems automatically compare the altitudes to within 75 feet.

(m) Missed approach operation

Where possible, the missed approach operation will necessitate RNP 1.0. The missed approach portion of these procedures is similar to a missed approach of an RNP APCH procedure. Where necessary, navigation accuracy less than RNP 1.0 will be used in the missed approach segment. To be approved to conduct these approaches, equipment should meet the criteria in AMC 20-26 (Requirements for Approaches with Missed Approach less than RNP 1.0).

(1) In many aircraft when 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 track-hold derived from the inertial system. LNAV guidance to the autopilot and flight director should be re-engaged as quickly as possible.

(2) The 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 issued a different clearance 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.

(3) Upon loss of GNSS updates, the RNAV guidance may begin to 'coast' on IRU, if installed, and drift, degrading the navigation position solution. Thus, when the RNP AR APCH missed approach operations rely on IRU 'coasting', the inertial guidance can only provide acceptable navigation performance for a specified amount of time.

(n) Contingency procedures

(1) Failure while en-route

The aircraft's RNP capability is dependent on operational aircraft equipment and GNSS satellites. The flight crew should be able to assess the impact of equipment failure on the anticipated RNP approach operation and take appropriate action.

(2) Failure on approach

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

(i) failure of the RNP system components, including those affecting lateral and vertical deviation performance (e.g. failures of a GPS sensor, the flight director or automatic pilot);

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

(o) Engine-out procedures

Aircraft may demonstrate acceptable flight technical error with one engine inoperative to conduct RNP AR APCH operations. Otherwise, flight crews are expected to take appropriate action in event of engine failure during an approach operation so that no specific aircraft qualification is required. The aircraft qualification should identify any performance limits in event of engine failure to support definition of appropriate flight crew procedures.

6) AMC1 SPA.PBN.105(d) was added:

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 flight management system (FMS) with the published procedure.

(2) Validate the loaded navigation data for the procedure, either in an FSTD or in the actual aircraft in visual meteorological conditions (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.

(3) Once the procedure is validated, retain and maintain a copy of the validated navigation data for comparison to subsequent data updates.

(4) For published procedures, where the 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.

(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.

(c) The operators should not use a navigation database for RNP APCH operations unless the navigation database supplier holds a Type 2 Letter of Acceptance (LoA) or equivalent.

(d) The operator should implement procedures that ensure timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

7) AMC1 SPA.PBN.105(e) was added:

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

REPORTABLE EVENTS

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

8) AMC1 SPA.PBN.105(f) was added:

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

RNP MONITORING PROGRAMME

(a) The operator should have an RNP monitoring programme to ensure continued compliance with applicable rules and to identify any negative trends in performance.

(b) During the initial 90 day interim approval period, the operator should submit the following information every 30 days to the competent authority.

(c) At a minimum, this programme should address the following information:

(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; and

(vi) flight crew reports of any anomaly;

(4) Flight crew comments.

(d) Thereafter, the operator should continue to collect and periodically review this data to identify potential safety concerns, and maintain summaries of this data.

3.11 Proposed amendments to AMC/GM to Part NCC (draft EASA Decision)

Part NCC — AMC/GM

Subpart A — General requirements

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AMC1 NCC.GEN.106 Pilot-in-command responsibilities and authority

FLIGHT PREPARATION FOR PBN OPERATIONS

(a) Flight crew should ensure that RNAV 1/2, RNP 1/2 and RNP APCH procedures to be used for the intended flight (including alternates aerodromes) are selectable from the navigation database and are not prohibited by a company instruction or NOTAM.

(b) Flight crews should take account of any NOTAMs or operator briefing material that could adversely affect the aircraft system operation, or the availability or suitability of the procedures at the airport of landing, or any alternate airport.

(c) When PBN relies on GNSS systems for which RAIM is required for integrity, its availability should be verified during the pre-flight planning. In the event of a predicted continuous loss of fault detection of more than five (5) minutes, the flight planning should be revised to reflect the lack of full PBN capability for that period.

(d) For RNP 4 operations with only GNSS sensors, a Fault Detection and Exclusion (FDE) check is required. The maximum allowable time for which FDE capability is projected to be unavailable on any one event is 25 minutes. If predictions indicate that the maximum allowable FDE outage will be exceeded, the operation should be rescheduled to a time when FDE is available.

(e) For RNAV 10 operations, the flight crew should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure en-route radio facilities are serviceable before departure, and to apply radio updates in accordance with any Flight Manual limits.

AMC2 NCC.GEN.106 Pilot-in-command responsibilities and authority

DATABASE SUITABILITY

The flight crew should check that any navigational database required for PBN operations includes the routes and procedures required for the flight.

DATABASE CURRENCY

Where a navigation database is required for PBN operations, the database validity (current AIRAC cycle) should be checked before the flight.

Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle is due to change during flight, operators and flight crew should establish procedures to ensure the accuracy of navigation data, including the suitability of navigation facilities used to define the routes and procedures for the flight.

An expired database may only be used if following conditions are satisfied:

(a) the pilot-in-command confirms that the parts of the database which are intended to be used during the flight and any contingencies that it is reasonable to expect are not changed in the current version;

(b) any NOTAMs associated with the navigational data is taken into account;

(c) the paper (or electronic) maps and charts corresponding to those parts of the flight are current and have not been amended since the last cycle;

(d) any aircraft MEL limitations are observed;

(e) the database is expired by no more than 28 days.

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Subpart B – Operational procedures

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GM1 NCC.OP.117 Performance-based navigation — aeroplanes and helicopters

MONITORING AND VERIFICATION

(a) Pre-flight and general

At navigation system initialisation, the flight crew should confirm that the navigation database is current and verify that the aircraft position, if required, has been entered correctly.

The active flight plan, if applicable, should be checked by comparing the charts or other applicable documents with navigation equipment and displays. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. Where relevant, the RF leg arc radii should be confirmed.

If required by a procedure, a check should be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid.

A procedure should not be used if doubt exists as to the validity of the procedure in the navigation database.

During the PBN operation, where feasible, flight progress should be monitored by cross-checks, with conventional navigation aids:

1) for navigational reasonableness, and

2) so as to allow immediate cross-checking or reversion in the event of loss of GPS GNSS navigation capability.

Where applicable and when used (e.g. in RNAV 10), the flight crew should monitor automatic updating of the inertial systems to ensure the period without updating does not exceed any permitted limit.

(b) Departure

Prior to commencing a take-off on a PBN procedure, the flight crew should verify that the PBN system is available and operating correctly and, where applicable, the correct airport and runway data have been loaded.

A positive check should be made that the indicated aircraft position is consistent with the actual aircraft position at the start of the take-off roll.

For non-GNSS systems, unless automatic updating of the actual departure point is provided, the flight crew should ensure initialisation on the runway or FATO either by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent position shift after the take-off. Where GNSS is

used, the signal should be acquired before the take-off roll commences and GNSS position may be used in place of the runway update.

(c) Arrival and approach

The flight crew should verify their aircraft navigation system is operating correctly and the correct arrival procedure and runway (including any applicable transition) are entered and properly depicted.

Although a particular method is not mandated, any published altitude and speed constraints should be observed.

Flight crew should check approach procedures (including alternate aerodromes if needed) as extracted by the system (e.g. CDU flight plan page) or presented graphically on the moving map, in order to confirm the correct loading and the reasonableness of the procedure content.

For PBN systems without GNSS updating, a navigation accuracy check is required during the descent phase before reaching the Initial Approach Fix. For GNSS based systems, absence of an integrity alarm is considered sufficient. If the check fails, a conventional procedure should then be flown.

In addition to normal procedure prior to commencing the approach (before the IAF and in compatibility with crew workload), the flight crew should verify the correctness of the loaded procedure by comparison with the appropriate approach charts. This check should include:

1) the waypoint sequence;

2) reasonableness of the tracks and distances of the approach legs, and the accuracy of the inbound course and mileage of the final approach segment;

3) the vertical path angle if applicable.

For RNP APCH operations using BARO VNAV, the flight crew should check that the two altimeters provide equivalent altitude (difference of 100 feet max) at or before FAF. This check should be made after the flight crew has set the correct altimeter setting.

The flight crew should also check the consistency between the VNAV guidance and the primary altimeters indications commensurate with pilot workload (e.g. after the aircraft is established on the vertical path).

During the descent, flight crew should check that the vertical speed is consistent with the VNAV angle to be flown.

(d) Barometric input and altimetry

For an RNP system with ABAS requiring barometric corrected altitude, the current aerodrome barometric altimeter setting should be input at the appropriate time and location, consistent with the performance of the flight operation.

For RNP APCH operations using BARO VNAV, the flight crew should confirm the correct altimeter setting. The procedure should only be flown with:

1) a current local altimeter setting source available; and

2) the QNH/QFE, as appropriate, set on the aircraft's altimeters.

The flight crew should not use a remote or regional altimeter setting source for RNP APCH using BARO VNAV to LNAV/VNAV minima.

RNP APCH operations to LNAV/VNAV minima are not permitted when the aerodrome temperature is outside the promulgated aerodrome temperature limits for the procedure, unless the PBN system is equipped with approved cold temperature compensation for the final approach. Only the final approach segment is protected by the promulgated

aerodrome temperature limits, and the flight crew should consider the effect of temperature on terrain and obstacle clearance in other phases of flight.

Where BARO VNAV is used in other operations, the flight crew should consider the effect of temperature on terrain and obstacle clearance in all phases of flight, in particular on any step-down fix.

(e) Sensor and RNP selection

For multi-sensor systems, the flight crew should verify, during the approach, that the GNSS sensor is used for position computation.

Flight crew of aircraft with RNP input selection capability should confirm that the indicated RNP value is appropriate for the PBN operation.

AMC2 NCC.OP.117 Performance-based navigation

For RNAV 1/2, RNP 1/2 and RNP APCH, the flight crew should not insert nor modify waypoints by manual entry into a procedure or route that has been retrieved from the database, and manual entry of coordinates is not permitted.

For RNP 4 operations, the flight crew should not modify waypoints that have been retrieved from the database. User defined data (e.g. for flex-track routes) may be entered and used.

The lateral and vertical definition of the flight path between the FAF and the Missed Approach Point (MAPt) retrieved from the database should not be revised by the flight crew.

AMC3 NCC.OP.117 Performance-based navigation

DISPLAYS AND AUTOMATION

During an RNAV 1, RNP 1 or RNP APCH procedure, flight crew should use a lateral deviation indicator, flight director or autopilot in lateral navigation mode.

The appropriate displays should be selected so that the following information can be monitored:

a) the RNAV computed desired path (DTK), and

b) aircraft position relative to the lateral path (CrossTrack Deviation) for FTE monitoring,

c) aircraft position relative to the vertical path (for a 3D operation).

Flight crew of aircraft with a lateral deviation indicator (e.g. CDI) should ensure that lateral deviation indicator scaling (fullscale deflection) is suitable for the navigation accuracy associated with the various segments of the procedure.

Flight crew should maintain procedure centrelines, as depicted by on board lateral deviation indicators and/or flight guidance during all the approach procedure unless authorised to deviate by ATC or under emergency conditions.

Crosstrack error/deviation (the difference between the RNAV system computed path and the aircraft position relative to the path) should normally be limited to ± ½ the RNAV/RNP value associated with the procedure. Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after turns, up to a maximum of 1 times the RNAV/RNP value are allowable.

For a 3D approach operation, the flight crew should use a vertical deviation indicator and, where required by AFM limitations, a flight director or autopilot in vertical navigation mode. Deviations below the vertical path should not exceed 75 feet, or half-scale deflection where angular deviation is indicated. The flight crew should execute a missed approach if the vertical

deviation exceeds this criterion, unless the flight crew has in sight the visual references required to continue the approach.

AMC4 NCC.OP.117 Performance-based navigation

VECTORING AND POSITIONING

ATC tactical interventions in the terminal area may include radar headings, 'direct to' clearances which bypass the initial legs of an approach, interceptions of an initial or intermediate segments of an approach or the insertion of additional waypoints loaded from the data base. In complying with ATC instructions, the flight crew should be aware of the implications for the navigation system.

'Direct to' clearances may be accepted to the Intermediate Fix (IF) provided that it is clear to the crew that the aircraft will be established on the final approach track at least 2 miles from the FAF.

'Direct to' clearance to FAF is not acceptable. Modifying the procedure to intercept the final approach course prior to the FAF is acceptable for radar vectored arrivals or at other times with ATC approval.

The final approach trajectory should be intercepted no later than the FAF in order for the aircraft to be correctly established on the final approach course before starting the descent (to ensure terrain and obstacle clearance).

'Direct to' clearances to a fix that immediately precede an RF leg are not permitted.

For parallel offset operations en-route (in RNP 4 and Advanced RNP), transitions to and from the offset track should maintain an intercept angle of between 30 and 45° unless specified otherwise by ATC.

AMC5 NCC.OP.117 Performance-based navigation

ALERTING AND ABORT

A RNP APCH procedure should be discontinued:

a) if navigation system failure is annunciated (e.g. warning flag),

b) if lateral or vertical (if provided) FTE exceeds the tolerances of AMC3 NCC.OP.117,

c) if, where applicable, VNAV trajectory is not consistent with aircraft altimetry system information or vertical speed information,

d) if integrity failure is annunciated (e.g. RAIM alert),

e) if integrity monitoring is lost (e.g. RAIM loss),

unless the pilot has sufficient visual reference to continue the approach to a safe landing.

Discontinuing the procedure may not be necessary for a multisensor navigation system that includes demonstrated RNP capability without GNSS in accordance with the AFM.

Where vertical guidance is lost while the aircraft is still above 1 000 ft AGL, the flight crew may decide to continue the approach to LNAV minima, when supported by the navigation system.

The missed approach should be flown in accordance with the published procedure. Use of PBN navigation during the missed approach procedure is acceptable provided:

a) The navigation system enabling PBN is operational (e.g. no loss of function, no RAIM alert, no failure indication, etc.). Note that where the missed approach is triggered by the failure or failure of integrity of one sensor system, this does not preclude the use of a different sensor for the missed approach procedure.

b) The whole procedure (including the missed approach) is loaded from the navigation data base.

AMC6 NCC.OP.117 Performance-based navigation

The operator should develop contingency procedures for the contingencies set out in GM2 NCC.OP.117 using the guidance therein.

GM1 NCC.OP.117 Performance-based navigation

DESCRIPTION

For both RNP X and RNAV X designations, the 'X' (where stated) refers to the lateral navigation accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route or procedure. For RNP APCH and Advanced RNP, the lateral navigation accuracy depends on the leg.

Performance-based navigation (PBN) may be required on notified routes, for notified procedures and in notified airspace.

GM2 NCC.OP.117 Performance-based navigation

RNAV 10

The designation RNP 10, used before the publication of the fourth edition of ICAO Doc 9613 in 2013, was inconsistent with PBN RNP and RNAV specifications. RNP 10 in fact did not include requirements for on-board performance monitoring and alerting.

For purposes of consistency with the PBN concept, RNP 10 is referred to as RNAV 10 in Part CAT. Renaming current RNP 10 routes to an RNAV 10 designation would be an extensive and expensive task, which is not cost-effective.

Consequently, the terms RNP 10 (obsolete) and RNAV 10 can be considered equivalent in any regulatory material, approval or aeronautical chart or publication.

GM3 NCC.OP.117 Performance-based navigation

CONTIGENCY PROCEDURES

Where the contingency to revert to a conventional arrival procedure is required, the flight crew should make the necessary preparation. The following conditions should be considered:

(a) failure of the navigation system components, including those affecting flight technical error (e.g. failures of the flight director or autopilot),

(b) multiple system failures,

(c) failure of the navigation sensors,

(d) coasting on inertial sensors beyond a specified time limit,

(e) RAIM (or equivalent) alert or loss of integrity function.

In the event of loss of PBN capability, the flight crew should invoke contingency procedures and navigate using an alternative means of navigation which may include the use of an inertial system. The alternative means need not be a PBN system.

Flight crew should ensure sufficient means are available to navigate and land at the destination or at an alternate aerodrome in the case of loss of RNP APCH capability.

In the event of failure of one PBN system during a procedure where two systems are necessary, the flight crew should abort the procedure if the failure occurs before FAF but may continue the approach if the failure occurs after FAF.

The flight crew should notify ATC of any problem with PBN navigation capability.

In the event of communications failure, the flight crew should continue with procedures in accordance with published lost communication procedures.

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Subpart D – Instruments, data and equipment

Section 1 – Aeroplanes

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AMC1 NCC.IDE.A.250 Navigation equipment

RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route or diversion for repairs. Note that for multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

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GM1 NCC.IDE.A.250 Navigation equipment

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 NCC.IDE.A.260 Electronic navigation data management

DATABASE SUITABILITY

The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with IR 21 subpart G).

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Section 2 – Helicopters

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AMC1 NCC.IDE.H.250 Navigation equipment

RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route

or diversion for repairs. Note that for multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

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GM1 NCC.IDE.H.250 Navigation equipment

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 NCC.IDE.H.260 Electronic navigation data management

DATABASE SUITABILITY

The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with IR 21 subpart G).

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3.12 Proposed amendments to AMC/GM to Part NCO (Draft EASA Decision)

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Subpart A - General requirements

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AMC1 NCO.GEN.105 Pilot-in-command responsibilities and authority

Flight Preparation for PBN operations

(a) Flight crews should ensure that RNAV 1/2, RNP 1/2 and RNP APCH procedures to be used for the intended flight (including alternates aerodromes) are selectable from the navigation database and are not prohibited by a company instruction or NOTAM.

(b) Flight crews should take account of any NOTAMs that could adversely affect the aircraft system operation, or the availability or suitability of the procedures at the airport of landing, or any alternate airport.

(c) When PBN relies on GNSS systems for which RAIM is required for integrity, its availability should be verified during the pre-flight planning. In the event of a predicted continuous loss of fault detection of more than five (5) minutes, the flight planning should be revised to reflect the lack of full PBN capability for that period.

(d) For RNP 4 operations with only GNSS sensors, a Fault Detection and Exclusion (FDE) check is required. The maximum allowable time for which FDE capability is projected to be unavailable on any one event is 25 minutes. If predictions indicate that the maximum allowable FDE outage will be exceeded, the operation should be rescheduled to a time when FDE is available.

(e) For RNAV 10 operations, the flight crew should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure en-route radio facilities are serviceable before departure, and to apply radio updates in accordance with any Flight Manual limits.

AMC2 NCO.GEN.105 Pilot-in-command responsibilities and authority

DATABASE SUITABILITY

The flight crew should check that any navigational database required for PBN operations includes the routes and procedures required for the flight.

DATABASE CURRENCY

Where a navigation database is required for PBN operations, the database validity (current AIRAC cycle) should be checked before the flight.

Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle is due to change during flight, flight crew should establish procedures to ensure the accuracy of navigation data, including the suitability of navigation facilities used to define the routes and procedures for the flight.

An expired database may only be used if following conditions are satisfied:

(a) the pilot-in-command confirms that the parts of the database which are intended to be used during the flight and any contingencies that are reasonable to expect are not changed in the current version,

(b) any NOTAMs associated with the navigational data is taken into account,

(c) the paper (or electronic) maps and charts corresponding to those parts of the flight are current and have not been amended since the last cycle,

(d) any aircraft MEL limitations are observed,

(e) the database is expired by no more than 28 days.

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Subpart B – Operational procedures

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GM1 NCO.OP.117 Performance-based navigation — aeroplanes and helicopters

MONITORING AND VERIFICATION

(a) Pre-flight and general

At navigation system initialisation, the flight crew should confirm that the navigation database is current and verify that the aircraft position, if required, has been entered correctly.

The active flight plan, if applicable, should be checked by comparing the charts or other applicable documents with navigation equipment and displays. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. Where relevant, the RF leg arc radii should be confirmed.

If required by a procedure, a check should be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid.

A procedure should not be used if doubt exists as to the validity of the procedure in the navigation database.

During the PBN operation, where feasible, flight progress should be monitored by cross-checks, with conventional navigation aids:

1) for navigational reasonableness, and

2) so as to allow immediate cross-checking or reversion in the event of loss of GPS GNSS navigation capability.

Where applicable and when used (e.g. in RNAV 10), the flight crew should monitor automatic updating of the inertial systems to ensure the period without updating does not exceed any permitted limit.

(b) Departure

Prior to commencing a take-off on a PBN procedure, the pilot should verify that the PBN system is available and operating correctly and, where applicable, the correct airport and runway data have been loaded.

A positive check should be made that the indicated aircraft position is consistent with the actual aircraft position at the start of the take-off roll.

For non-GNSS systems, unless automatic updating of the actual departure point is provided, the flight crew should ensure initialisation on the runway or FATO either by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent position shift after the take-off. Where GNSS is used, the signal should be acquired before the take-off roll commences and GNSS position may be used in place of the runway update.

(c) Arrival and approach

The flight crew should verify their aircraft navigation system is operating correctly and the correct arrival procedure and runway (including any applicable transition) are entered and properly depicted.

Although a particular method is not mandated, any published altitude and speed constraints should be observed.

Flight crew should check approach procedures (including alternate aerodromes if needed) as extracted by the system (e.g. CDU flight plan page) or presented graphically on the moving map, in order to confirm the correct loading and the reasonableness of the procedure content.

For PBN systems without GNSS updating, a navigation accuracy check is required during the descent phase before reaching the Initial Approach Fix. For GNSS based systems, absence of an integrity alarm is considered sufficient. If the check fails, a conventional procedure should then be flown.

In addition to normal procedure prior to commencing the approach (before the IAF and in compatibility with crew workload), the flight crew should verify the correctness of the loaded procedure by comparison with the appropriate approach charts. This check should include:

1) the waypoint sequence,

2) reasonableness of the tracks and distances of the approach legs, and the accuracy of the inbound course and mileage of the final approach segment,

3) the vertical path angle if applicable.

For RNP APCH operations using BARO VNAV, the flight crew should check that the two altimeters provide equivalent altitude (difference of 100 feet max) at or before FAF. This check should be made after the flight crew has set the correct altimeter setting.

The flight crew should also check the consistency between the VNAV guidance and the primary altimeters indications commensurate with pilot workload (e.g. after the aircraft is established on the vertical path).

During the descent, flight crew should check that the vertical speed is consistent with the VNAV angle to be flown.

(d) Barometric input and altimetry

For an RNP system with ABAS requiring barometric corrected altitude, the current aerodrome barometric altimeter setting should be input at the appropriate time and location, consistent with the performance of the flight operation.

For RNP APCH operations using BARO VNAV, the flight crew should confirm the correct altimeter setting. The procedure should only be flown with:

1) a current local altimeter setting source available; and

2) the QNH/QFE, as appropriate, set on the aircraft's altimeters.

The flight crew should not use a remote or regional altimeter setting source for RNP APCH using BARO VNAV to LNAV/VNAV minima.

RNP APCH operations to LNAV/VNAV minima are not permitted when the aerodrome temperature is outside the promulgated aerodrome temperature limits for the procedure, unless the PBN system is equipped with approved cold temperature compensation for the final approach. Only the final approach segment is protected by the promulgated aerodrome temperature limits, and the flight crew should consider the effect of temperature on terrain and obstacle clearance in other phases of flight.

Where BARO VNAV is used in other operations, the flight crew should consider the effect of temperature on terrain and obstacle clearance in all phases of flight, in particular on any step-down fix.

(e) Sensor and RNP selection

For multi-sensor systems, the flight crew should verify, during the approach, that the GNSS sensor is used for position computation.

Flight crew of aircraft with RNP input selection capability should confirm that the indicated RNP value is appropriate for the PBN operation.

AMC2 NCO.OP.117 Performance-based navigation

For RNAV 1/2, RNP 1/2 and RNP APCH, the flight crew should not insert nor modify waypoints by manual entry into a procedure or route that has been retrieved from the database, and manual entry of coordinates is not permitted.

For RNP 4 operations, the flight crew should not modify waypoints that have been retrieved from the database. User defined data (e.g. for flex-track routes) may be entered and used.

The lateral and vertical definition of the flight path between the FAF and the Missed Approach Point (MAPt) retrieved from the database should not be revised by the flight crew.

AMC3 NCO.OP.117 Performance-based navigation

DISPLAYS AND AUTOMATION

During an RNAV 1, RNP 1 or RNP APCH procedure, flight crew should use a lateral deviation indicator, flight director or autopilot in lateral navigation mode.

The appropriate displays should be selected so that the following information can be monitored:

a) the RNAV computed desired path (DTK), and

b) aircraft position relative to the lateral path (Cross Track Deviation) for FTE monitoring,

c) aircraft position relative to the vertical path (for a 3D operation).

Flight crew of aircraft with a lateral deviation indicator (e.g. CDI) should ensure that lateral deviation indicator scaling (full-scale deflection) is suitable for the navigation accuracy associated with the various segments of the procedure.

Flight crew should maintain procedure centrelines, as depicted by on board lateral deviation indicators and/or flight guidance during all the approach procedure unless authorised to deviate by ATC or under emergency conditions.

Cross track error/deviation (the difference between the PBN system computed path and the aircraft position relative to the path) should normally be limited to ± ½ the RNAV/RNP value associated with the procedure. Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after turns, up to a maximum of 1 times the RNAV/RNP value are allowable.

For a 3D approach operation, flight crew should use a vertical deviation indicator, and, where required by AFM limitations, a flight director or autopilot in vertical navigation mode. Deviations below the vertical path should not exceed 75 feet, or half-scale deflection where angular deviation is indicated. The flight crew should execute a missed approach if the vertical deviation exceeds this criterion, unless the flight crew has in sight the visual references required to continue the approach.

AMC4 NCO.OP.117 Performance-based navigation

VECTORING AND POSITIONING

ATC tactical interventions in the terminal area may include radar headings, 'direct to' clearances which bypass the initial legs of an approach, interceptions of an initial or intermediate segments of an approach or the insertion of additional waypoints loaded from the data base. In complying with ATC instructions, the flight crew should be aware of the implications for the navigation system.

'Direct to' clearances may be accepted to the Intermediate Fix (IF) provided that it is clear to the crew that the aircraft will be established on the final approach track at least 2 miles from the FAF.

'Direct to' clearance to FAF is not acceptable. Modifying the procedure to intercept the final approach course prior to the FAF is acceptable for radar vectored arrivals or at other times with ATC approval.

The final approach trajectory should be intercepted no later than the FAF in order for the aircraft to be correctly established on the final approach course before starting the descent (to ensure terrain and obstacle clearance).

'Direct to' clearances to a fix that immediately precede an RF leg are not permitted.

For parallel offset operations en-route (in RNP 4 and Advanced RNP), transitions to and from the offset track should maintain an intercept angle of between 30 and 45° unless specified otherwise by ATC.

AMC5 NCO.OP.117 Performance-based navigation

ALERTING AND ABORT

A RNP APCH procedure should be discontinued:

a) if navigation system failure is annunciated (e.g. warning flag),

b) if lateral or vertical (if provided) FTE exceeds the tolerances of AMC3 NCO.OP.117,

c) if, where applicable, VNAV trajectory is not consistent with aircraft altimetry system information or vertical speed information,

d) if integrity failure is annunciated (e.g. RAIM alert),

e) if integrity monitoring is lost (e.g. RAIM loss),

unless the pilot has sufficient visual reference to continue the approach to a safe landing.

Discontinuing the procedure may not be necessary for a multisensor navigation system that includes demonstrated RNP capability without GNSS in accordance with the AFM.

Where vertical guidance is lost while the aircraft is still above 1 000 ft AGL, the flight crew may decide to continue the approach to LNAV minima, when supported by the navigation system.

The missed approach should be flown in accordance with the published procedure. Use of PBN navigation during the missed approach procedure is acceptable provided:

a) The navigation system enabling PBN is operational (e.g. no loss of function, no RAIM alert, no failure indication, etc.). Note that where the missed approach is triggered by the failure or failure of integrity of one sensor system, this does not preclude the use of a different sensor for the missed approach procedure.

b) The whole procedure (including the missed approach) is loaded from the navigation data base.

AMC6 NCO.OP.117 Performance-based navigation

The flight crew should consider the action to be taken in the event of the contingencies set out in GM2 NCO.OP.117.

GM1 NCO.OP.117 Performance-based navigation

DESCRIPTION

For both RNP X and RNAV X designations, the 'X' (where stated) refers to the lateral navigation accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route or procedure. For RNP APCH and Advanced RNP, the lateral navigation accuracy depends on the leg.

Performance-based navigation (PBN) may be required on notified routes, for notified procedures and in notified airspace.

GM2 NCO.OP.117 Performance-based navigation

CONTIGENCY PROCEDURES

Where the contingency to revert to a conventional arrival procedure is required, the flight crew should make the necessary preparation. The following conditions should be considered:

(a) failure of the navigation system components, including those affecting flight technical error (e.g. failures of the flight director or autopilot),

(b) multiple system failures,

(c) failure of the navigation sensors,

(d) coasting on inertial sensors beyond a specified time limit,

(e) RAIM (or equivalent) alert or loss of integrity function.

In the event of loss of PBN capability, the flight crew should invoke contingency procedures and navigate using an alternative means of navigation which may include the use of an inertial system. The alternative means need not be a PBN system.

Flight crew should ensure sufficient means are available to navigate and land at the destination or at an alternate aerodrome in the case of loss of RNP APCH capability.

In the event of failure of one PBN system during a procedure where two systems are necessary, the flight crew should abort the procedure if the failure occurs before FAF but may continue the approach if the failure occurs after FAF.

The flight crew should notify ATC of any problem with PBN navigation capability.

In the event of communications failure, the flight crew should continue with procedures in accordance with published lost communication procedures.

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Subpart D – Instruments, data and equipment

Section 1 – Aeroplanes

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AMC1 NCO.IDE.A.195 Navigation equipment

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RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route or diversion for repairs. Note that for multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

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GM1 NCO.IDE.A.195 Navigation equipment

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 NCO.IDE.A.196 Electronic navigation data management

DATABASE SUITABILITY

The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with Opinion 01/2005).

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Section 2 – Helicopters

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AMC1 NCO.IDE.H.195 Navigation equipment

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RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route or diversion for repairs. Note that for multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

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GM1 NCO.IDE.H.195 Navigation equipment

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 NCC.IDE.H.196 Electronic navigation data management

DATABASE SUITABILITY

The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with Opinion 01/2005).

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3.13 Proposed amendments to AMC/GM to Part SPO (Draft EASA Decision)

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Subpart A - General requirements

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AMC1 SPO.GEN.107 Pilot-in-command responsibilities and authority

Flight Preparation for PBN operations

(a) Flight crew should ensure that RNAV 1/2, RNP 1/2 and RNP APCH procedures to be used for the intended flight (including alternates aerodromes) are selectable from the navigation database and are not prohibited by a company instruction or NOTAM.

(b) Flight crews should take account of any NOTAMs or operator briefing material that could adversely affect the aircraft system operation, or the availability or suitability of the procedures at the airport of landing, or any alternate airport.

(c) When PBN relies on GNSS systems for which RAIM is required for integrity, its availability should be verified during the pre-flight planning. In the event of a predicted continuous loss of fault detection of more than five (5) minutes, the flight planning should be revised to reflect the lack of full PBN capability for that period.

(d) For RNP 4 operations with only GNSS sensors, a Fault Detection and Exclusion (FDE) check is required. The maximum allowable time for which FDE capability is projected to be unavailable on any one event is 25 minutes. If predictions indicate that the maximum allowable FDE outage will be exceeded, the operation should be rescheduled to a time when FDE is available.

(e) For RNAV 10 operations, the flight crew should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure en-route radio facilities are serviceable before departure, and to apply radio updates in accordance with any Flight Manual limits.

AMC2 SPO.GEN.107 Pilot-in-command responsibilities and authority

DATABASE SUITABILITY

The flight crew should check that any navigational database required for PBN operations includes the routes and procedures required for the flight.

DATABASE CURRENCY

Where a navigation database is required for PBN operations, the database validity (current AIRAC cycle) should be checked before the flight.

Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle is due to change during flight, operators and flight crew should establish procedures to ensure the accuracy of navigation data, including the suitability of navigation facilities used to define the routes and procedures for the flight.

An expired database may only be used if the following conditions are satisfied:

(a) the operator [pilot-in-command] confirms that the parts of the database which are intended to be used during the flight and any contingencies that it is reasonable to expect are not changed in the current version,

(b) any NOTAMs associated with the navigational data is taken into account,

(c) the paper (or electronic) maps and charts corresponding to those parts of the flight are current and have not been amended since the last cycle,

(d) any aircraft MEL limitations are observed,

(e) the database is expired by no more than 28 days.

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Subpart B – Operational procedures

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GM1 SPO.OP.117 Performance-based navigation — aeroplanes and helicopters

MONITORING AND VERIFICATION

(a) Pre-flight and general

At navigation system initialisation, the flight crew should confirm that the navigation database is current and verify that the aircraft position, if required, has been entered correctly.

The active flight plan, if applicable, should be checked by comparing the charts or other applicable documents with navigation equipment and displays. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. Where relevant, the RF leg arc radii should be confirmed.

If required by a procedure, a check should be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid.

A procedure should not be used if doubt exists as to the validity of the procedure in the navigation database.

During the PBN operation, where feasible, flight progress should be monitored by cross-checks, with conventional navigation aids:

1) for navigational reasonableness, and

2) so as to allow immediate cross-checking or reversion in the event of loss of GPS GNSS navigation capability.

Where applicable and when used (e.g. in RNAV 10), the flight crew should monitor automatic updating of the inertial systems to ensure the period without updating does not exceed any permitted limit.

(b) Departure

Prior to commencing a take-off on a PBN procedure, the flight crew should verify that the PBN system is available and operating correctly and, where applicable, the correct airport and runway data have been loaded.

A positive check should be made that the indicated aircraft position is consistent with the actual aircraft position at the start of the take-off roll.

For non-GNSS systems, unless automatic updating of the actual departure point is provided, the flight crew should ensure initialisation on the runway or FATO either by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent position shift after the take-off. Where GNSS is used, the signal should be acquired before the take-off roll commences and GNSS position may be used in place of the runway update.

(c) Arrival and approach

The flight crew should verify their aircraft navigation system is operating correctly and the correct arrival procedure and runway (including any applicable transition) are entered and properly depicted.

Although a particular method is not mandated, any published altitude and speed constraints should be observed.

Flight crew should check approach procedures (including alternate aerodromes if needed) as extracted by the system (e.g. CDU flight plan page) or presented graphically on the moving map, in order to confirm the correct loading and the reasonableness of the procedure content.

For PBN systems without GNSS updating, a navigation accuracy check is required during the descent phase before reaching the Initial Approach Fix. For GNSS based systems, absence of an integrity alarm is considered sufficient. If the check fails, a conventional procedure should then be flown.

In addition to normal procedure prior to commencing the approach (before the IAF and in compatibility with crew workload), the flight crew should verify the correctness of the loaded procedure by comparison with the appropriate approach charts. This check should include:

1) the waypoint sequence,

2) reasonableness of the tracks and distances of the approach legs, and the accuracy of the inbound course and mileage of the final approach segment,

3) the vertical path angle if applicable.

For RNP APCH operations using BARO VNAV, the flight crew should check that the two altimeters provide equivalent altitude (difference of 100 feet max) at or before FAF. This check should be made after the flight crew has set the correct altimeter setting.

The flight crew should also check the consistency between the VNAV guidance and the primary altimeters indications commensurate with pilot workload (e.g. after the aircraft is established on the vertical path).

During the descent, flight crew should check that the vertical speed is consistent with the VNAV angle to be flown.

(d) Barometric input and altimetry

For an RNP system with ABAS requiring barometric corrected altitude, the current aerodrome barometric altimeter setting should be input at the appropriate time and location, consistent with the performance of the flight operation.

For RNP APCH operations using BARO VNAV, the flight crew should confirm the correct altimeter setting. The procedure should only be flown with:

1) a current local altimeter setting source available; and

2) the QNH/QFE, as appropriate, set on the aircraft's altimeters.

The flight crew should not use a remote or regional altimeter setting source for RNP APCH using BARO VNAV to LNAV/VNAV minima.

RNP APCH operations to LNAV/VNAV minima are not permitted when the aerodrome temperature is outside the promulgated aerodrome temperature limits for the procedure, unless the PBN system is equipped with approved cold temperature compensation for the final approach. Only the final approach segment is protected by the promulgated aerodrome temperature limits, and the flight crew should consider the effect of temperature on terrain and obstacle clearance in other phases of flight.

Where BARO VNAV is used in other operations, the flight crew should consider the effect of temperature on terrain and obstacle clearance in all phases of flight, in particular on any step-down fix.

(e) Sensor and RNP selection

For multi-sensor systems, the flight crew should verify, during the approach, that the GNSS sensor is used for position computation.

Flight crew of aircraft with RNP input selection capability should confirm that the indicated RNP value is appropriate for the PBN operation.

AMC2 SPO.OP.117 Performance-based navigation

MANAGAMENT OF THE NAVIGATION DATA BASE

For RNAV 1/2, RNP 1/2 and RNP APCH, the flight crew should not insert nor modify waypoints by manual entry into a procedure or route that has been retrieved from the database, and manual entry of coordinates is not permitted.

For RNP 4 operations, the flight crew should not modify waypoints that have been retrieved from the database. User defined data (e.g. for flex-track routes) may be entered and used.

The lateral and vertical definition of the flight path between the FAF and the Missed Approach Point (MAPt) retrieved from the database should not be revised by the flight crew.

AMC3 SPO.OP.117 Performance-based navigation

DISPLAYS AND AUTOMATION

During an RNAV 1, RNP 1 or RNP APCH procedure, flight crew should use a lateral deviation indicator, flight director or autopilot in lateral navigation mode.

The appropriate displays should be selected so that the following information can be monitored:

a) the RNAV computed desired path (DTK), and

b) aircraft position relative to the lateral path (Cross Track Deviation) for FTE monitoring,

c) aircraft position relative to the vertical path (for a 3D operation).

Flight crew of aircraft with a lateral deviation indicator (e.g. CDI) should ensure that lateral deviation indicator scaling (full-scale deflection) is suitable for the navigation accuracy associated with the various segments of the procedure.

Flight crew should maintain procedure centrelines, as depicted by on board lateral deviation indicators and/or flight guidance during all the approach procedure unless authorised to deviate by ATC or under emergency conditions.

Cross track error/deviation (the difference between the PBN system computed path and the aircraft position relative to the path) should normally be limited to ± ½ the RNAV/RNP value associated with the procedure. Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after turns, up to a maximum of 1 times the RNAV/RNP value are allowable.

For a 3D approach operation flight crew should use a vertical deviation indicator, and, where required by AFM limitations, a flight director or autopilot in vertical navigation mode. Deviations below the vertical path should not exceed 75 feet, or half-scale deflection where angular deviation is indicated. The flight crew should execute a missed approach if the vertical deviation exceeds this criterion, unless the flight crew has in sight the visual references required to continue the approach.

AMC4 SPO.OP.117 Performance-based navigation

VECTORING AND POSITIONING

ATC tactical interventions in the terminal area may include radar headings, 'direct to' clearances which bypass the initial legs of an approach, interceptions of an initial or intermediate segments of an approach or the insertion of additional waypoints loaded from the data base. In complying with ATC instructions, the flight crew should be aware of the implications for the navigation system.

'Direct to' clearances may be accepted to the Intermediate Fix (IF) provided that it is clear to the crew that the aircraft will be established on the final approach track at least 2 miles from the FAF.

'Direct to' clearance to FAF is not acceptable. Modifying the procedure to intercept the final approach course prior to the FAF is acceptable for radar vectored arrivals or at other times with ATC approval.

The final approach trajectory should be intercepted no later than the FAF in order for the aircraft to be correctly established on the final approach course before starting the descent (to ensure terrain and obstacle clearance).

'Direct to' clearances to a fix that immediately precede an RF leg are not permitted.

For parallel offset operations en-route (in RNP 4 and Advanced RNP), transitions to and from the offset track should maintain an intercept angle of between 30 and 45° unless specified otherwise by ATC.

AMC5 SPO.OP.117 Performance-based navigation

ALERTING AND ABORT

A RNP APCH procedure should be discontinued:

a) if navigation system failure is annunciated (e.g. warning flag),

b) if lateral or vertical (if provided) FTE exceeds the tolerances of AMC3 SPO.OP.117,

c) if, where applicable, VNAV trajectory is not consistent with aircraft altimetry system information or vertical speed information,

d) if integrity failure is annunciated (e.g. RAIM alert),

e) if integrity monitoring is lost (e.g. RAIM loss),

unless the pilot has sufficient visual reference to continue the approach to a safe landing.

Discontinuing the procedure may not be necessary for a multisensor navigation system that includes demonstrated RNP capability without GNSS in accordance with the AFM.

Where vertical guidance is lost while the aircraft is still above 1 000 ft AGL, the flight crew may decide to continue the approach to LNAV minima, when supported by the navigation system.

The missed approach should be flown in accordance with the published procedure. Use of PBN navigation during the missed approach procedure is acceptable provided:

a) The navigation system enabling PBN is operational (e.g. no loss of function, no RAIM alert, no failure indication, etc.). Note that where the missed approach is triggered by the failure or failure of integrity of one sensor system, this does not preclude the use of a different sensor for the missed approach procedure.

b) The whole procedure (including the missed approach) is loaded from the navigation data base.

AMC6 SPO.OP.117 Performance-based navigation

CONTIGENCY PROCEDURES

The flight crew should consider the action to be taken in the event of the contingencies.

Where the contingency to revert to a conventional arrival procedure is required, the flight crew should make the necessary preparation. The following conditions should be considered:

(a) failure of the navigation system components, including those affecting flight technical error (e.g. failures of the flight director or autopilot),

(b) multiple system failures,

(c) failure of the navigation sensors,

(d) coasting on inertial sensors beyond a specified time limit,

(e) RAIM (or equivalent) alert or loss of integrity function

In the event of loss of PBN capability, the flight crew should invoke contingency procedures and navigate using an alternative means of navigation which may include the use of an inertial system. The alternative means need not be a PBN system.

Flight crew should ensure sufficient means are available to navigate and land at the destination or at an alternate aerodrome in the case of loss of RNP APCH capability.

In the event of failure of one PBN system during a procedure where two systems are necessary, the flight crew should abort the procedure if the failure occurs before FAF but may continue the approach if the failure occurs after FAF.

The flight crew should notify ATC of any problem with PBN navigation capability.

In the event of communications failure, the flight crew should continue with procedures in accordance with published lost communication procedures.

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GM1 SPO.OP.117 Performance-based navigation

DESCRIPTION

For both RNP X and RNAV X designations, the 'X' (where stated) refers to the lateral navigation accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route or procedure. For RNP APCH and Advanced RNP, the lateral navigation accuracy depends on the leg.

Performance-based navigation (PBN) may be required on notified routes, for notified procedures and in notified airspace.

Subpart D – Instruments, data and equipment

Section 1 – Aeroplanes

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AMC1 SPO.IDE.A.220 Navigation equipment

RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route or diversion for repairs. Note that for multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

GM1 SPO.IDE.A.220 Navigation equipment

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 SPO.IDE.A.230 Electronic navigation data management

DATABASE SUITABILITY

The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with Opinion 01/2005).

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Section 2 – Helicopters

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AMC1 SPO.IDE.H.220 Navigation equipment

RNP 4

For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the flight manual, should be operational at the entry point of the RNP airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew should consider an alternate route or diversion for repairs. Note that for multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

GM1 SPO.IDE.H.220 Navigation equipment

GENERAL

The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

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AMC1 SPO.IDE.H.230 Electronic navigation data management

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The navigation database should be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. A Letter of Acceptance (LOA) issued by the appropriate regulatory authority demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or Agency LOA issued in accordance with Opinion 01/2005).

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3.14 Proposed amendments to AMC 20-4 (Draft EASA Decision)

AMC 20-4A

Airworthiness Approval ~~and Operational Criteria For the Use~~ of Navigation Systems ~~in European Airspace Designated~~ For ~~Basic~~ RNAV 5 Operations

FOREWORD

In July 1996 JAA published Temporary Guidance Leaflet (TGL) No. 2 containing Advisory Material for the Airworthiness Approval of Navigation Systems for use in European Airspace designated for Basic RNAV operations.

The FAA published comparable material under AC 90-96 on 20 March 1998. These two documents provided identical functional and operational requirements.

In the context of the terminology adopted by this document B-RNAV requirements are totally equivalent to RNAV 5.

~~This AMC presents Acceptable means of Compliance relative to the implementation of Basic RNAV operations within European designated Airspace, from January 1998. This AMC has been co-ordinated with EUROCONTROL.~~

1 PURPOSE

This edition A of the document provides acceptable means of compliance for airworthiness approval ~~and operational criteria for the use~~ of navigation systems ~~in European airspace designated~~ for ~~Basic~~ RNAV 5 operations. The document establishes an acceptable means, but not the only means that can be used in the airworthiness approval process, ~~and provides guidelines for operators where GPS stand-alone equipment is used as the means for Basic RNAV operations~~. The document is in accordance with ~~the April 1990 directive issued by the Transport Ministers of ECAC member states and with regard to the Basic RNAV operations as defined within~~ the EUROCONTROL Standard 003-93 Edition 1 and satisfies the intent of ICAO Doc. 9613-AN/937 Manual on Required Navigation Performance (RNP) ~~First~~ Fourth Edition – ~~1994~~ 2013. It is consistent also with Regional Supplementary Procedures contained within ICAO Doc 7030.

2 SCOPE

This document provides guidance related to navigation systems intended to be used for ~~Basic~~ RNAV 5 operations and considers existing airworthiness approval standards as providing acceptable means of compliance. The content is limited to general certification considerations including navigation performance, integrity, functional requirements and system limitations.

~~Compliance with the guidance in this Leaflet does not constitute an o~~Operational ~~authorisation/~~approval to conduct Basic RNAV operations is not required for EU operators. ~~Aircraft operators should apply to their Authority for such an authorisation/approval.~~

ICAO RNP-4 criteria are outside the scope of this AMC, but it is expected that navigation systems based on position updating from traditional radio aids and approved for ~~Basic~~ RNAV 5 operations in accordance with this AMC will have an RNP-4 capability.

Related specifications

CS/FAR 25.1301, 25.1307, 25.1309, 25.1321, 25.1322, 25.1431

CS/FAR 23.1301, 23.1309, 23.1311, 23.1321, 23.1322, 23.1431

CS/FAR 27.1301, 27.1309, 27.1321, 27.1322

CS/FAR 29.1301, 29.1309, 29.1321, 29.1322, 29.1431

~~operating requirements~~

~~ATC~~ Reference Documents

EUROCONTROL Standard Document 003-93 Edition 1

ICAO Doc. 9613-AN/937 - Manual on Required Navigation Performance (RNP) ~~First~~ Fourth Edition – ~~1994~~ 2013

~~Related navigation documents~~

~~EASA Acceptable means of Compliance~~

AMC 25-11 Electronic Display Systems

~~AMC 20-5 Acceptable Means of Compliance for Airworthiness Approval and Operational Criteria for the use of the NAVSTAR Global Positioning System (GPS)~~

~~FAA Advisory Circulars~~

AC 20-130() Airworthiness Approval of Multi-sensor Navigation Systems for use in the U.S. National Airspace System

AC 20-138 Airworthiness Approval of NAVSTAR Global Positioning System (GPS) for use as a VFR and IFR Supplemental Navigation System

AC 25-4 Inertial Navigation Systems (INS)

AC 25-15 Approval of FMS in Transport Category Airplanes

AC 90-45 A Approval of Area Navigation Systems for use in the U S. National Airspace System

~~ETSOs~~

ETSO-C115~~b~~c ~~Airborne Area Navigation Equipment Using Multi Sensor Inputs~~ Flight Management Systems (FMS) using Multi-Sensor Inputs

ETSO-C129a Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)

ETSO-C145c Airborne Navigation Sensors Using the Global Positioning System ~~(GPS)~~ Augmented by the ~~Wide Area~~ Satellite Based Augmentation System ~~(WAAS)~~.

ETSO-C146c Stand-Alone Airborne Navigation Equipment Using the Global Positioning System ~~(GPS)~~ Augmented by the ~~Wide Area~~ Satellite Based Augmentation System ~~(WAAS)~~.

~~EUROCAE/RTCA documents~~

ED-27 Minimum Operational Performance Requirements (MOPR) for Airborne Area Navigation Systems, based on VOR and DME as sensors

ED-28 Minimum Performance Specification (MPS) for Airborne Area Navigation Computing Equipment based on VOR and DME as sensors

ED-39 MOPR for Airborne Area Navigation Systems, based on two DME as sensors

ED-40 MPS for Airborne Computing Equipment for Area Navigation System using two DME as sensors

ED-58 Minimum Operational Performance Specification (MOPS) for Area Navigation Equipment using Multi-Sensor Inputs

ED-72() MOPS for Airborne GPS Receiving Equipment

DO-180() Minimum Operational Performance Standards (MOPS) for Airborne Area Navigation Equipment Using a Single Collocated VOR/DME Sensor Input

DO-187 MOPS for Airborne Area Navigation Equipment Using Multi Sensor Inputs

DO-200 Preparation, Verification and Distribution of User-Selectable Navigation Data Bases

DO-201 User Recommendations for Aeronautical Information Services

DO-208 MOPS for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)

3 SYSTEMS CAPABILITY

Area navigation (RNAV) is a method which permits aircraft navigation along any desired flight path within the coverage of either ground station referenced navigation aids, Global Navigation Satellite Systems (GNSS) or within the limits of the capability of self-contained aids, or a combination of both methods.

In general terms, RNAV equipment operates by automatically determining aircraft position from one, or a combination, of the following together with the means to establish and follow a desired path:

VOR/DME

DME/DME

INS* or IRS

LORAN C*

GPNSS*

Equipment marked with an asterisk *, is subject to the limitations contained in paragraph 4.4.2.

4 AIRWORTHINESS APPROVAL

4.1 Criteria For ~~Basic~~ RNAV 5 System

4.1.1 Accuracy

The navigation performance of aircraft approved for ~~Basic~~ RNAV 5 operations ~~within European airspace~~ requires a track keeping accuracy equal to or better than +/- 5 NM for 95% of the flight time. This value includes signal source error, airborne receiver error, display system error and flight technical error.

This navigation performance assumes the necessary coverage provided by satellite or ground based navigation aids is available for the intended route to be flown.

4.1.2 Availability and Integrity

Acceptable means of compliance for assessment of the effects associated with the loss of navigation function or erroneous display of related information is given in AMC 25-11 paragraph 4 a (3)(viii).

The minimum level of availability and integrity required for ~~Basic~~ RNAV 5 systems ~~for use in designated European airspace~~ can be met by a single installed system comprising one or more sensors, RNAV computer, control display unit and navigation display(s) (e.g. ND, HSI or CDI) provided that the system is monitored by the flight crew and that in the event of a system failure the aircraft retains the capability to navigate relative to ground based navigation aids (e.g. VOR, DME and NDB).

4.2 Functional Criteria

4.2.1 Required Functions

The following system functions are the minimum required ~~to conduct~~ for ~~Basic~~ RNAV 5: ~~operations.~~

(a) continuous indication of aircraft position relative to track to be displayed to the pilot flying on a navigation display situated in his primary field of view.

In addition, where the minimum flight crew is two pilots, indication of aircraft position relative to track to be displayed to the pilot not flying on a navigation display situated in his primary field of view;

(b) display of distance and bearing to the active (To) waypoint;

(c) display of ground speed or time to the active (To) waypoint;

(d) storage of waypoints; minimum of 4;

(e) appropriate failure indication of the RNAV system, including the sensors.

4.2.2 Recommended Functions

In addition to the requirements of paragraph 4.2.1, the following system functions and equipment characteristics are recommended:

(a) autopilot and/or Flight Director coupling;

(b) present position in terms of latitude and longitude;

(c) 'direct To' function;

(d) indication of navigation accuracy (e.g. quality factor);

(e) automatic channel selection of radio navigation aids;

(f) navigation data base;

(g) automatic leg sequencing and associated turn anticipation.

4.3 Aircraft Flight Manual - MMEL (Master Minimum Equipment List)

The basis for certification should be stated in the Aircraft Flight Manual (AFM), together with any RNAV system limitations. The AFM may also provide the appropriate RNAV system ~~operating and~~ normal, abnormal and contingency procedures applicable to the equipment installed, including, where applicable, reference to required modes and systems configuration necessary to support an RNP capability.

The (Master) Minimum Equipment List MMEL should identify the minimum equipment necessary to satisfy the ~~Basic~~ RNAV 5 criteria defined in paragraphs 4.1 and 4.2.

4.4. ~~Basic~~ RNAV 5 Systems - Acceptable Means Of Compliance

4.4.1 Acceptable Means of Compliance

Navigation systems which are installed on aircraft in accordance with the advisory material contained within FAA AC 90-45A, AC 20-130(), AC 20-138 or AC 25-15, are acceptable for ~~Basic~~ RNAV 5 operations. Where reference is made in the AFM to either the above advisory material or the specific levels of available navigation performance (RNP), no further compliance statements will be required.

Compliance may be based also on the lateral navigation standards defined in ETSO-C115b, ETSO-C129a, ED-27/28, ED-39/40, DO-187/ED-58 or DO-180(). However, qualification of the equipment to these standards, in itself, is not considered as sufficient for the airworthiness approval.

4.4.2 Limitations on the Use of Navigation Systems

The following navigation systems, although offering an RNAV capability, have limitations for their use in ~~Basic~~ RNAV 5 operations.

4.4.2.1 INS

INS without a function for automatic radio updating of aircraft position and approved in accordance with AC 25-4, when complying with the functional criteria of paragraph 4.2.1, may be used only for a maximum of 2 hours from the last alignment/position update performed on the ground. Consideration may be given to specific INS configurations (e.g. triple mix) where either equipment or aircraft manufacturer's data, justifies extended use from the last on-ground position update.

INS with automatic radio updating of aircraft position, including those systems where manual selection of radio channels is performed in accordance with flight crew procedures, should be approved in accordance with AC 90-45A or equivalent material.

4.4.2.2 LORAN C

No EASA advisory material currently exists for ~~operational or~~ airworthiness approval of LORAN C ~~system within European airspace~~. ~~Where LORAN C coverage within European Airspace permits use on certain Basic RNAV routes,~~ AC 20-121A may be adopted as a compliance basis.

4.4.2.3 GPS

The use of GPS to perform ~~Basic~~ RNAV 5 operations is limited to equipment approved to ETSO-C129a, ETSO-C 145, or ETSO-C 146 and which include the minimum system functions specified in paragraph 4.2.1. Integrity should be provided by Receiver Autonomous Integrity Monitoring (RAIM) or an equivalent means within a multi-sensor navigation system. ~~The equipment should be approved in accordance with the AMC 20-5.~~ In addition, GPS stand-alone equipment should include the following functions:

(a) pseudorange step detection,

(b) health word checking.

These two additional functions are required to be implemented in accordance with ETSO-C129a criteria.

Traditional navigation equipment (e.g. VOR, DME and ADF) will need to be installed and be serviceable, so as to provide an alternative means of navigation.

Note: Where GPS stand-alone equipment provides the only RNAV capability installed onboard the aircraft, this equipment, on its own, may be incompatible with a future airspace infrastructure such as Precision RNAV routes, terminal procedures, and where implementation of an augmented satellite navigation system will allow, the decommissioning of traditional ground based radio navigation aids.

5 OPERATIONAL CRITERIA FOR USE OF GPS STAND-ALONE EQUIPMENT

Point 5 is proposed to be deleted entirely.

ANNEX 1

GPS Integrity Monitoring (RAIM) Prediction Program

Annex 1 is proposed to be deleted entirely.

3.15 Proposed amendment to AMC 20-5 (Draft EASA Decision)

The proposal is to delete AMC 20-5 entirely.

3.16 Proposed amendments to AMC 20-12 (Draft EASA Decision)

AMC 20-12A Airworthiness Approval ~~**Recognition Of FAA Order 8400.12a For**~~ of Navigation Systems for RNAV ~~**RNP**~~ **10 Operations.**

1. PURPOSE

The RNP 10 designation, used in the past, is inconsistent with PBN RNP and RNAV specifications. RNP 10 in fact did not include requirements for on-board performance monitoring and alerting. For purposes of consistency with the PBN concept, RNP 10 is referred to as RNAV 10 in this document.

Renaming current RNP 10 routes, approvals, etc., to an RNAV 10 designation would be an extensive and expensive task, which is not cost-effective.

Consequently, the terms RNP 10 (obsolete) and RNAV 10 can be considered equivalent in any regulatory material, approval or aeronautical chart or publication.

This AMC ~~calls attention to~~ is mainly based on the FAA Order 8400.12A 'Required Navigation Performance 10 (RNP-10) Operational Approval', issued 9th February 1998. FAA Order 8400.12A addresses RNP-10 requirements, the operational approval process, application principles, continuing airworthiness and operational requirements.

This AMC explains how the technical content ~~and the operational principles~~ of the Order may be applied as a means, but not the only means, to obtain Agency airworthiness approval for ~~RNP~~ RNAV 10 ~~operations~~.

2. REFERENCE DOCUMENTS

2.1 Related Requirements

CS/FAR 25.1301, 25.1307, 25.1309, 25.1316, 25.1321, 25.1322, 25.1329, 25.1431, 25.1335 25.1581.

CS/FAR 23.1301, 23.1309, 23.1311, 23.1321, 23.1322, 23.1329, 23.1335, 23.1431, 23.1581.

2.2 Related Guidance Material

2.2.1 ICAO

ICAO Doc 7030/4	Regional Supplementary Procedures
ICAO Doc 9613-AN/937	Manual on Required Navigational Performance

2.2.2 EASA~~/JAA~~

EASA AMC 25-11	Electronic Display Systems.
~~EASA AMC 20-5~~	~~Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS).~~
~~JAA Leaflet No 9~~	~~Recognition of EUROCAE Document ED-76 (RTCA DO-200A): Standards for Processing Aeronautical Data.~~

2.2.3 FAA

Order 8400.12A	Required Navigation Performance 10 (RNP-10) Operational Approval, issued February 1998
Order 8110.60	GPS as Primary Means of Navigation for Oceanic/Remote Operations
AC 25-4	Inertial Navigation Systems (INS)
AC 25-11	Electronic Display Systems.
AC 25-15	Approval of Flight Management Systems in Transport Category Airplanes
AC 20-130A	Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors
AC 20-138	Airworthiness Approval of NAVSTAR Global Positioning System (GPS) for use as a VFR and IFR Supplemental Navigation System
14 CFR Part 121 Appendix G	Doppler Radar and Inertial Navigation System (INS): Request for Evaluation; Equipment and Equipment Installation; Training Program; Equipment Accuracy and Reliability; Evaluation Program.)

2.2.4 European Technical Standard Orders

ETSO-~~2~~C115c	Flight Management Systems (FMS) using Multi-Sensor Inputs ~~Airborne Area Navigation Equipment Using Multi-sensor Inputs.~~
ETSO-C129a	Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)
ETSO-C145c	Airborne Navigation Sensors Using the Global Positioning System ~~(GPS)~~ Augmented by the ~~Wide Area~~ Satellite Based Augmentation System ~~(WAAS)~~
ETSO-C146c	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System ~~(GPS)~~ Augmented by the ~~Wide Area~~ Satellite Based Augmentation System ~~(WAAS)~~

2.2.5 EUROCAE / RTCA and ARINC

ED-75A / DO-236A	Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation
ED-76 / DO-200A	Standards for Processing Aeronautical Data
ED-77 / DO-201A	Standards for Aeronautical Information
DO-229B	Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne equipment
ARINC 424	Navigation System Data Base

3. BACKGROUND

3.1 Airspace in various oceanic and remote regions of the world was ~~is being~~ restructured progressively to provide capacity and operating benefits for the aircraft traffic. This restructuring involves~~d~~ reduced route spacing (e.g. 50NM in place of 100NM) that, in turn, demands improved aircraft navigational performance. Airspace for this purpose ~~is~~ was designated as RNP-10 airspace, although it would have been more correct to speak about RNAV 10.

3.2 The RNP-10/RNAV 10 implementation is for the oceanic and remote phases of flight where ground based navigation aids do not exist except possibly at isolated locations. Hence aircraft navigation will need to be based on a long range navigation capability of acceptable performance using inertial navigation and/or global navigation ~~positioning~~ satellite systems (GNSS).

3.3 Aircraft may qualify for ~~RNP~~ RNAV 10 ~~airspace~~ operation~~als~~ ~~approval~~ on the basis of compliance with an appropriate ~~RNP~~ build standard. The navigation performance of aircraft already in service also may qualify and this AMC provides a means of determining their eligibility.

3.4 ~~It is not intended that RNP 10 o~~Operational approval~~s already granted by national authorities in compliance with FAA Order 8400.12A should be re-investigated.~~ to conduct RNAV 10 operations is not required for EU operators.

4 CERTIFICATION CRITERIA

4.1 Airworthiness Approval

FAA Order 8400.12A discusses required system performance (paragraphs 10 and 15), certification actions (paragraph 16), continued airworthiness considerations (paragraph 14), and provides guidance (paragraph 12) for demonstrating eligibility for RNP-10 approval. Key aspects of the FAA Order are summarised in the following paragraphs of this AMC. ~~These should be applied in conjunction with the technical content of the Order for the purposes of obtaining RNP-10 approval under EASA regulations.~~

4.2 Required Equipment and Performance

4.2.1 Aircraft operating in ~~RNP~~ RNAV 10 airspace shall have a 95% cross-track error of less than 10 NM. This includes positioning error, flight technical error (FTE), path definition error and display error. The aircraft shall have also a 95% along-track positioning error of less than 10 NM.

4.2.2 Loss of all long range navigation information should be Improbable (Remote), and displaying misleading navigational or positional information simultaneously on both pilot's displays should be Improbable (Remote). This requirement can be satisfied by the carriage of at least dual independent, long range navigation systems compliant with the criteria of this AMC and the FAA Order. See also EASA AMC 25-11.

4.3 Eligibility for RNP-10 Operations

In respect of system navigational performance, the Order defines three aircraft groups, which may be eligible for RNP-10 operations:

- aircraft eligibility through RNP certification (Eligibility Group 1),
- aircraft eligibility through prior navigation system certification (Eligibility Group 2),
- aircraft eligibility through Data Collection (Eligibility Group 3).

In all cases, where navigation relies on inertial systems, a usage limit of 6.2 hours is set from the time the inertial system is placed into the navigation mode. The FAA Order explains, in paragraph 12d, the options available to extend the time limits for use of inertial systems.

RNP containment integrity/continuity, as defined in EUROCAE ED-75( ) (or RTCA DO-236( ) 'MASPS for RNP Area Navigation'), are not required functions for ~~RNP~~ RNAV 10 operations.

4.3.1 Aircraft eligibility through RNP certification (Eligibility Group 1)

Group 1 aircraft are those that have obtained formal certification and approval of ~~RNP~~ RNAV capable systems integrated in the aircraft.

If ~~RNP~~ RNAV compliance is stated in the Aircraft Flight Manual (AFM), the operational approval of Group 1 aircraft will be based upon the performance defined in that statement.

Note: ~~RNP~~ RNAV value in AFM is typically not limited to ~~RNP~~ RNAV 10. The AFM will state RNP levels that have been demonstrated. An airworthiness approval specifically addressing only ~~RNP~~ RNAV 10 performance may be requested and granted.

4.3.2 Aircraft eligibility through prior navigation system certification (Eligibility Group 2)

Group 2 represents aircraft that can equate their level of performance, certified against earlier standards, to the ~~RNP~~ RNAV 10 criteria. Group 2 aircraft are sub-divided into three parts:

(a) Aircraft equipped with Inertial Systems

These aircraft are considered to meet all of the ~~RNP~~ RNAV 10 requirements for up to 6.2 hours of flight time if the inertial systems have been shown to meet the intent of CFR Part 121, Appendix G[11], or equivalent criteria. This time starts when the system is placed in the navigation mode and no en-route facility for radio updating is available. Operators may seek approval to extend this time limit by demonstrating inertial system accuracy, better than the assumed 2 NM per hour radial error, by means of an additional data collection.

If systems are updated en-route (radio navigation updating), the 6.2 hour limit can be extended taking account of the accuracy of the update. See paragraph 4.5 of this AMC.

(b) Aircraft where GPS provides the only means of long range navigation.

For aircraft in this group where GPS provides the only means of long range navigation (i.e. inertial systems are not carried) when out of range of conventional ground stations (VOR/DME), the aircraft flight manual should indicate that the GPS installation is approved as a primary means of navigation for oceanic and remote operations in accordance with FAA Notice 8110.60[12]. These aircraft are considered to meet the RNP-10 requirements without time limitations. At least dual GPS equipment, compliant with ETSO-C129a/TSO-C129(), are required, together with an approved availability prediction program for fault detection and exclusion (FDE) for use prior to dispatch. For ~~RNP~~ RNAV 10 operations, the maximum allowable period of time for which the FDE capability is predicted to be unavailable is 34 minutes.

(c) Multisensor Systems Integrating GPS with Inertial Data.

Multisensor systems integrating GPS with RAIM, FDE or an equivalent integrity method that are approved in accordance with FAA AC 20-130A are considered to meet ~~RNP~~ RNAV 10 requirements without time limitations. In this case, the inertial system will need to meet the intent of CFR Part 121, Appendix G, or equivalent criteria.

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[11] See Annex 2.

[12] Notice 8110.60 is recognised by AMC 20-5. The material is now incorprated in AC 20-138A as Appendix 1.

4.3.3 Aircraft eligibility through Data Collection (Eligibility Group 3)

Group 3 represents older out-of-production aircraft that contain widely varying navigation capability.

A data collection program, acceptable to the Agency, may be used by the applicant to demonstrate that the aircraft and navigation systems provide the flight crew with acceptable navigational situational awareness relative to the intended ~~RNP~~ RNAV 10 route. The Order describes the essential aspects of a data collection programme.

The Agency will accept as evidence, inertial system performance data obtained and analysed during previous programmes for ~~RNP~~ RNAV 10 approval including data that validates extended flight time.

Subchapters 4.4 (Operational Approval and Procedures), 4.5 (Position Updating) and 4.6 (Incident reporting) are proposed to be deleted entirely.

5. AVAILABILITY OF DOCUMENTS

~~JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on the JAA website and at www.avdataworks.com).~~

EUROCAE documents may be purchased from EUROCAE, ~~17~~ 102 rue Etienne Dolet, 92240 Malakoff ~~Hamelin, 75783 Paris Cedex 16,~~ France, (Telephone: +33 1 40 92 79 30; Fax : 33 1 46 55 62 65 ~~45 05 72 30~~). (E-mail: eurocae@eurocae.net, Website: ~~www.eurocae.org~~ www.eurocae.net)

FAA documents …

3.17 Proposed Amendments to AMC 20-26 (Draft EASA Decision)

AMC 20-26A

Airworthiness Approval ~~and Operational Criteria~~ for RNP Authorisation Required (RNP AR) Operations

This AMC provides a means of compliance for applicants for an airworthiness approval to enable aircraft to conduct Required Navigation Performance Authorisation Required (RNP AR) Operations ~~and the applicable criteria to obtain an operational approval~~. It relates to the implementation of area navigation within the context of the Single European Sky[13], in particular in relation to the verification of conformity of the airborne constituents, per Article 5 of EC Regulation 552/2004. Additional guidance material can be found in the ICAO Performance-based Navigation Manual, Document 9613, Fourth Edition, 2013 ~~Volume II, Chapter 6, as contained in ICAO State Letter AN 11/45-07/22~~.

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….

1 PREAMBLE

In order to ensure an increased availability, enhanced safety and reduced operating minima over and above that provided from traditional non-precision and conventional Area Navigation (RNAV) approaches, the concept of area navigation within the European Region, RNP should be implemented on instrument approach procedures.

This AMC provides a means of compliance for the airworthiness approval of area navigation systems ~~and their use~~ for RNP AR operations that range from nominal (i.e. where general aircraft qualification is matched to standard AR procedure design) to those more demanding in operational and performance requirements. The assurance of consistency with and conformance to the target level of safety (TLS) objectives for RNP AR operations results from the specific compliance criteria of this AMC, from compliance with the AIR-OPS rules and the ~~associated~~ standards for RNP AR procedure design.

This AMC is generally consistent with the Single European Sky legislation and with material in the ICAO Performance-Based Navigation Manual, as well as in EUROCONTROL publications dealing with related operational and functional requirements for area navigation. The material contained in this AMC reflects the fundamental change associated with RNP in the roles, responsibilities and requirements for the regulator, manufacturer, operator and procedure designer.

This AMC is based on barometric-vertical navigation (BARO-VNAV) and RNAV multi-sensor navigation systems, as well as the system concepts, guidance and standards defined in the RTCA DO-236()/EUROCAE ED-75() MASPS. RNP AR builds on the RNP concept that requires the ability of the aircraft navigation system to monitor its achieved navigation performance, and to identify to the pilot whether the operational requirement is or is not being met during an operation.

This AMC addresses general certification considerations, including functional requirements, accuracy, integrity, continuity of function and system limitations.

This AMC introduces some provisions for aircraft qualification to RNP AR Departure protected with customised procedure design criteria. These provisions will be completed

[13] Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation).

in a next issue of the AMC, ~~once ICAO has published public~~ with procedure design criteria for departures.

This AMC is based on the criteria developed in FAA AC 90-101, with inclusion of more stringent criteria (see Appendix 6), including notably a focus on aircraft performance in Non-Normal conditions.

Compliance with this AMC provides, but by itself does not constitute, a basis for an operational approval to conduct RNP operations. In fact operators, before conducting RNP AR operations, shall obtain a specific approval from their competent authority, based on rule SPA.PBN.105.

The special procedure design criteria contained in the RNP AR procedure design manual may necessitate additional operational evaluation depending upon the operator needs or operating conditions.

~~Aircraft operators should apply to their competent authority for such an approval.~~ Since this AMC has been harmonised with other RNP implementation and operations approval criteria outside of Europe i.e. USA/FAA, it is expected to facilitate interoperability and ease the effort in obtaining operational approval by airline operators.

1.1 PURPOSE

This AMC establishes an acceptable means of compliance for an applicant to obtain airworthiness approval of an RNP system ~~and the operational criteria~~ for use in ~~designated European airspace blocks where~~ RNP AR operations ~~have been implemented by the competent aviation authority~~. An applicant may elect to use an alternative means of compliance. However, those alternative means of compliance must meet safety objectives that are acceptable to the Agency. Compliance with this AMC is not mandatory hence the use of the terms *shall* and *must* apply only to an applicant who elects to comply with this AMC in order to obtain airworthiness approval.

1.2 BACKGROUND

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The criteria (both procedure design and certification) may take account of the fact that aircraft with different flight guidance capabilities will be used to fly the procedures. However, the procedure design criteria do reflect specific levels of aircraft performance and capability for the barometric VNAV aspects of the operation. ~~The operator authorisation may be extended where the operational requirements can be met by aircraft but require more stringent performance criteria.~~

2 SCOPE

This material provides airworthiness approval criteria related to RNAV systems with lateral navigation (LNAV) and BRAO-VNAV capabilities, intended to be used under Instrument Flight Rules, including Instrument Meteorological Conditions, ~~in designated European airspace blocks~~ where RNP Authorisation Required (AR) operations have been implemented per a decision of the competent aviation authorities. It addresses general certification requirements, including functional requirements, accuracy, integrity, continuity of function, and system limitations.

…

This AMC recognises that published criteria for demonstrated aircraft performance may be insufficient to enable RNP AR operations where the performance required is less than 0.3 NM. Consequently, this AMC provides the criteria necessary to support airworthiness approval to these lower values and criteria including guidance for the assessment of:

- ~~Training and Crew Qualification (see APPENDIX 2)~~
- ~~RNP Operational Considerations (see APPENDIX 3)~~
- Flight Technical Error (see APPENDIX ~~4~~ 2)
- ~~Flight Operation Safety Assessment (see APPENDIX 5)~~

This AMC also contains criteria reflecting the Agency's opinion that parts of the ICAO PBN Navigation Specification for RNP AR APCH are not appropriate for the RNP AR operations ~~that the Agency will authorise~~. As a result, select criteria in the AMC are different and are clearly noted as such.

Section 3.2 of this AMC refers to documents which contribute to the understanding of the RNP concept and which may support an application for approval. However, it is important that an applicant evaluates his/her aircraft system against the criteria of this AMC.

~~Compliance with this AMC provides, but by itself does not constitute, a basis for, an operational approval to conduct RNP operations. Aircraft operators should apply to their national authority for such an approval.~~ While an objective of this AMC is interoperability and to ease operator operational approvals, some operators and manufacturers will need to consider the noted differences in requirements from the ICAO PBN Manual and FAA AC 90-101 to determine what additional aircraft or system changes are necessary, or what operational limitations must be implemented.

A glossary of terms and acronyms used in this AMC is given in APPENDIX 1.

3 REFERENCE DOCUMENTS

3.1 Related Requirements

CS 25.1301, 25.1302, 25.1307, 25.1309, 25.1316, 25.1321, 25.1322, 25.1329, 25.1431, 25.1581.

CS 23.1301, 23.1309, 23.1311, 23.1321, 23.1322, 23.1329, 23.1335, 23.1431, 23.1581.

Air OPS: SPA.PBN.100, SPA.PBN.105, SPA.MNPS.100, SPA.MNPS.105; ORO.GEN.160; CAT.IDE.A.100, CAT.IDE.A.105; CAT.IDE.A.345, CAT.IDE.A.350; CAT.IDE.A.355

~~National operational regulations~~

3.2 Related Material

3.2.1 ICAO

Doc 8168-OPS/611	Aircraft Operations (PANS OPS)
Doc 9613	Performance-based Navigation Manual (4th edition)
Doc 9881	Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information
Doc 9905	Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual

3.2.2 EASA

~~AMC 20-5~~	~~Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS)~~
AMC 25-11	Electronic Display Systems

AMC 20-27	AMC 20-27 Airworthiness Approval ~~and Operational Criteria~~ for RNP APPROACH (RNP APCH) Operations Including APV BARO-VNAV Operations
AMC 20-28	Airworthiness Approval related to Area Navigation for GNSS approach to Localiser performance with Vertical Guidance minima using SBAS
EASA Opinion Nr. 01/2005	The Acceptance of Navigation Database Suppliers

3.2.3 EUROCONTROL

Document 003-93( )	Area Navigation Equipment: Operational Requirements and Functional Requirements

3.2.4 FAA

AC 25-11( )	Electronic Display Systems
AC 20-129	Airworthiness Approval of Vertical Navigation (VNAV) Systems for Use in the U.S. National Airspace System (NAS) and Alaska
AC 20-130( )	Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors
AC 20-138( )	Airworthiness Approval of NAVSTAR Global Positioning System (GPS) for use as a VFR and IFR Supplemental Navigation System
AC 25-4	Inertial Navigation Systems (INS)
AC 25-15	Approval of Flight Management Systems in Transport Category Airplanes
AC 90-97	Use of Barometric Vertical Navigation (VNAV) for Instrument Approach Operations using Decision Altitude
Order 8260.52	United States Standard for Required Navigation Performance (RNP) Approach Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR)
AC 90-101A	Approval for Required Navigation Performance (RNP) Procedures with Special Aircraft and Aircrew Authorisation Required (SAAAR)
AC 120-29A	Criteria for Approval of Category I and Category II Weather Minima for Approach
AC 20-153	Acceptance of Data Processes and Associated Navigation Databases

3.2.5 European Technical Standard Orders

ETSO-C115( ) ~~/TSO-C115( )~~	Flight Management Systems (FMS) using Multi-Sensor Inputs ~~Airborne Area Navigation Equipment Using Multi-sensor Inputs.~~
ETSO-C129( ) ~~/TSO-C129( )~~	Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)
ETSO-C145( ) ~~/TSO-C145( )~~	Airborne Navigation Sensors Using the Global Positioning System ~~(GPS)~~ Augmented by the

	~~Wide Area~~ Satellite Based Augmentation System ~~(WAAS)~~.
ETSO-C146( )~~/TSO-C146( )~~	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System ~~(GPS)~~ Augmented by the ~~Wide Area~~ Satellite Based Augmentation System ~~(WAAS)~~.
ETSO-C151( )~~/TSO-C151( )~~	Terrain Awareness and Warning System (TAWS)

3.2.6 EUROCAE/RTCA and ARINC

ED-75( )/DO-236( )	Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation
DO-283A	Minimum Operational Performance Standards for Required Navigation Performance for Area Navigation
ED-76 / DO-200A	Standards for Processing Aeronautical Data
ED-77 / DO-201A	Standards for Aeronautical Information
DO-229( )	Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne equipment
ARINC 424	Navigation System Data Base

4 ASSUMPTIONS

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~~4.2 Communication & ATS Surveillance Considerations~~

~~RNP AR operations described herein do not require any unique communication or ATS Surveillance considerations.~~

4.~~3~~2 Obstacle Clearance and Route Spacing

All RNP AR procedures:

(1) are published by an Aeronautical Information Service Provider certified according to article ~~7~~ 8b of Basic Regulation 216/2008 ~~550/2004~~[14]; or

(2) are designed by a certified airspace design organisation, according to article 8b of Basic Regulation 216/2008; or

~~(2)~~ (3) are consistent with the relevant parts of ICAO Doc 8168 PANS OPS and ICAO PBN RNP AR Procedure Design Manual;

~~(3)~~ (4) take account of the functional and performance capabilities of RNP systems and their safety levels as detailed in this AMC;

Note: Particular attention should be given to the constraints implied by the Airworthiness Certification objectives of paragraph 6.

[14] Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the service provision Regulation).

~~(4)~~

~~(5)~~(5) support reasonableness checking by the flight crew by including, on the charts, fix data (e.g. range and bearing to navigational aids or waypoint to waypoint);

~~(6)~~(6) terrain and obstacle data in the vicinity of the approach is published in accordance with ICAO Annex 15 to the Convention on International Civil Aviation and Doc 9881, Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information;

~~(7)~~ (7) if the contingency procedure allows a reversion in aircraft use of navigation infrastructure, e.g. GNSS to DME/DME, the obstacle clearance assessment is based on an RNP that allows either infrastructure;

~~(8)~~(8) barometric altitude compensation for low temperature effects is accounted for in the procedure design, and any necessary limitations are specified in the AIP;

~~(9) the Safety Case assessment for RNP AR operations accounts for the regulatory determination and documentation of compliance to the AMCs detailed requirements for the navigation system, aircraft operational capability, crew procedures and continuing airworthiness, as meeting or exceeding their TLS objectives for the procedure and/or spacing;~~

(9) are designated RNAV e.g. $RNAV_{(RNP)}$ and throughout the AIP and on aeronautical charts, will specify either the sensors allowed or the RNP value required;

(10) may have attributes that depart from the standard applications of procedures described in the ICAO RNP AR Procedure Design Manual.

…

4.8 Status Monitoring

The Navaid infrastructure is monitored and, where appropriate, maintained by a service provider certified for navigation services according to Article ~~7~~ 8b of ~~EC~~ Basic Regulation ~~550/2004~~. For the use of non-EU navigation service providers, timely warnings of outages (NOTAM) should be issued. Also status information should be provided to Air Traffic Services in accordance with ICAO Annex 11 to the Convention on International Civil Aviation for navigation facilities or services that may be used to support the operation.

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6 AIRWORTHINESS CERTIFICATION OBJECTIVES

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6.1.3 RNP System Performance

The required demonstration of RNP system performance, including lateral and vertical path steering performance (FTE), will vary according to the type of AR operation being considered e.g. low RNP for obstacle clearance or separation in an obstacle rich environment or high density air traffic environment. It will be for the competent Authority, responsible for the approval of the procedure, to assess the RNP level for the considered operation in accordance with the Flight Operations Safety Assessment (FOSA) ~~see APPENDIX 5~~.

…

8 AIRWORTHINESS COMPLIANCE

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~~**8.2 Database Integrity**~~

~~The navigation database should be shown to comply with EUROCAE ED-76/RTCA DO-200A, or equivalent approved procedures.~~

8.~~3~~2 Use of GPS

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8.~~4~~3 Use of Inertial Reference System (IRS)

…

8.~~5~~4 Use of Distance Measuring Equipment (DME)

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8.~~6~~5 Use of VHF Omni-directional Range station (VOR)

….

8.~~7~~6 Intermixing of Equipment

….

Chapter 10 (Operational criteria) is proposed to be deleted completely.

APPENDIX 1 GLOSSARY

The following are definitions of key terms used throughout this AMC.

AFM Aircraft Flight Manual

Appendix 2 – Training and crew qualification issues is proposed to be deleted entirely.

APPENDIX ~~3~~ 2 RNP OPERATIONAL CONSIDERATIONS

…

APPENDIX ~~4~~ 3 ACCEPTABLE METHODS FOR FLIGHT TECHNICAL ERROR ASSESSMENT FOR RNP

…

Appendix 5 Flight operation safety assesment is proposed to be deleted entirely.

APPENDIX ~~6~~ 4 AMC 20-26/PBN Manual/AC90-101 Comparison

…

3.18 Proposed amendments to AMC 20-27A (Draft EASA Decision)

AMC 20-27~~A~~B Airworthiness Approval ~~and Operational Criteria~~ for RNP APPROACH (RNP APCH) ~~Operations~~ Including APV BARO-VNAV ~~Operations~~

1. PURPOSE

This AMC provides an acceptable means that can be used to obtain airworthiness approval of an Area Navigation (RNAV) system based on a Global Navigation Satellite System (GNSS) stand-alone receiver or multi-sensor system, including at least one GNSS sensor in order to conduct RNP Approach (RNP APCH) operations.

RNP APCH procedures are characterised by existing charted RNAV (GNSS) approach procedures designed with straight final approach segments.

~~This AMC also defines~~ ~~o~~Operational approval ~~criteria~~ is not ~~necessary~~ required for EU operators to conduct ~~safely~~ RNP APCH operations ~~in designated European airspace~~.

This AMC addresses RNP APCH operation without vertical guidance (Non Precision Approach operation) and with vertical guidance based on barometric vertical navigation (APV BARO-VNAV operation). Final approaches utilising SBAS (Localiser Performance with Vertical guidance (LPV) operation) are addressed in ~~separate~~ AMC ~~material~~ 20-28.

APV BARO-VNAV systems are based on barometric altimetry for the determination of the aircraft position in the vertical axis. The final approach segment of VNAV instrument flight procedures are performed using vertical guidance to a vertical path computed by the on-board RNAV system. The vertical path is contained in the specification of the instrument procedure within the RNAV system navigation database. For other phases of flight, barometric VNAV provides vertical path information that can be defined by altitudes at fixes in the procedure. It should be noted that there is no vertical requirement in this AMC associated to the use of VNAV guidance outside of the final approach segment. Vertical navigation on the initial or intermediate segment can be conducted without VNAV guidance.

An applicant may elect to use an alternative means of compliance. However, those alternative means of compliance must meet safety objectives that are acceptable to the Agency or the competent authority. Compliance with this AMC is not mandatory. Use of the terms *shall* and *must* apply only to an applicant who elects to comply with this AMC in order to obtain airworthiness approval ~~or to demonstrate compliance with the operational criteria~~.

2. BACKGROUND

This document addresses and defines airworthiness ~~and operational~~ criteria related to RNAV systems approved for RNP APCH based on GNSS with or without vertical guidance based on BARO-VNAV. It relates to the implementation of area navigation within the context of the Single European Sky[15], in particular in relation to the verification of conformity of the airborne constituents, per Article 5 of EC Regulation 552/2004[16]. It addresses general certification considerations of stand-alone and multi-sensor systems

[15] Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation) (O J L 096, 31/03/2004, p. 01).

[16] Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (O J L 096, 31.3.2004, p. 26).

on-board aircraft, including their functional requirements, accuracy, integrity, continuity of function, and limitations, together with operational considerations.

This document is applicable to RNP APCH operations only. It does not address RNP AR APCH operations (see AMC 20-26()).

This AMC identifies the airworthiness ~~and operational~~ requirements for RNP APCH operations including APV BARO-VNAV operation. Operational safety is ensured by compliance ~~with these requirements must be addressed through national operational regulations, and may require a specific operational approval in some cases~~ with the rules and AMC in Part CAT, Part NCC, Part NCO and Part SPO.

Use of BARO-VNAV information for RNP APCH with LNAV minima is only possible using the CDFA (Continuous Descent Final Approach) concept. This use is possible provided the navigation system is able to compute a vertical continuous descent path on the Final Approach segment and operator complies with CAT.OP.MPA.110, SPA.LVO.110 ~~EU-OPS 1.430~~ section. ~~It should be noted that this AMC does not address such operational approval authorisation.~~

3. SCOPE

This AMC includes airworthiness ~~and operational~~ criteria related to RNAV systems based on a GNSS stand-alone receiver, or multi-sensor systems including at least one GNSS sensor, intended to be used under Instrument Flight Rules, including Instrument Meteorological Conditions~~, in designated European airspace~~. It contains also airworthiness ~~and operational~~ criteria related to systems based upon the use of barometric altitude and RNAV information in the definition of vertical paths and vertical tracking to a path to conduct APV BARO-VNAV operation.

Section 4.2 of this AMC refers to documents which contribute to the understanding of the RNP APCH concept and which may support an application for approval. ~~However, it is important that an operator evaluates his aircraft system and the proposed operational procedures against the criteria of this AMC.~~

~~Compliance with this AMC does not, by itself, constitute an operational authorisation to conduct RNP APCH operations. Aircraft operators should apply to their national authority.~~ Since this AMC has been harmonised with other RNP implementation and operational criteria outside of Europe, i.e. USA/FAA, it is expected to facilitate interoperability ~~and ease the effort in obtaining operational authorisation by operators~~.

This AMC does not cover RNP approaches where special authorisation is required (RNP AR APCH). RNP AR APCH is addressed ~~in a separate~~ by AMC 20-26().

4. REFERENCE DOCUMENTS

4.1 Related Requirements

- CS 25.1301, 25.1302, 25.1307, 25.1309, 25.1316, 25.1321, 25.1322, 25.1325, 25.1329, 25.1431, 25.1581.
- CS 23.1301, 23.1309, 23.1311, 23.1321, 23.1322, 23.1325, 23.1329, 23.1335, 23.1431, 23.1581.
- Equivalent requirements of CS/FAR 27 and 29 if applicable.
- Air OPS: ORO.GEN.200, ORO.GEN.205, ORO.GEN.220; CAT.OP.MPA.105; CAT.OP.MPA.110; SPA.PBN.100, SPA.PBN.105, SPA.MNPS.100, SPA.MNPS.105; CAT.OP.MPA.175; CAT.OP.MPA.180; CAT.OP.MPA.185, SPA.ETOPS.115; CAT.OP.MPA.300; ORO.GEN.160; CAT.IDE.A.100, CAT.IDE.A.105; CAT.IDE.A.345, CAT.IDE.A.350; SPA.MNPS.105; CAT.IDE.A.355; ORO.FC.105

~~EU-OPS[17] 1.035, 1.220, 225, 1.243, 1.290, 1.295, 1.297, 1.400, 1.420, 1.845, 1.865, 1.870, 1.873 and 1.975.~~

- ~~JAR-OPS 3.243, 3.845, 3.865.~~
- ~~National operational regulations.~~

4.2 Related Material

4.2.1 ICAO

ICAO Annex 10	International Standards and Recommended Practices- Aeronautical Telecommunications
ICAO Doc 7030/4	Regional Supplementary Procedures
ICAO Doc 9613	Performance-based Navigation Manual (PBN)
ICAO Doc 8168	PANS OPS (Procedures for Air Navigation Services-Aircraft Operations)

4.2.2 EASA

AMC 25-11	Electronic Flight Deck Display
~~AMC 20-5~~	~~Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS)~~
AMC 20-115 (latest edition)	Software considerations for certification of airborne systems and equipment
ETSO-C115( )	Airborne Area Navigation Equipment using Multi-Sensor Inputs
ETSO-C129( )	Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)
ETSO-C145( )	Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS)
ETSO-C146( )	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS)
ETSO-C106( )	Air Data Computer
EASA OPINION No 01/2005	Conditions for Issuance of Letters of Acceptance for Navigation Database Suppliers by the Agency (i.e. an EASA Type 2 LoA). EASA OPINION Nr. 01/2005 on 'The Acceptance of Navigation Database Suppliers' dated 14 Jan 05

4.2.3 FAA

AC 25-4	Inertial Navigation Systems (INS)
AC 25-11( )	Electronic Display Systems
AC 20-129	Airworthiness Approval of Vertical Navigation (VNAV) Systems or use in the U.S. National Airspace System (NAS) and Alaska
AC 20-138( )	Airworthiness Approval of GNSS equipment

[17] Council Regulation (EEC) No 3922/91 on the harmonisation of technical requirements and administrative procedures in the field of civil aviation. Regulation as last amended by Regulation (EC) No 1899/2006 of the European Parliament and of the Council of 12 December 2006 (O L J 377, 27.12.2006, p. 1).

AC 20-130A	Airworthiness approval of navigation or flight management systems integrating multiple navigation sensors
AC 23-1309-1C	Equipment, systems, and installation in Part 23 airplanes
AC 20-153	Acceptance of data processes and associated navigation data bases

4.2.4 Technical Standard Orders

FAA TSO-C115( )	Airborne Area Navigation Equipment using Multi-Sensor Inputs
FAA TSO-C129( )	Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)
FAA TSO-C145( )	Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS)
FAA TSO-C146( )	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS)
FAA TSO-C106( )	Air Data Computer

4.2.5 EUROCAE/RTCA, SAE and ARINC

ED 26	MPS for airborne Altitude measurements and coding systems
ED 72A	Minimum Operational Performance Specification for Airborne GPS Receiving Equipment
ED-75( )/DO-236( )	Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation
ED-76/DO-200A	Standards for Processing Aeronautical Data
ED-77/DO-201A	Standards for Aeronautical Information
DO 88	Altimetry
DO 187	Minimum operational performances standards for airborne area navigation equipments using multi-sensor inputs
DO 208	Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)
DO-229( )	Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne equipment
ARINC 424	Navigation System Data Base
ARINC 706	Mark 5 Air Data System

5. ASSUMPTIONS

Applicants should note that this AMC is based on the following assumptions:

5.1 Navaid infrastructure

GNSS is the primary navigation system to support RNP APCH procedures.

The acceptability of the risk of loss of RNP APCH capability for multiple aircraft due to satellite failure, loss of the on board monitoring, alerting function (e.g. RAIM holes) and radio frequency interference, will be considered by the responsible airspace authority.

5.2 Obstacle clearance

5.2.1 RNP APCH without BARO-VNAV guidance

Detailed guidance …

5.2.2 APV BARO-VNAV

BARO-VNAV …

5.3 Publication

The instrument approach chart will …

5.5 Service provider assumption for APV BARO-VNAV operation.

It is expected that air navigation service provision will include …

6. RNP APCH AIRWORTHINESS CRITERIA

…

7. FUNCTIONAL CRITERIA

…

8. AIRWORTHINESS COMPLIANCE

…

9. Aircraft Flight Manual/pilot operating handbook

….

10. RNP APCH Operational Criteria

This section is proposed to be deleted completely.

11. AVAILABILITY OF DOCUMENTS

~~JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on the JAA website and at www.jaa.nl .~~

EASA documents ….

APPENDIX 1: GLOSSARY

The following are definitions of key terms used throughout this AMC.

Aircraft-Based Augmentation System (ABAS): An augmentation system …

….

APPENDIX 2 Operational characteristics of the procedure and its operational use

This Appendix is proposed to be deleted completely.

APPENDIX 3: ALTERNATE NAVIGATION DATABASE INTEGRITY CHECK

If operator's navigation data base supplier has no Type 2 LOA or equivalent approval, the operator should develop and describe a method to demonstrate an acceptable level of integrity of the navigation data base content used by the RNAV system on board the aircraft.

The operator should implement navigation data base integrity checks for all RNP APCH procedures they wish to operate, using manual verification procedures or appropriate software tools, at each AIRAC Cycle.

The objective of this integrity check is to identify any significant discrepancies between the published charts/procedures and the navigation database content.

Integrity checks may be conducted by a designated third party, under the operator responsibility.

1 Elements to be verified

…..

2 Means to verify those elements

….

Paragraph 3 (Feedback and reporting errors found) is proposed to be deleted entirely.

Appendices 4 (Operational procedures) and 5 (Flight crew training syllabus) are proposed to be deleted entirely.

3.19 Proposed amendments to AMC 20-28 (Draft EASA Decision)

AMC 20-28A Airworthiness Approval ~~and Operational Criteria~~ related to Area Navigation for Global Navigation Satellite System approach operation to Localiser Performance with Vertical guidance minima using Satellite Based Augmentation System

This AMC provides an acceptable means that can be used to obtain airworthiness approval for an Area Navigation (RNAV) approach system based on Global Navigation Satellite System (GNSS) augmented by a Satellite Based Augmentation System (SBAS) in order to conduct approach operations to Localiser Performance with Vertical guidance (LPV) minima. ~~This AMC also defines the~~ ~~o~~Operational approval ~~criteria~~ is not ~~necessary~~ required for EU operators to conduct ~~safely~~ such approach operations ~~in designated European airspace~~.

TABLE OF CONTENTS

…..

1 PURPOSE

This AMC provides an acceptable means that can be used to obtain airworthiness approval for an Area Navigation (RNAV) approach system based on Global Navigation Satellite System (GNSS) augmented by a Satellite Based Augmentation System (SBAS) ~~in order to conduct~~ enabling approach operations to Localiser Performance with Vertical guidance (LPV) minima. ~~This AMC also defines the operational criteria necessary to conduct safely such approach operations in designated European airspace.~~

An applicant may elect to use an alternative means of compliance. However, that means of compliance must meet the objectives of this AMC and be acceptable to the Agency ~~and the competent authority~~. Compliance with this AMC is not mandatory. Use of the terms *shall* and *must* apply only to an applicant who elects to comply with this AMC in order to obtain airworthiness approval or to demonstrate compliance with the operational criteria.

2 BACKGROUND

This document addresses and defines airworthiness ~~and operational~~ criteria related to an aircraft system based on GNSS augmented by SBAS in order to ~~conduct~~ enable RNAV GNSS approach operation to LPV minima. It addresses certification considerations of stand-alone and multi-sensor systems on board an aircraft, including their functional requirements, accuracy, integrity, continuity of function and limitations.~~, together with operational considerations. Operational compliance with these requirements at the date of publication must be addressed through national operational regulations, however, following publication of the Commission regulation on "Air Operations" compliance with that regulation will be required and may require a specific operational approval.~~

RNAV GNSS approaches ~~conducted~~ down to LPV minima are characterised by a Final Approach Segment (FAS). A FAS is the approach path which is defined laterally by the Flight Path Alignment Point (FPAP) and Landing Threshold Point/Fictitious Threshold Point (LTP/FTP) and defined vertically by the Threshold Crossing Height (TCH) and Glide Path Angle (GPA). The FAS of such approaches may be intercepted by an approach transition (e.g. Precision Area Navigation (P-RNAV) or initial and intermediate segments of an RNP APCH approach) or through vectoring (e.g. interception of the extended FAS).

3 SCOPE

This AMC is to be used to show compliance with the applicable Certification Specifications and functional criteria as defined in paragraphs 4.1 and 7.1. These are related to systems based on a stand-alone receiver or multi-sensor systems, including at least one GNSS SBAS sensor. ~~It also defines the operational approval criteria for the~~ These systems are intended for use under Instrument Flight Rules, including in Instrument Meteorological Conditions~~, in designated European airspace~~.

Section 4.2 of this AMC refers to documents which contribute to the understanding of an RNAV GNSS approach operation to LPV minima using SBAS and which may support an application for approval. However, it is important that an applicant evaluates the aircraft systems ~~and the proposed operational procedures~~ against the criteria of this AMC.

~~Compliance with this AMC does not, by itself, constitute an operational authorisation to conduct RNAV GNSS approach operation to LPV minima using SBAS. Aircraft operators should apply to their competent authority.~~ Since this AMC has been harmonised with other implementation and operational criteria outside of Europe, i.e. USA/FAA, it is expected to facilitate interoperability ~~and ease the effort in obtaining operational authorisation by operators~~.

In this AMC, 'LPV approach' wording has been used in lieu of 'RNAV GNSS approach to LPV minima' for simplification purposes.

This document is only applicable to RNAV(GNSS) approaches ~~conducted~~ down to LPV minima that are in accordance with the assumption given in paragraph 5.

4 REFERENCE DOCUMENTS

Related Requirements

- CS 25.1301, 25.1302, 25.1307, 25.1309, 25.1316, 25.1321, 25.1322, 25.1329, 25.1431, 25.1581.
- CS 23.1301, 23.1309, 23.1311, 23.1321, 23.1322, 23.1329, 23.1335, 23.1431, 23.1581.
- CS 27.1301, 27.1309, 27.1321, 27.1322, 27.1329, 27.1581.
- CS 29.1301, 29.1307, 29.1309, 29.1321, 29.1322, 29.1329, 29.1431, 29.1581.
- Air OPS[18]: ORO.GEN.200, ORO.GEN.205, ORO.GEN.220; CAT.OP.MPA.105; CAT.OP.MPA.110; SPA.PBN.100, SPA.PBN.105, SPA.MNPS.100, SPA.MNPS.105; CAT.OP.MPA.175; CAT.OP.MPA.180; CAT.OP.MPA.185, SPA.ETOPS.115; CAT.OP.MPA.300; ORO.GEN.160; CAT.OP.MPA.110, SPA.LVO.110; CAT.IDE.A.100, CAT.IDE.A.105; CAT.IDE.A.345, CAT.IDE.A.350; SPA.MNPS.105; CAT.IDE.A.355; ORO.FC.105
- ~~EU-OPS[19] 1.035, 1.220, 1.225, 1.243, 1.290, 1.295, 1.297, 1.400, 1.420, 1.430, 1.845, 1.865, 1.870, 1.873, and 1.975.~~
- ~~JAR-OPS 3.243, 3.845, 3.865.~~
- ~~National operating regulations.~~

Related Material
ICAO

[18] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p.1).

Annex 10 International Standards and Recommended Practices- Aeronautical Telecommunications.
Doc 7030/4 Regional Supplementary Procedures.
Doc 9613 Manual on Performance-based Navigation (PBN).
Doc 8168 PANS OPS (Procedures for Air Navigation Services-Aircraft Operations).
EASA
AMC 25-11 Electronic Display Systems.
AMC 20-26() Airworthiness Approval and Operational Criteria for RNP Authorisation Required (RNP AR) Operations.
AMC 20-27() Airworthiness approval and Operational Criteria for RNP APPROACH (RNP APCH) operations Including APV BARO-VNAV Operations.
AMC 20-115( ) Software considerations in airborne systems and equipment certification
ETSO- C115( ) Airborne area Navigation Equipment using Multi-sensor Inputs.
ETSO-C145c Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Satellite Based Augmentation System.
ETSO-C146c Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Satellite Based Augmentation System.
EASA OPINION Conditions for Issuance of Letters of Acceptance for Navigation
Nr. 01/2005 Database Suppliers by the Agency (i.e. an EASA Type 2 LoA).

FAA
AC 25-11( ) Electronic Display Systems.
AC 20-138( ) Airworthiness Approval of GNSS equipment.
AC 20-130A Airworthiness approval of navigation or flight management systems integrating multiple navigation sensors.
AC 23-1309-1( ) Equipment, systems, and installation in Part 23 airplanes.
AC 20-153 Acceptance of data processes and associated navigation data bases.

EUROCAE / RTCA and ARINC
ED-76 / DO-200A Standards for Processing Aeronautical Data.
ED-80( ) / DO-254( ) Design assurance guidance for airborne electronic hardware.
ED-77 / DO-201A Standards for Aeronautical Information.
DO-229( ) Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne equipment.
ARINC 424 Navigation System Data Base.

…

10. OPERATIONAL CRITERIA

This paragraph is proposed to be deleted entirely.

11 AVAILABILITY OF DOCUMENTS
~~JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on the JAA website: www.jaa.nl.~~
EASA documents may be obtained from …

APPENDIX 1: GLOSSARY
The following are definitions of key terms used throughout this AMC.

Abnormal procedure: Crew procedure …

APPENDIX 2 Operational characteristics of the procedure and its operational use, APPENDIX 3 LPV approach operational procedures and **APPENDIX 4 Flight crew training syllabus** are proposed to be deleted entirely.

4 Regulatory Impact Assessment (RIA)

4.1 Issues to be addressed

4.1.1 Historical background

Pilots holding an instrument rating (and where necessary a type rating) have the privilege to fly an aircraft under Instrument Flight Rules (IFR), meaning that, for example, they may use routes following a series of VOR (VHF Omni-Range) stations or fly Non-Precision Approaches (NPA) supported by Non-Directional Beacons (NDB), or other radio-navigation aid, without any additional authorisation or approval.

The privilege is usually limited to operations not more complex than ILS Category I and with minimum decision altitude not lower than 200 ft above ground level (AGL).

This general principle is embedded also in EU rules on flight crews[20].

The privilege, however, is based on a number of underlying assumptions:

1. the aircraft and its navigation systems have an airworthiness approval covering the type of envisaged IFR operations;
2. the complexity of these IFR operations does not pose any unusual challenges;
3. both the concept and the systems which are the basis of the IFR operations are considered mature (= not 'new', meaning that the civil aviation community has accrued few years of actual operational experience using them);
4. risks associated with improper operation are tolerable (including third parties on ground as well as in the air);
5. the accuracy, integrity, availability and the continuity of radio navigation signals are ensured under the responsibility of a Navigation Service Provider (NSP);
6. appropriate standards for quality and management of procedure designers are established;
7. the accuracy and integrity of the NAV database are ensured;
8. appropriate training, checking standards and procedures for this type of IFR operation for pilots exist and are implemented; and
9. provision of information (e.g. Master Minimum Equipment List (MMEL) and training requirements) from holders of Type Certificates (TC) to air operators, throughout the life cycle of the aircraft, is ensured.

In the case of emerging 'new' concepts of operations (such as PBN at its beginning) or new navigation systems, one or more of these assumptions may not be substantiated.

MNPS was the first (i.e. 1977) international ancestor of a Performance-based Navigation (PBN) specification.

On the 23 August 1977, the USA FAA, aware that for this 'new' type of operations not all of the assumptions as listed above were necessarily verified for all pilots/operators, published the Advisory Circular 91-49[21]. It made it clear that all operators who intended

[20] FCL.605 IR, Part-FCL: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:311:0001:0193:EN:PDF.

[21] Federal Aviation Administration (FAA) Advisory Circular AC 91-49 of 23 August 1977 on General Procedures for flight in North Atlantic Minimum Navigation Performance Specification (MNPS) airspace

to use MNPS had to 'show compliance' with the specifications to the FAA in order to obtain a specific approval for this type of operations in the form of a Letter of Authorisation or an amendment to the Operations Specifications. The concept of specifying a 'performance' for navigation instead of 'avionic boxes' (alias navigation sensors) was a new idea at the time.

In 1988[22] the ICAO Special Committee on Future Air Navigation Systems (FANS) concurred that the progress of integration of on-board navigation systems on the one hand and the emerging Global Navigation Satellite Systems (GNSS) on the other hand, required a more general approach to the matter. As a result, the Required Navigation Performance Capability (RNPC) was identified; it included no reference to any specific navigation sensor and the scope of applicability was not only covering the North Atlantic, but was rather global.

Based on the conclusion of the FANS Committee, ICAO then published[23], in 1994, the first edition of the Manual on Required Navigation Performance (Doc 9613), whose scope was at the time limited to the accuracy requirements for en route instrument navigation.

Two years later, in 1996, in Europe, EUROCONTROL published the first edition of its standard[24] on Basic and Precision Area Navigation (B-RNAV and P-RNAV), following the FANS approach (total freedom for designers and operators to choose navigation sensors and architecture of the on-board navigation system), but giving Member States total freedom to decide on the operational approval (making however reference to the JAR-OPS harmonised rules).

Meanwhile, the special ICAO Conference in 1995 on Communications/Operations[25] recommended the extension of the RNP concept to departure, approach and landing operations. The recommendation was followed in 1999 by the second edition of Doc 9613[26].

Henceforward, the industry began to make a difference between RNAV and RNP (where RNP not only required a certain accuracy, but also the monitoring of its achievement) and the States continued to require a specific approval for RNAV or RNP, as the conditions listed above were not satisfied in all their aspects.

Therefore, the principle of requiring a specific approval (SPA) was not only applied to MNPS but also to RNAV operations. This was in general followed by the Joint Aviation Authorities, particularly in JAR-OPS 1 and was in turn reflected by the so-called 'EU-OPS' in 2006[27].

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[22] ICAO Report of the Fourth Meeting of the Special Committee on Future Air Navigation Systems (Doc 9524).

[23] ICAO Doc 9613-AN/937 Manual on Required Navigation Performance (RNP), First Edition — 1994.

[24] EUROCONTROL Standard Document for Area Navigation Equipment Operational Requirements and Functional Requirements, edition 1.0, 1996.

[25] ICAO Doc 9650 — Report of the Special Communications/Operations Divisional Meeting (SP COM/OPS/95) Montreal, 27 March — 7 April 1995.

[26] ICAO Doc 9613 — Manual on Required Navigation Performance (RNP) (Second Edition, 1999).

[27] Regulation (EC) No 1899/2006 of the European Parliament and of the Council of 12 December 2006 amending Council Regulation (EEC) No 3922/91 on the harmonisation of technical requirements and administrative procedures in the field of civil aviation (OJ L 377, 27.12.2006, p. 1).

A SPA was still required, for operators of commercial air transport (CAT) by aeroplanes, in the last edition of EU-OPS[28] in particular (letter (h) in Appendix 1 to OPS 1.175) for the following list of new or complex procedures:

- Precision Approach in CAT II or CAT III;
- MNPS;
- Area Navigation (RNAV)[29];
- Reduced Vertical Separation Minimum (RVSM);

With the technical evolution from 1978 onwards, the aeronautical mobile communications experienced significant progress, including the introduction of communications via satellite, data link et.al. However, the concept of 'specific approval' has not entered the communications domain.

At the 11th Air Navigation Conference[30] of ICAO, the progress achieved in the area of RNAV, RNP, PBN and GNSS was recognised and it was recommended by the Conference to define and update the operations approval criteria, obstacle clearance criteria and the separation criteria for PBN operations as a necessary complement to the airworthiness specifications.

In 2007, ICAO recognised at the maximum governance level[31] the maturity of PBN and GNSS for operational implementation, through the Resolution A36-23 reproduced in Appendix 4. This was followed by the third edition of the ICAO PBN Manual[32].

Three years later the 37th Session of the ICAO General Assembly[33] adopted, through Resolution A37-11 reproduced in Appendix 5, a challenging implementation plan for PBN, including instrument approaches supported by GNSS at any runway instrument end.

In 2008, the competencies of the Agency were extended to OPS and FCL[34]. In accordance with these extended competencies, the Agency proposed in the NPA[35] for the future 'AIR-OPS', to include in Subpart D OPS.SPA (i.e. specific approval) not only MNPS, RNAV, RVSM and other operations, but also explicitly PBN, in line with the

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[28] Annex III to Council Regulation (EEC) No 3922/91 of 16 December 1991 on the harmonization of technical requirements and administrative procedures in the field of civil aviation (OJ L 373, 31.12.1991, p. 4), as last amended by Commission Regulation (EC) 859/2008 of 20 August 2008 (OJ L 254, 20.9.2008, p. 1), now replaced by Commission Regulation (EU) 965/2012.

[29] Including for Basic RNAV alias RNAV 5.

[30] ICAO 11th Air Navigation Conference (2003) — Report of Committee B to the Conference on Agenda Item 6 (AN-Conf/11-WP/201).

[31] ICAO Assembly Resolution A36-23 on Performance-based Navigation (PBN).

[32] ICAO Doc 9613 AN/937 Performance-based Navigation (PBN) Manual, third edition, 2008.

[33] ICAO Assembly Resolution A37-11 on Performance-based Navigation (PBN) global goals.

[34] Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC. Regulation as last amended by Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 (OJ L 309, 24.11.2009, p. 51).

[35] Notice of Proposed Amendment (NPA) No 2009-02A: Draft Opinions of the European Aviation Safety Agency for a Commission Regulation establishing the implementing rules for air operations of Community operators and Draft Decisions of the Executive Director on acceptable means of compliance, certification specifications and guidance material related to the implementing rules for air operations of Community operators, published in January 2009.

general principle of EU-OPS 1.243. A specific approval was hence proposed in line with EU-OPS for any PBN operation, including B-RNAV on the basis of AMC 20-4[36].

In contrast to the former JAR OPS 1 and EU-OPS, which applied only to CAT aeroplane operators, Part SPA, after the transition, would be applicable to all aircraft operators (including private non-commercial operators of non-complex aircraft). Hence, the number of potentially affected stakeholders would increase dramatically, as well as the administrative burden on them and on respective competent authorities.

According to the European Commission[37], there were up to 50,000 motor-powered General and Business Aviation aircraft in Europe in 2008 (these included approximately 2,800 turbine-powered), while the European commercial fleet numbered about 5,500 aircraft.

The mentioned NPA on specific approvals for PBN operations was generally accepted by the majority of Member States and stakeholders. But from the side of GA representatives, concerns were raised as a reaction to the subsequent CRD. These concerns can be summarised in two points:

- a perceived huge economic and administrative burden of OPS.SPA on General Aviation; and
- the maturity reached by PBN and particularly by RNP APCH operations, which had made the use of these systems not more complex than ILS CAT I (for which no SPA was ever required).

Based on these points, stakeholders and in particular non-commercial operators involved in operations with other-than-complex motor-powered aircraft, put forward a request that the requirement for a specific PBN approval should not apply to them.

In the interest of safety, these comments were not accepted (ref. par. 279 in CRD[38]), the reasoning for this being that the conditions listed above were not completely verified. But in this CRD, the Agency also clarified that no SPA was required for Basic RNAV (RNAV 5), which was deemed to be sufficiently mature.

This approach was also maintained in Opinion 04/2011 and subsequent Commission Regulation (EU) No 965/2012 on AIR OPS, where in any case Article 10.2 specifies that Member States may decide not to apply the provisions of Annexes I to V (i.e. Part SPA) until 28 October 2014.

Non-commercial operators of complex (NCC) motor-powered aircraft and of other than complex (NCO) aircraft, as well as operators of aerial work carrying out specialised operations (SPO) are not yet included in AIR OPS. This may happen around the end of 2013. Should the Commission adopt a transition period of two years, as usual and as proposed by the Agency's Opinions on the matter, this means that at the end of 2015, if nothing were done, even non-commercial operators would be obliged to obtain a SPA before carrying out PBN operations (excluding RANV 5).

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[36] AGENCY AMC 20-4 Airworthiness Approval and Operational Criteria for the use of navigation systems in European airspace designated for Basic RNAV Operations.

[37] Communication form the Commission — An agenda for sustainable future in general and business aviation [COM(2007) 869 final of 11 January 2007].

[38] Comment Response Document (CRD) to NPA 2009-02, published in November 2010.

After this transition period, based on Part SPA — Subpart SPA.PBN, the specific approval process would be the same for commercial and non-commercial operators, as summarised in below:

Table 1: Required SPA for PBN

Type of operations	AGENCY AMC 20	Operational approval			
		CAT	SPO	NCC	NCO
RNAV 10	AMC 20-12	Yes	Yes	Yes	yes
RNAV 5 (B-RNAV)	AMC 20-4	No	No	No	No
RNAV 2	to be developed	Yes	Yes	Yes	Yes
RNAV 1 (~P-RNAV)	future AMC 20-16	Yes	Yes	Yes	Yes
RNP 4	to be developed	Yes	Yes	Yes	Yes
BASIC-RNP 1	future AMC 20-XX	Yes	Yes	Yes	Yes
RNP APCH (LNAV)	AMC 20-27	Yes	Yes	Yes	Yes
RNP APCH (LNAV/VNAV)	AMC 20-27	Yes	Yes	Yes	Yes
RNP APCH (LPV)	AMC 20-28 — NPA	Yes	Yes	Yes	Yes
RNP AR	AMC 20-26	Yes	Yes	Yes	Yes

CAT: Commercial Air Transport operations
NCC: Non-commercial operations with complex motor-powered aircraft
NCO: Non-commercial operations with other–than-complex motor-powered aircraft
SPO: Specialised operations (alias aerial work)

Nevertheless, representatives of non-commercial operators claimed that the Agency would be much stricter than FAA in this regard. Furthermore, the proposed Agency rules were stated to be much stricter than those in force at the time in several Member States. FAA in fact does not always require a specific approval today, in particular for non-commercial operators, as presented below:

Table 2: SPA for PBN required by FAA

ICAO Navigation Specification	Ops/Airworthiness	Requirement for Specific Approval
RNP APCH (to LNAV/VNAV, LNAV, LP, and LPV lines of minima) **Baro-VNAV** (Attachment vice Nav Spec) **Radius-to-Fix (RF)** (Proposed Attachment) **Basic-RNP 1** **Advanced-RNP 1** (For next version of PBN Manual — Renamed as Advanced RNP) **RNP 0.3** (For next version of PBN Manual — may be helicopter specific) **RNP 2** (For next version of PBN Manual)	**AC 90-105** Note 1: Advanced RNP, RNP 0.3, RNP 2, and additional 'advanced features' pending. Note 2: Basic-RNP 1 designated as RNP 1 in the United States **AC 90-107** (for LPV and LP)	**CAT:** Yes (OpsSpecs/MSpecs C052 for RNP APCH and C063 for RNP 1) TBD for RNP 2 (perhaps B034), RNP 0.3, and Advanced-RNP **NCC/NCO:** No (for RNP APCH and RNP 1) TBD for RNP 2, might be required for RNP 0.3 and Advanced-RNP
RNP AR APCH (For next version of PBN Manual — RNP AR Departures)	**AC 90-101A**	**CAT:** Yes (OpsSpecs/MSpecs C384) **NCC/NCO:** Yes (LOA C384)
RNAV 1 and RNAV 2	**AC 90-100A**	**CAT:** Yes (OpsSpecs / MSpecs C063) **NCC/NCO:** No (Optional LOA C063)
RNAV 5	**AC 90-96A**	**CAT:** Yes (OpsSpecs / MSpecs B034) **NCC/NCO:** Yes (LOA B034)
RNP 4	**Order 8400.33**	**CAT: Yes** (OpsSpecs / MSpecs B036) **NCC/NCO:** Yes (LOA B036 + B0XX for Area of Operation)
RNAV 10 (Designated as RNP 10)	**Order 8400.12B**	**CAT:** Yes (OpsSpecs / MSpecs B036) **NCC/NCO:** Yes (LOA B036 + B0XX for Area of Operation)

In order to have an overview of the national situation in the EU, in spring 2011 the Agency distributed a questionnaire to the members of the Advisory Group of National Authorities (AGNA). Question V therein asked if the respective national law included a specific operational approval for certain PBN operations. 20 States replied to this questionnaire and a summary of the replies can be found below:

Table 3: Currently required SPA for PBN based on national law

PBN Operations	Specific operational approval required by national law			PBN included in the curriculum for pilot training	PBN included and checked in the instrument rating
	CAT	NCC	NCO		
	Number of States (out of 20 respondents)				
RNAV 10	16	5	5	14	**8**
RNAV 5 (B-RNAV)	15	6	5	15	**8**
RNAV 2	5	2	2	5	**3**
RNAV 1 (P-RNAV)	16	4	4	15	**8**
RNP 4	9	2	2	6	**3**
Basic-RNP 1	7	3	3	4	**3**
RNP APCH (LNAV)	11	3	3	11	**8**
RNP APCH (LNAV/VNAV)	11	3	3	10	**8**
RNP APCH (LPV)	9	2	3	8	**6**
RNP AR APCH	**7**	**2**	**2**	**6**	**6**

From Table 3 one can observe that:

- RNAV 10 was mainly driven by the FAA requirements to enter the oceanic MNPS airspace;
- the requirement for CAT was mainly driven by EU-OPS 1.243 (i.e. legal provision) and not necessarily by safety assessment at national level;
- less than one third of the responding states required SPA for NCC or NCO in relation to PBN operations en route and in terminal areas;
- even though EU-OPS 1.243 allowed some flexibility, only about half of the respondents required SPA for RNP APCH by CAT operators;
- only a small minority of the responding states required SPA for RNP APCH by non-commercial operators;
- a significant number of states had already introduced requirements for pilot training.

In order to assess if the SPA requirement for PBN could be relaxed, it would be useful to compare the situation as it evolved with the requirements listed above in the perspective of 'total system' (i.e. competent authorities have tools to oversee the safety of all relevant operations/services/organisations):

Table 4: Evolution of RNP APCH operations in Europe

Year	2008	2009	2010	2011
Reference document	**Reg. (EC) 859/2008 (last EU-OPS)**	**AGENCY NPA 2009-02**	**AGENCY CRD 2009-02**	**Declaration of verification for EGNOS**
1. **Regulatory material for airworthiness approval available**	Not available for RNP APCH	AMC 20-27 (Baro VNAV) published	As in 2009	**AMC 20-28 (GNSS LPV) planned in the year**
2. **Complexity of operations does not present particular challenges**	**True for approaches not more complex than current NPA or ILS Cat I**			
3. **Concept and systems mature enough (= not 'new')**	'New' for JAR OPS 1 and EU-OPS Mature for ICAO	AGENCY bound to reproduce as much EU-OPS as possible	No SPA for BRNAV (but required for Basic RNP 1 and RNP APCH)	**AGENCY Opinion 04/2011 (same situation as in 2010)**
4. **Risk associated with improper operation tolerable**	RNP includes monitoring	RNP includes monitoring	RNP includes monitoring	**RNP includes monitoring**
5. **Accuracy, integrity, availability, continuity of satellite signals ensured by a Navigation Service Provider (NSP)**	Not ensured	Not ensured	ESSP certified as NSP	**EGNOS backed by Declaration of Verification**
6. **Standards for procedure design and procedure designers**	Not available	Standards for data quality[39]	Designers in AGENCY Basic Regulation[40]	**Entry into force of the AGENCY B.R. for ATM/ANS**
7. **Accuracy and integrity of NAV database ensured**	Approval per AGENCY Opinion 01/2005	Data providers in AGENCY B.R.	Data providers in AGENCY B.R.	**Entry into force of the AGENCY B.R. for ATM/ANS**
8. **Common EU training and checking standards for pilots**	**Not available**	**Not available**	**Not available**	**Not available**
9. **Provision of information**	**Not**	**NPA 2009-**	**NPA 2009-**	**CRD to NPA**

[39] Commission Regulation (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky (OJ L 23, 27.1.2010, p. 6).

[40] Airspace design in point (i) in the list of Air Navigation Services in chapter 2 of Annex Vb.

from Type Certificate (TC) holder (including as a consequence for changes)	**mandated**	**01 published**	**01 published**	**2009-01 (i.e. OSD) published**

Consequently, since the basic legal tools to oversee the safety of all actors involved in PBN have been adopted, the approach of requiring specific operational approvals for PBN and, in particular, the situation of General Aviation could be reviewed (excluding RNP AR APCH and new applications for which the SPA requirement would continue to apply).

As it can be observed from Table 4 above, the major remaining gap in 2011 were the lack of common requirements for pilot training and periodic checking (at EU level), and the obligation for a TC holder to provide Operational Suitability Data (OSD) throughout the life-cycle of the involved aircraft. The latter issue is however solved, since in July 2013 the EASA Committee at Commission level endorsed the text of the implementing rules on OSD, whose publication is hence expected early in 2014.

4.1.2 Safety risk assessment

According to the information available to the Agency[41], in the decade 2002-2011 Commercial Air Transport (CAT) by aeroplane in Europe has suffered about 9 'controlled flight into terrain' (CFIT) accidents (averaging 0.9/year). Since in Europe there are more or less 10 million ($=10^7$) IFR flights/year, each lasting slightly above two hours on average, this means a historical probability within the range of 4.5×10^{-8} per flight hour (extremely improbable).

The severity of a CFIT by large transport aeroplane is usually catastrophic (i.e. multiple fatalities).

However, the same Annual Safety Review mentions 22 CFIT accidents in only six years (i.e., 2006-2011) for aircraft below 2 250 kg, which are mostly operated by General Aviation operators. This represents a frequency exceeding 3.5 CFIT per year. Although exposure data for General Aviation are not available, this frequency is rated as 'remote'. In this case the severity (few people on board) can be rated as 'hazardous'.

If nothing were done (i.e. continue to impose administrative requirements to fly PBN approach procedures, but not specifying pilot training requirements and, moreover, not periodically checking the skills of the pilots, since this is not included in SPA), it is assumed that the frequency of CFIT accidents mentioned above would at least remain constant as today, considering that following ICAO Resolution A37-11, the number of runways served by instrument PBN procedures is expected to increase significantly in the next few years.

The link between safety of General Aviation (GA) in relation to CFIT and GNSS (a key enabler for PBN) has been recognised also by the European Commission[42]:

'The EU has long invested in the development of satellite based navigation. Despite ICAO recommendations and the availability of certified airborne avionics, those systems are not widely exploited today. From a safety point of view, GNSS could offer one more source of position information. **GNSS contributes to preventing "Controlled Flight into Terrain" (CFIT), which is still the most significant cause of fatal accidents, especially for the least sophisticated aircraft.** GNSS could also allow more flexibility

[41] EASA Annual Safety Review 2011.

[42] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions — An action plan for airport capacity, efficiency and safety in Europe [COM(2006) 819 final of 24 January 2007].

for approach and departure route design in order to avoid obstacles, reduce noise impact or allow safe operations of more closely spaced airports or runways.'

The two risks discussed above for CAT and for GA respectively can be mapped in the risk matrix[43] below[44].

Table 5: Safety risk matrix

Probability of occurrence		**Severity of occurrence**				
		Negligible	**Minor**	**Major**	**Hazardous**	**Catastrophic**
		1	2	3	5	8
Extremely improbable	1					**CAT (8)**
Improbable	2					
Remote	3				**G.A. (15)**	
Occasional	4					
Frequent	5					

4.1.3 Who is affected?

Transition to PBN operations would concern not only Commercial Air Transport, but also General Aviation, as well as Aerial Work (SPO) and, in particular, aeroplanes and helicopters. Furthermore, with a possible inclusion of PBN into the training and examination, Approved flight Training Organisations (ATO) will be affected as well. Likewise, all current licence/IR holders are directly affected as well as flight instructors and examiners. Hence all the stakeholders are as follows:

- Competent Authorities;
- Pilots qualified for instrument operations;
- Related flight instructors (FI) and flight examiners (FE);
- Approved Training Organisations (ATO);
- Providers of simulator training;
- Commercial and non-commercial operators, as well as aerial work (SPO) operators.

[43] The matrix is based on the ICAO Safety Management Manual. Doc 9859 Safety Management Manual – 2nd Edition - 2009. The green boxes correspond to low significance issues, the yellow to medium significance issues, and the red to high significance issues.

[44] Enter the risk index in the appropriate box. For example, an issue that has been identified as 'improbable' and 'catastrophic' would get a risk index of 2 x 8 = 16. Put the result in the appropriate box of the table.

Conversely, aircraft designers and manufacturers are not affected by this NPA, since no amendment is proposed in the rules applicable to them, unless involved in Flight Synthetic Training Devices (FSTD).

4.1.4 How could the issue evolve?

If the regulatory framework remains as of the current date, all operators are required, after 2015, to obtain a specific approval for all PBN applications, with the exception of RNAV 5 (B-RNAV).

Training for IFR flight would remain as today, not include any of the developments of PBN occurred in the last decade.

This means that, for nearly all operations, a specific administrative process would be required, which in turn, due to the increasing amount of applications, would lead to a high workload on the competent authorities. The process will require resources from applicants and possibly less scrupulous checking of individual applications by inspectors, due to lack of time.

4.2 Objectives

The overall objectives of the EU regulatory system are defined in Article 2 of the Basic Regulation. This NPA contributes to the achievement of the overall objectives by pursuing the following specific objectives:

(a) establish safe and cost-efficient pilot training and checking requirements to remove the need of SPA for some PBN operation;

(b) reduce the number of cases in which an operational approval for PBN operation is required for CAT, SPO, NCC, and NCO operators; and

(c) take into account the introduction of RNP 2, Advanced-RNP and RNP 0.3 in the fourth edition of the ICAO PBN Manual and the consequent possibility of 'bundling' approvals to implement these safe and cost-efficient ATM procedures.

4.3 Policy options for PBN operational approval

The basic aim of this NPA is to remove the administrative burden for specific approval of some PBN applications, for operators (especially non-commercial) and authorities. To maintain safety, this administrative alleviation must be compensated by pilot IR training encompassing PBN.

Although the idea summarised in the lines above is very simple, implementing it into the existing regulatory framework across several domains is a complex matter and requires several decisions which influence each other.

Hence, this RIA analyses in series five different issues, because the option selected for one leads to a number of possible options for the subsequent issue.

These five interrelated issues are:

(1) removal of SPA obligation for certain (or all?) PBN applications;

(2) alleviation of the administrative burden represented by SPA for both operators and competent authorities;

(3) amending of the IR rules for 'new' pilots;

(4) transition for 'old' pilots already holding a valid IR; and

(5) transition for the approved training organisations (ATO), for flight instructors (FI) and for flight examiners (FE).

These five issues are assessed in paragraphs 4.5 to 4.9 below.

4.4 Methodology

All the five issues are assessed using the Multi-Criteria Analysis (MCA), which allows to translate any assessment (qualitative or quantitative but not in the same units of measurement) into a dimensional numerical weighted scores.

The first step is to identify a number of possible alternative policy options, for each of the five issues.

These options are then comparatively assessed in terms of safety, environmental, social and economic impacts, as well as proportionality and harmonisation.

All identified impacts are qualitatively assessed (RIA light) and expressed as a score, which is a numerical single digit:

Scale for assessment of impacts	Score
Highly positive (High)	+5
Significantly positive (Medium)	+3
Slightly positive (Low)	+1
Neutral	0
Slightly negative (Low)	-1
Significantly negative (Medium)	-3
Highly negative (High)	-5

Safety scores, since safety is the primary objective of the Agency as per Article 2 of the Basic Regulation, are assigned a weight of 3. Environmental scores, based on the same article, have a weight of 2. Other scores' weight is 1.

Finally, all these scores are algebraically summed.

Differences in the order of magnitude of these final scores support the decision on the option to be preferred.

4.5 Issue 1: For which PBN types is safely possible to remove SPA?

4.5.1 Policy options

For this purpose the following options have been identified:

Table 12: Identified policy options

No.	Short title	Description
0	Do nothing	**Baseline option (no change in rules; risks remain as outlined in the issue analysis).** **SPA required for all PBN (except B-RNAV alias RNAV 5) types, for commercial and non-commercial operators from 2016 onwards**
1	Selected PBN types	**Maintain specific approval (SPA) for RNP AR APCH, RNP 0.3 and some cases for Advanced RNP. Eliminate the obligation for SPA for all other PBN types, for both commercial and non-commercial operators, including all types of PBN APCH, if not RNP AR or 'steep'.**
2	All PBN types	**Eliminate the obligation for SPA for all PBN types described in ICAO Doc 9613 Edition 4.**

Option 1 can be visualised in Table 13 below:

Navigation Specification	Flight Phase							
	En route		Arrival	Approach				Departure
	Oceanic/ remote	Continental		Initial	Interme diate	Final	Missed	
RNAV 10								
RNAV 5								
RNAV 2								
RNAV 1								
RNP 4								
RNP 2								
RNP 1 even with RF legs								
RNP APCH (LNAV)								
RNP APCH (LNAV/VNAV)								
RNP APCH (LPV)								
RNP APCH (LP)								
ADVANCED RNP with RNP scalability, RF legs, FRT, Barometric VNAV, Higher Continuity								
ADVANCED RNP with other optional features (e.g. RTA)								
RNP AR APCH								
RNP 0.3 Rotorcraft								
Steep RNP APCH LPV Rotorcraft								

Not applicable

No operational approval required

Operational approval required

Option 1 will simplify the authorisation procedure to fly PBN: i.e. privilege granted by law to properly trained and checked pilots, flying approved PBN procedures or routes on board of airworthy and suitably equipped aircraft, instead than an additional administrative process to obtain the SPA.

The selection of the PBN types related to such Option 1, has been based not only on the complexity of the operation (i.e. RNP AR APCH not eligible to be exempted from SPA), but also on the maturity of the PBN types just recently included in Doc 9613.

In the coming years, based on the maturity of the requirements and on the acquired experience, the same simplification could be considered for these more recent PBN types, like RNP.03 or 'steep' approach operations for rotorcraft.

Table XX depicts therefore Option 2, in which the obligation for SPA would be removed for all PBN types included in the 4th edition of ICAO Doc 9613.

Navigation Specification	Flight Phase							
	En route		Arrival	Approach				Departure
	Oceanic/ remote	Continental		Initial	Interme diate	Final	Missed	
RNAV 10								
RNAV 5								
RNAV 2								
RNAV 1								
RNP 4								
RNP 2								
RNP 1 even with RF legs								
RNP APCH (LNAV)								
RNP APCH (LNAV/VNAV)								
RNP APCH (LPV)								
RNP APCH (LP)								
ADVANCED RNP with RNP scalability, RF legs, FRT, Barometric VNAV, Higher Continuity.								
ADVANCED RNP with other optional features (e.g. RTA, ...)								
RNP AR APCH								
RNP 0.3 Rotorcraft								
Steep RNP APCH LPV Rotorcraft								

Not applicable

No operational approval required

Operational approval required

Table 13: SPA removed for all PBN operations

4.5.2 Impact analysis

4.5.2.1 Safety impact

The experience acquired by community on RNP 0.3 during regular operations is still insufficient, while for rotorcraft 'steep' approaches ICAO standards have not been adopted. Hence, it is difficult to affirm that these applications are mature enough.

Advanced RNP has a number of features (e.g. RNP scalability, RF legs, FRT, Barometric VNAV, Higher Continuity) which are already installed in most modern aircraft types and regularly flown by related pilots, including in the domain of jet business aviation. However, some of its features (e.g. required Time of Arrival) were considered by the Group of Experts for this task not yet consolidated. In any case they may become operationally required only when SESAR is implemented.

Finally, all the experts in the aviation community concur that RNP AR APCH is intended for difficult environments (e.g. mountainous areas) which present safety challenges and therefore operators should be subject to deeper oversight before flying such procedures.

Option 0:

Due to ICAO Resolution A37-11 and mandate to EUROCONTROL, PBN routes and procedures may proliferate in Europe. Current EU rules will impose the administrative SPA process also to non-commercial operators.

Some aviators may elect not to apply and so continue to use less-safe, obsolete procedures. The workload on inspectors may divert part of their scarce resources from safety to paperwork.

In conclusion, safety would slightly decrease.

Option 1:

Obligation for SPA removed only for operations on which the community has sufficient experience and whose complexity is not more demanding than ILS CAT I.

Flying CAT I without any additional administrative process is a historical privilege of IR pilots; there is no evidence that this approach is unsafe.

The introduction of PBN without SPA for some of the PBN operations types will ensure additional safety benefits by facilitating the performance of flights under PBN rules. Therefore, a medium increase in safety is foreseen.

Option 2:

When SPA are not required for any PBN operations, there will be few PBN operations like RNP AR APCH which will highly increase the safety risks due to the lack of special approval process by the regulator. RNP AR APCH is possibly even more complex than CAT II/III operations, for which most regulators, including the Agency, require SPA.

Furthermore, it is common practice for rule makers to establish or relax rules only when sufficient experience has been accrued, which is not yet the case today.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**0**	**1**	**2**
	Do nothing	**SPA still required for complex or recent PBN types**	**No SPA required for any PBN type**

Assessment	PBN routes and procedures may proliferate in Europe with automatically an administrative SPA process also to non-commercial operators.Some aviators may elect not to apply and so continue to use less-safe, obsolete procedures.In conclusion safety would slightly decrease.	The introduction of PBN without SPA for of the PBN operations types will ensure additional safety benefits by facilitating the performance of flights under PBN rules. Therefore a medium increase in safety is foreseen.	When SPA are not required for any PBN operations, there will be few PBN operations like RNP AR APCH which will highly increase the safety risks due to the lack of special approval process by the regulator.
Score (un-weighted)	-1	3	-5
Weight	Multiply the score by 3		
Score (weighted)	**-3**	**9**	**-15**

4.5.2.2 Environmental impact

The removal of the obligation for SPA for most or all PBN types is expected to accelerate the transition PBN. In turn, since PBN routes are in principle shorter and more efficient than conventional ATS routes, environmental impact would be in general positive.

Option 2 would be even more beneficial, since allowing more efficient operations in particular for helicopters.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**0**	**2B3C1A1**	**2B3C1A2**
	Do nothing	**SPA still required for complex or recent PBN types**	**No SPA required for any PBN type**
Assessment	No improvement of today's situation. Neutral	Quicker transition to PBN, implying more efficient navigation and hence less fuel consumption and less emissions.	Even quicker transition than in Option 2B3C1A1, including for helicopters.
Score (un-weighted)	0	1	3
Weight	Multiply the score by 2		
Score (weighted)	**0**	**2**	**6**

4.5.2.3 Social impact

Option 1 would allow to use more rapidly some regional aerodromes, not equipped with ground radio-navigation aids, even in relatively low visibility conditions, contributing to spread social and economic development in less developed European regions.

Option 2 would be even better, especially for helicopters.

Based on the above considerations, the two identified options are compared as summarised in the table below:

Options	**0**	**1**	**2**
	Do nothing	**SPA still required for complex or recent PBN types**	**No SPA required for any PBN type**
Assessment	No improvement of today's situation. Neutral	More possibility to land at regional aerodromes even in low visibility conditions, which will contribute to the development of all EU regions	Even better than Option 1, in particular in relation to helicopters
Score (un-weighted)	0	3	5
Weight		Multiply the score by 1	
Score (weighted)	**0**	**3**	**5**

4.5.2.4 Economic impact

Option 0: the introduction of new PBN routes will require new SPA also for non-commercial operators. As a consequence, the economic impact will be significantly negative. Any SPA procedure is associated with an administrative burden and cost for both operators and authorities.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**0**	**1**	**2**
	Do nothing	**SPA still required for complex or recent PBN types**	**No SPA required for any PBN type**
Assessment	the introduction of new PBN routes will require new SPA also for non-commercial operators, so the economic impact will be significantly negative	Economic and administrative burden alleviated for most PBN types	Economic and administrative burden alleviated for all PBN types listed in ICAO Doc 9613 Edition 4
Score (un-weighted)	-3	3	5
Weight		Multiply the score by 1	
Score (weighted)	**-3**	**3**	**5**

4.5.2.5 General Aviation and proportionality issues

All the options would treat general aviation (NCC and NCO) similarly to CAT. But option 0, due to the applicability of Part NCC and Part NCO on 2016, would introduce additional complexity in the procedures for general aviation in the majority of the Member States. This would not be in line with the principle P2 for GA in the European General Aviation Safety Strategy.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**0**	**1**	**2**
	Do nothing	**SPA still required for complex or recent PBN types**	**No SPA required for any PBN type**
Assessment	Significant additional administrative burden for general aviation from 2016 onwards	Simplifies the regulation for GA in the same way as for CAT	Even simpler than option 1 including for SMEs operating rotorcraft.
Score (un-weighted)	-5	3	5
Weight		Multiply the score by 1	
Score (weighted)	**-5**	**3**	**5**

4.5.2.6 Impact on 'Better Regulation' and harmonisation

Option 0: Additional 'red tape' (i.e. additional administrative procedure) to fly even mature and non-complex PBN procedures or routes

Option 1: Not requiring SPA for mature operations not more complex than ILC CAT I is fully harmonised with the aviation tradition.

Option 2: Eliminating SPA even for 'novel' PBN types, on which there is not sufficient actual experience, would depart from the prudent approach constantly taken by regulators in aviation history.

Based on the above considerations, the identified options are compared as summarised in the table below:

Options	**0**	**1**	**2**
	Do nothing	**SPA still required for complex or recent PBN types**	**No SPA required for any PBN type**
Assessment	Additional 'red tape'	Fully harmonised with existing rules and with the tradition in aviation history	Departing from the approach in existing rules and from the tradition in aviation history
Score (un-weighted)	-5	3	-3
Weight		Multiply the score by 1	
Score (weighted)	**-5**	**3**	**-3**

4.5.3 Comparison of options

Using the multi-criteria analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed:

Options	**0**	**1**	**2**
	Do nothing	**SPA still required for complex or recent PBN types**	**No SPA required for any PBN type**
		Weighted score	
Safety	-3	9	-15
Environment	0	2	6
Social	0	3	5
Economic	-3	3	5
General Aviation & Proportionality	-5	3	5
Regulation and Harmonisation	-5	3	-3
Total	**-16**	**23**	**3**

Option 0 ('do nothing') is significantly negative in the total score and slightly negative from each perspective, including safety.

Option 1 has a very high total score; it is positive from any perspective and is by far the best with respect to safety and the best for regulation harmonisation.

Option 2 ('Eliminate SPA for all PBN types' has a marginal positive total score, but it is highly negative in safety terms, although being more positive than Option 1 for the environmental, social, economic and proportionality impact.

4.5.4 Conclusions on issue 1

Option 1 (eliminate SPA for almost all PBN types, but excluding the most complex or new ones) is the preferred one.

It postulates eliminating SPA for most PBN types, but this Option does not clarify 'how' this should be implemented. I.e. only amending Part SPA or even other implementing rules and related AMC/GM. This is hence the next issue analysed in paragraph 4.6 immediately below.

4.6 Issue 2: How to remove SPA for PBN

4.6.1 Policy options

The following options have been identified:

No.	Short title	Description
1A	Amend Part SPA	Baseline option: SPA removed for some PBN types (as in Option 1 selected above) through amendment of **Part SPA**, but no other rules (e.g. other Parts of AIR-OPS, or Part FCL or AMC 20 amended).
1B	Remove SPA without amending Part FCL	Baseline option: SPA removed for some PBN types (as in Option 1 selected above) through amendment of **Part SPA**. Other Parts of **AIR-OPS** amended as well and the same for **AMC 20**. Part FCL rules on training and checking for Instrument Rating (IR) unchanged.
1C	Remove SPA and amend Part FCL	As Option 1B, but in addition amending **Part FCL** rules on training and checking for IR, to reflect the change in pilot's theoretical knowledge (TK) and practical skill (PS) required to cover PBN.

4.6.2 Impact analysis

4.6.2.1 Safety impact

Principle: a specific approval is an administrative process whose procedures represent a burden for both applicants and competent authorities, therefore a specific approval should be used only when it provides an added-value in the prevention of accidents.

Option 1A: the administrative SPA process would be eliminated for the majority of PBN types, for commercial and non-commercial operators. But the pilot training and checking requirements would not be aligned with PBN, so leaving a possible safety gap.

Furthermore, the text of some AMC 20 (still referring to operational approval) may be confusing, while no clear requirments, e.g. for operator training, would exist in the AIR-OPS.

In addition, some potential applicants, especially in non-commercial aviation, may elect not to apply and hence continue to fly obsolete and less safe procedures. At the same time, the perceived additional burden in 2016 would undermine the message that PBN is beneficial, especially in terms of safety to prevent Controlled Flight Into Terrain (CFIT) for the entire civil aviation community.

Furthermore, the administrative burden would require resources not only from operators, but also from authorities. The resources of the authorities, which are often shrinking due to the general economic situation, and which are faced by the growing complexity of modern aviation, could be more efficiently used to increase safety, instead of processing a huge amount of paperwork.

Option 1B: Commercial and non-commercial instrument rated pilots could take advantage of new PBN procedures, without administrative burden.

Air operators would find clear guidance in AIR-OPS not contrasting with AMC 20.

The clarity of the rules would contribute to improving safety, but the lack of specific training and checking provisions would lead to a 'learning-by-doing' attitude, with potential additional risks caused by flying PBN procedures even without proper and stabndardised training.

Option 1C: Commercial and non-commercial instrument rated pilots could take advantage of new PBN procedures, without administrative burden.

Therefore, it would be beneficial from the safety viewpoint that a SPA is only required when really necessary, while giving by law the privilege (like for instrument approaches in ILS Cat I) to properly rated pilots on board of suitable and airworthy aircraft, to fly PBN applications not more complex than present Cat I.

However, the 'new' pilots (i.e. those not yet holding an IR) have to be not only properly qualified for IR (including for PBN), but also periodically checked.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1A**	**1B**	**1C**
	Only Part SPA	**Remove SPA and amend AIR-OPS and AMC 20, but not Part FCL**	**Remove SPA and amend AIR-OPS, AMC 20 and Part FCL**
Assessment	Lack of harmonisation between different sets of rules would highly compromised safety.	The clarity of the rules would contribute to improving safety, but the lack of specific training and checking provisions, would lead to a 'learning-by-doing' attitude, with potential additional risks caused by flying PBN procedures even without proper and standardised training.	Having adapted Part FCL to PBN would create the theoretical knowledge and practical skill necessary to properly fly PBN procedures. The safety risk for CAT would substantially remain at the same level of today. But CFIT events would became less probable for non-commercial operators, due to better standardised training and perdiodic checking.
Score (un-weighted)	-5	-3	3
Weight		Multiply the score by 3	
Score (weighted)	**-15**	**-9**	**9**

4.6.2.2 Environmental impact

All the three identified options are neutral from the environmental perspective.

4.6.2.3 Social impact

Currently, in the great majority of EU Member States, IR rated general aviation pilots today fly PBN procedures without the need to obtain a specific SPA.

Option 1A: If nothing is changed in the AIR-OPS rules, from 2016 onwards these thousands of pilots would be forced to apply for SPA or discontinue flying PBN, for which most of them have acquired sufficient competence. This would create gross dissatisfaction in the general aviation community, contrary to declared Commission policy to revamp this segment of aviation. The dissatisfaction could even contribute to decreasing the citizens' perception of the benefits stemming from the European Union, which is a phenomenon present today on the continent.

Option 1B and 1C: Abolishment of the administrative burden for SPA, even in the few States that today require it for general aviation (NCC and NCO), will ensure a slight positive social impacts because of cutting 'red tape' in those States.

Based on the considerations from above, the three identified options are compared as summarised in the table below:

Options	**1A**	**1B**	**1C**
	Only Part SPA	**Remove SPA and amend AIR-OPS and AMC 20, but not Part FCL**	**Remove SPA and amend AIR-OPS, AMC 20 and Part FCL**
Assessment	From 2016 gross dissatisfaction in the general aviation community	Abolishment of the administrative burden for SPA, even in the few States which today require it for general aviation (NCC and NCO)	As 1
Score (un-weighted)	-3	1	1
Weight		Multiply the score by 1	
Score (weighted)	**-3**	**1**	**1**

4.6.2.4 Economic impact

General aspects:

Any administrative process costs money to applicants (to fill and submit the form, but even more to acquire, record and provide the necessary evidence supporting it) and to competent authorities (whether the cost is borne by applicants or by tax-payers).

- The obligation to comply with different rules not mutually harmonised and divergent will imply a cost on operators and authorities to find pragmatic ways to mitigate the regulatory mismatches.

Modernising the rules for IR training and checking would reduce the burden for operator training and facilitate the mobility of pilots.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1A**	**1B**	**1C**
	Only Part SPA	**Remove SPA and amend AIR-OPS and AMC 20, but not Part FCL**	**Remove SPA and amend AIR-OPS, AMC 20 and Part FCL**
Assessment	Additional burden to interpret and apply contrasting rules. Burden for operator training not reduced in comparison to today's situation.	Clear and mutually consistent AIR-OPS and AMC 20, but still need for substantial operator training, since instrument rated pilots would not be trained for PBN.	Clear and mutually consistent AIR-OPS and AMC 20. Operator training needs reduced.
Score (un-weighted)	-1	1	3
Weight		Multiply the score by 1.	
Score (weighted)	**-1**	**1**	**3**

4.6.2.5 General Aviation and proportionality issues

In case of option 1A and 1B, the additional burden for (non-standardised) PBN tranining would be proportionally greater on physical persons and on Small or Medium-sized Enterprises (SMEs), including CAT operators with fleet of small dimensions.

This burden would increase with the increase of PBN types in fourth edition of ICAO Doc 9613.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1A**	**1B**	**1C**
	Only Part SPA	**Remove SPA and amend AIR-OPS and AMC 20, but not Part FCL**	**Remove SPA and amend AIR-OPS, AMC 20 and Part FCL**
Assessment	In proportion, greater burden on physical persons and SMEs, due to mismatch among rules (e.g. Part SPA versus AMC 20)	Better than 1A, but still unclear on the pilot requirments	Clear rules on initial training and periodic checking of IR rated pilots would allow also non-commercial or SME CAT operators to standardise their respective pilots with no excessive burden
Score (un-weighted)	-3	-1	3
Weight		Multiply the score by 1	
Score (weighted)	**-3**	**-1**	**3**

4.6.2.6 Impact on 'Better Regulation' and harmonisation

With option 1A, the decision not to pursue any amendment to existing regulations beyond Part SPA would lead to confusion with other Parts of AIR-OPS and between AIR-OPS and AMC 20. Furthermore, no standardised rules would exist for pilot training which is an integral part of the 'total aviation system' recalled by the Legislator in recital (1) of Regulation (EU) No 1108/2009 (i.e. second extension of the mandate of the Agency).

This would mean confusion, for pilots, operators and authorities, when transitioning from the current regulatory approach, so contrasting the spirit of 'better (or smart) regulation[45]' pursued by the European Commission.

In any case some mismatch would exist with FAA, which presently requires several specific operational approvals, including for PBN, for CAT operators, recorded in the OPS SPECS. The effect of the mismatch would be mitigated, but not in the case of Option 1A, by amending the Form for the EU OPS SPECS.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1A**	**1B**	**1C**
	Only Part SPA	**Remove SPA and amend AIR-OPS and AMC 20, but not Part FCL**	**Remove SPA and amend AIR-OPS, AMC 20 and Part FCL**
Assessment	Regulations will become mutually not consistent. No rules existing for standardised pilot training and checking in the PBN context. Mismatch with the FAA practice not mitigated.	Regulations will become mutually consistent, but no rules would exist for standardised pilot training and checking in the PBN context. Mismatch with the FAA practice mitigated.	In line with 'better regulation'. Mismatch with the FAA practice mitigated.
Score (un-weighted)	-5	-1	3
Weight		Multiply the score by 1	
Score (weighted)	**-5**	**-1**	**3**

[45] http://ec.europa.eu/smart-regulation/index_en.htm.

4.6.3 Comparison of options

Using the multi-criteria analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed:

Options	1A	1B	1C
	Only Part SPA	**Remove SPA and amend AIR-OPS and AMC 20, but not Part FCL**	**Remove SPA and amend AIR-OPS, AMC 20 and Part FCL**
		Weighted score	
Safety	-15	-9	9
Environment	0	0	0
Social	-3	1	1
Economic	-1	1	3
General Aviation & Proportionality	-3	-1	3
Regulation and Harmonisation	-5	-1	3
Total	**-27**	**-9**	**19**

The significantly negative score of Option 1A (only Part SPA) leads to the conclusion that amendments should be introduced, not only to this Part but also in other rules. This option is also negative in safety terms.

Option 1B (amend AIR-OPS and AMC 20, but not amend Part FCL) is also negative, in particular from the safety perspective.

Remaining Option 1C (amend AIR-OPS, AMC 20 andPart FCL) has not only the highest score, but it is the only one positive in safety terms and not negative from any other perspective.

4.6.4 Conclusions on issue 2

Option 1C (amend AIR-OPS, AMC 20 andPart FCL) is the preferred one

It postulates amending Part FCL to integrate PBN therein, but this Option does not clarify 'how' Part FCL should be amended. This is hence the next issue analysed in paragraph 4.7 immediately below.

4.7 Issue 3: Pilot training for Instrument Rating (IR)

4.7.1 Policy options

Having selected Option 1C for issue 2, which includes amendment of Part FCL in relation to IR (for 'new' pilots; i.e. not yet holding a valid Instrument Rating), it is clearly not necessary to assess the option 'do nothing' for issue 3.

However, Part FCL could be amended in different ways and hence the following options have been identified:

Table 3: Selected policy options

No.	Short title	Description
1C1	Add PBN to IR	Option 1C: SPA removed for some PBN types. Part FCL rules on training and checking for IR adapted to reflect the change in pilot's theoretical knowledge (TK) and practical skill (PS) required to cover PBN. Plus: Maintain conventional navigation elements in the current IR training and checking and **add PBN** elements for initial qualification of future IR pilots. IR requirements become more extensive than the current ones.
1C2	Modernise IR	Option 1C: SPA removed for some PBN types. Part FCL rules on training and checking for IR adapted to reflect the change in pilot's theoretical knowledge (TK) and practical skill (PS) required to cover PBN. Plus: Maintain only the reasonably required conventional navigation elements in an updated IR (outdated procedures and technologies removed), while adding PBN elements for initial qualification of future IR pilots. This implies additional learning objectives for theoretical knowledge. Amend the requirements for **training and checks in flight to cover also PBN, but without extending their duration.**
1C3	Parallel IR	Option 1C: SPA removed for some PBN types. Part FCL rules on training and checking for IR adapted to reflect the change in pilot's theoretical knowledge (TK) and practical skill (PS) required to cover PBN. Plus: Until the end of the transition period (e.g. 2023), the conventional IR will continue while the 'new' IR, without the old-fashioned elements, is introduced **in parallel** at the same time. Both IRs have the same extent, but one lacks PBN while the other lacks the 'old-fashioned' procedures.

Option 1C3 (i.e. two different sets of requirments for IR TK and PS in parallel for about 10 years) is not assessed in detail in the following pargraphs, since:

- TK and PS requirements have often been moderinised in aviation history, but never two different sets of requirements existed in parallel in any Member State, when new navigation techniques emerged;
- in fact two sets of rules would cause significant confusion among pilots, instructors and examiners;
- the confusion might even create safety issues;
- two sets of requirments for IR would lead to high difficulty for implementation and maintaining records of which one is held by which pilot;
- the transition to PBN would be longer, so contrasting the spirit of ICAO Assembly Resolutions.

Hence, in following paragraph 4.7.2, only options 1C1 and 1C2 will be compared in detail.

4.7.2 Impact analysis

4.7.2.1 Safety impact

Option 1C1 would increase the time necessary to acquire the necessary theoretical knowledge for PBN (estimated one day of distance-learning), but it would also increase the duration, and hence the cost, of flight training and checking. This additional cost of flight activity could deter some pilots from acquiring or maintaining the validity of their IR. These pilots may hence fly only under VFR, which is less safe than IFR.

Option 1C2 would cause little additional time/cost for flight activity and therefore no pilot will be induced to change her/his plans for IR.

Both options 1C1 and 1C2, however, by introducing PBN in the pilot career, would make the training closer to actual modern operations, with beneficial effects in terms of safety.

Based on the above considerations, the two options for issue 3 are compared as summarised in the table below:

Options	**1C1**	**1C2**
	Add PBN to IR **(More extensive requirements)**	**Modernise IR** **(no change in duration of flight training and checking)**
Assessment	Increased time and cost of flight activity to acquire and maintain IR could deter some pilots from operating under IFR. These pilots would fly under VFR which is, based on historical data, less safe.	Addition of PBN elements into IR will make IR closer to actual modern operations, but still economically accessible, particularly for General Aviation pilots.
Score (un-weighted)	-3	3
Weight	Multiply the score by 3	
Score (weighted)	**-9**	**9**

4.7.2.2 Environmental impact

Both the two options for issue 3 are neutral for the environmental impact.

4.7.2.3 Social impact

Similarly the two options are considered neutral from the social perspective.

4.7.2.4 Economic impact

A change in IR would have an economic impact mainly on three entities: ATO, student pilots and competent authorities.

Options 1C1 and 1C2:

- ATOs which provide IR training are impacted. They will have to adapt their courses, resources and equipment (e.g. FSTDs).
- the competent authorities which have to oversee the application of the requirements are impacted.

Option 1C1: the pilots (including student pilots) wishing to acquire the IR in the future will be subject to the cost and time requirements due to the increased scope of IR which would lead to longer training and checking, including on FSTDs and in flight.

Based on the above considerations, the two options for issue 3 are compared as summarised in the table below:

Options	**1C1**	**1C2**
	Add PBN to IR **(More extensive requirements)**	**Modernise IR** **(no change in duration of flight training and checking)**
Assessment	Cost for ATO to necessarily upgrade equipment. Increased scope of IR would lead to longer training and checking, including on FSTDs and in flight. Costs for student pilots would increase.	Cost for ATO to necessarily upgrade equipment. Training and checking, including on FSTDs and in flight would not become significantly longer. No significant costs increase for student pilots.
Score (un-weighted)	-5	-1
Weight	Multiply the score by 1	
Score (weighted)	**-5**	**-1**

4.7.2.5 General Aviation and proportionality issues

Based on the European GA Safety Strategy[46], the principle is that GA should be handled differently from CAT and not be seen as a simple appendix to it, subject to the same rules, which in fact may as well be disproportionate (Principle P1, Guideline G1.1).

But the principles established in the European GA Safety Strategy also dictate that where resources are shared between GA and CAT or if they interact, appropriate measures have to be developed (G2.2). G2.3 requires favourable consideration of new technologies, and PBN falls into this category.

As PBN is concerned with navigation and the use of airspace and aerodromes, which are shared between commercial and non-commercial operators, an appropriate level of competence is necessary to maintain a common target level of safety in the airspace and at the aerodromes. Even if an accident at an aerodrome may involve only a general aviation aircraft, this may nevertheless disrupt the scheduled flights for that day.

Option 1C1: the GA pilots wishing to acquire the IR in the future will be subject to licence cost increase due to the increased scope of IR, which would lead to longer training and checking, including on FSTDs and in flight.

Option 1C2: because training and checking, including on FSTDs and in flight, would not become significantly longer, there will not be a significant increase in cost of training for SMEs and private pilots.

Based on the above considerations, the two options for issue 3 are compared as summarised in the table below:

Options	**1C1**	**1C2**
	Add PBN to IR **(More extensive requirements)**	**Modernise IR** **(no change in duration of flight training and checking)**
Assessment	Due to an increased scope of IR would lead to longer training and checking, including on FSTDs and in flight, higher cost of training for SMEs and private pilots.	Training and checking, including on FSTDs and in flight, would not become significantly longer.
Score (un-weighted)	-1	3
Weight	Multiply the score by 1	
Score (weighted)	**-1**	**3**

[46] http://www.europe-air-sports.org/fileadmin/user_upload/newsletter/European_GA_Safety_Strategy_final_30_Aug_12.pdf.

4.7.2.6 Impact on 'Better Regulation' and harmonisation

Including PBN into the IR training and checking would not only create a uniform framework across Europe, but would also reflect the trends towards the spreading of PBN at global level.

Another important point is that including PBN in the rules for pilot training and checking would provide evidence of proper training and checking to EU aviators operating out of the European airspace, to be possibly shown to third country inspectors.

Based on the above considerations, the two options for issue 3 are compared as summarised in the table below:

Options	**1C1**	**1C2**
	Add PBN to IR **(More extensive requirements)**	**Modernise IR** **(no change in duration of flight training and checking)**
Assessment	Uniform training, which includes all types of radio-navigation, implemented in all the Member States Evidence of PBN competence easily shown to inspectors, including in third countries	As 1C1
Score (un-weighted)	5	5
Weight	Multiply the score by 1	
Score (weighted)	**5**	**5**

4.7.3 Comparison of options

Using the multi-criteria analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed:

Options	1C1	1C2
	Add PBN to IR (More extensive requirements)	**Modernise IR (no change in duration of flight training and checking)**
	Weighted score	
Safety	-9	9
Environment	0	0
Social	0	0
Economic	-5	-1
General Aviation & Proportionality	-1	3
Regulation and Harmonisation	5	5
Total	**-10**	**16**

According to the MCA, Options 1C1 is significantly negative. It is also negative in safety terms.

The preferred option is hence 1C2, which has a positive total score, while definitely exceeding the other from the safety perspective. Furthermore, it is positive from the proportionality and harmonisation point of view, while its negative economic impact is much less than the other option.

4.7.4 Conclusions on issue 3

Option 1C2 (i.e. add PBN elements for initial qualification of future IR pilots, in particular in learning objectives for theoretical knowledge and amend the requirements for training and checks in flight, without extending their duration) is the preferred one.

4.8 Issue 4: Transition for pilots already instrument rated

4.8.1 Policy options

Option 1C2 solves the issue of safely removing the obligation for SPA for some PBN applications, having amended the training and checking requirements for pilots wishing to achieve the IR after the date of applicability of the new rules.

However, this immediately opens up other questions to be addressed. The first issue is how and when to upgrade (or verify) the PBN competence of 'old' pilots already holding a valid IR. Even in this case the option 'do nothing' is not relevant, since already dismissed when discussing issue 1 above.

The following options have been identified in relation to the transition of 'old' pilots already holding an IR:

Table 4: Identified policy options

No.	Short title	Description
1C2A	SPA required for pilots holding a valid IR issued before a certain date	Option 1C2: SPA removed for some PBN types. Part FCL rules on training and checking for IR adapted to reflect the change in pilot's theoretical knowledge (TK) and practical skill (PS) required to cover PBN. Maintain only the reasonably required conventional navigation elements in an updated IR (outdated procedures and technologies removed), while adding PBN elements for initial qualification of future IR pilots. This implies additional learning objectives for TK. Amend the requirements for training and checks in flight to cover also PBN, but without extending their duration. Plus: IR holders, who obtained their **'old' IR** before the applicability of the updated IR, will need a **SPA** for flying PBN procedures.
1C2B	Mandatory training	Option 1C2: SPA ….. …. without extending their duration. Plus: IR holders, who obtained their IR before the applicability of the updated IR, will need to participate in a **mandatory training** (both TK and PS) in order to maintain the validity of the IR.
1C2C	Competency assessed at the first periodic check	Option 1C2: SPA ….. …. without extending their duration. Plus: IR holders, who obtained their IR before the applicability of the updated IR, will need to update their TK on PBN trough courses and trainings. Competence in PS shall be demonstrated in courses or in the first periodic check. **No mandatory training on PS**.

4.8.2 Impact analysis

4.8.2.1 Safety impact

The main objective of the Agency rules is to increase the safety of flight operations, while maintaining the regulatory burden for stakeholders and authorities at a reasonable level. The question is hence how it would be possible to ensure that existing IR holders acquire appropriate PBN competencies during the transition period.

If SPA is maintained for holders of 'old' IR (i.e. Option 1C2A), the operators concerned (including non-commercial ones) would be required to provide evidence that a training programme has been established, but the nature of the training programme would not be specified in regulatory material. This might lead to significantly different standards across the Union.

Another option (i.e. 1C2B) is to require all existing IR holders to attend mandatory 'delta' training, including TK and PS. At the end of this mandatory cycle, the whole flying population would have achieved the same competence.

The third option (i.e. 1C2C) is to require TK training, but not to mandate PS in flight or on FSTDs. The holders of IR would be requested to demonstrate their PS at the first periodic check, which will take place in accordance with existing rules in Part FCL.

In assessing the safety impact of these alternative options, it is important to consider the magnitude of the change envisaged. Technologies and operating procedures have changed gradually along the history of IFR operations. Pilots were expected to adapt to modern procedures and changing environment through a number of mechanisms.

For commercial operators, the recurrent flight training requirements in Part ORO (Subpart ORO.FC) ensure this. For non-commercial operators not subject to ORO.FC, advisory material such as AICs, safety publications from NAAs/EGAST and the GM in the regulations provide the mechanism, which is subject to scrutiny through annual proficiency checks. Since the creation of JAR-FCL learning objectives (LO), significant changes have been made, in particular to 'subject 62' (i.e. radio navigation). Significant PBN material is already incorporated in LO, even though it does not reflect the very latest ICAO terminology in 4th edition of Doc 9613.

RNAV 5, which in practice uses similar equipment (including the Human Machine Interface in the cockpit) and incorporates many of the concepts in other PBN specifications, has been a *de facto* requirement in the European airspace during the last 10 years, since mandatory above FL95, and with very few conventional airways remaining.

Most operations have used the underlying technical enablers of PBN, such as GNSS, navigational databases, fly-by waypoints, direct-to routing and integrity monitoring. Most conventional approaches and departure procedures are already flown using PBN 'overlays'[47]. Almost all Air Traffic Service Providers (ATSPs) expect operators to apply PBN techniques rather than navigate between ground-based navaids. In congested airspace, aircraft following different routes may in fact create safety problems.

During the development of this NPA, the Rulemaking Group has sought data on PBN-related safety occurrences. While lessons learnt and insights can be drawn from the results of that research, there is no evidence that flight crews are performing PBN

[47] I.e. an instrument procedure following exactly the pattern of the previous conventional procedure, but supported by PBN infrastructure.

operations inadequately. Neither there is evidence that PBN is less safe than conventional radio-navigation.

On the other hand, any mandate for training of any sort may have a marginal effect on flight crew competence, unless there is obligation to demonstrate the acquired TK and PS. There is no reason to believe that, in order to improve safety, training time, resources and focus would be optimally spent on PBN operations training instead of, for example, on loss of control or Threat and Error Management.

Furthermore, mandatory training does not allow to credit previously acquired skills, which is the essence of modular and competence based training.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2A**	**1C2B**	**1C2C**
	SPA for holders of 'old' IR	**Mandatory training for holders of 'old' IR**	**Competence assessed at the first periodic check**
Assessment	Once assessed the first time, the competence for SPA is not subject to subsequent periodic checking. No uniform training and checking standards across the EU	The mandatory conversion training will bring all IR holders to the same standards with respect to PBN. Previously acquired competence not credited. Knowledge and skill are verified through periodic checks, throughout the pilot career.	IR holders can acquire the theoretical knowledge through courses in accordance with FCL.615, in an ATO or through operator programme. Previously acquired competence can be credited. Knowledge and skills are verified through periodic checks, throughout the pilot career. In conclusion, it is equivalent to Option 2B2 in safety terms
Score (un-weighted)	-3	5	5
Weight		Multiply the score by 3	
Score (weighted)	**-9**	**15**	**15**

4.8.2.2 Environmental impact

All the three identified options are neutral form the environmental perspective.

4.8.2.3 Social impact

In Option 1C2A, a large percentage of pilots who currently have the privilege to fly PBN procedures under national law, would be subject to a 'surprising' (from their perspective) requirement to apply for and obtain a SPA.

Option 1C2B would also dissatisfy several IR holders, forced to undergo (and possibly pay) additional TK and PS training, even though they may have a proven safe track record in the use of PBN procedures.

Furthermore, both 1C2A and 1C2B would depart from the practices that regulators have historically followed when implementing changes in IR requirements.

Option 1C2C would have the least social impact as it allows all current IR holders to continue to conduct PBN operations without disruption in the immediate and to demonstrate the acquired competence at the next proficiency check, due anyway.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2A**	**1C2B**	**1C2C**
	SPA for holders of 'old' IR	**Mandatory training for holders of 'old' IR**	**Competence assessed at the first periodic check**
Assessment	IR holders in some countries are already performing PBN procedures in accordance with their national rules. They would lose this privilege and be 'surprisingly' forced to apply and obtain a SPA. The general aviation community would be highly dissatisfied.	Forcing a mandatory training, without taking credit of previously acquired competence, would not only 'surprise' the general aviation community, but also impose an additional cost. This community would be even more dissatisfied than in Option 2B1.	In accordance with the historical precedents, a 'smooth' transition which assumes that pilots are responsible enough to acquire the missing knowledge through courses or training in order to cope with the changing rule framework is the option with the smallest social impact. Moreover, the higher emphasis on self-improvement and crediting acquired skills, is more in line with the safety culture, rather than a punitive approach.
Score (un-weighted)	-3	-5	5
Weight		Multiply the score by 1	
Score (weighted)	**-3**	**-5**	**5**

4.8.2.4 Economic impact

Option 1C2A: A minor cost could be expected in case of SPA in which case previously acquired experience would most probably be taken into account.

Option 1C2B: Economically, introducing a mandatory Δ-training would represent an additional cost for the IR holders, but a positive income for several ATOs.

Option 1C2C: on the other hand, would allow anyone to decide how to possibly improve her/his competence, knowing that it will be verified at the first periodic check.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2A**	**1C2B**	**1C2C**
	SPA for holders of 'old' IR	**Mandatory training for holders of 'old' IR**	**Competence assessed at the first periodic check**
Assessment	With the proliferation of PBN types, the need for current IR holders to gain a number of SPA will lead to a substantial workload on operators and authorities to handle SPA requests. Cost of unnecessary training would however be negligible.	Mandatory training would represent a significant cost on the current IR holders.	Minor cost impact in the absence of mandatory PS courses and avoiding unnecessary training, since acquired competence would be credited.
Score (un-weighted)	-1	-3	3
Weight	Multiply the score by 1		
Score (weighted)	**-1**	**-3**	**3**

4.8.2.5 General Aviation and proportionality issues

The European GA Safety Strategy urges to limit the amount of bureaucracy to which GA is subjected to the necessary minimum. It favours a 'competency based' approach, by using the proficiency check to assess competence.

For GA all the options proposed carry along some drawbacks.

Option 1C2A:

All PBN types, except B-RNAV, are subject to a SPA, even though nowadays a number of Member States allow some PBN operations without additional training or approvals. Hence, SPA for holders of 'old' IR means the introduction of the requirement for SPA on nearly all PBN types. This would create administrative burden on the general aviation community and respective competent authorities.

Options 1C2B and 1C2C:

On the contrary, these options would allow PBN operations for everyone without the need for a SPA for each PBN type.

After the transition period and based on Commission Regulation (EU) No 965/2012, only B-RNAV is allowed without SPA, which represents a heavy administrative burden on general aviation and SMEs.

Option 1C2B:

However, full mandatory training is close to the invalidation of the current IR. This would not only require extra time but also additional expenditure for several IR rated pilots. It can be argued that this Option will only benefit ATOs. Note also principle P4 of the Safety Strategy on grandfathering and guideline G5.2 on having confidence in participants to 'do the right thing', and G5.5 on taking account of the best global practices for GA in the light of the FAA's lack of burdensome requirements for Part 91 operators.

Option 1C2C:

Hence, it is more reasonable to ensure the availability of the theoretical knowledge (TK) and to rely, where possible, on competence acquired through previous experience, demonstrated to the examiners during the periodic checks of these skills.

All IR holders are allowed to continue PBN operations without SPA and without mandatory PS training. Evidence of TK has to be given to the examiner and PS proven through evidence or demonstrated during the first periodic check. No privileges will be lost because of regulatory action. On the contrary, some privileges might be gained, since the IR would give the privilege to fly almost all PBN types.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2A**	**1C2B**	**1C2C**
	SPA for holders of 'old' IR	**Mandatory training for holders of 'old' IR**	**Competence assessed at the first periodic check**
Assessment	This SPA will impose heavy administrative burden on general aviation and SMEs	Significant additional cost on general aviation and SMEs, despite no SPA.	Ensure the availability of the TK and rely, where possible, on competence acquired through previous experience, demonstrated to the examiners during the periodic checks of these skills will allow a positive impact on GA.
Score (un-weighted)	-3	-3	3
Weight		Multiply the score by 1	
Score (weighted)	**-3**	**-3**	**3**

4.8.2.6 Impact on 'Better Regulation' and harmonisation

Option 1C2A :

Should the privilege to fly PBN procedures be coupled to a SPA for the existing IR holders this would be a break from the current historical practices in several Member States. This may even disrupt PBN operations and slow down the transition required by ICAO Resolution A37-11, since the scarce inspectors available in several competent authorities would have to cope with a huge number of applications.

Option 1C2B:

Further on, an enforced mandatory training would be a unique novel approach limited to Europe and in stark contrast with other ICAO Contracting States, including USA, in which PBN is seen as a natural evolution of IR, and where it is responsibility of 'Part 91' IR holders to keep up with evolution of the state of the art.

Option 1C2C:

Hence, option 1C2C would best reflect the current approach in the Member States as well as other States and poses the least issues with respect to harmonisation and with the required oversight and assurance that third countries trust the European IRs.

Greater emphasis on the individual responsibility is well in line with practices in other countries as well as the Member States would be in line with the 'Better regulation' approach.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2A**	**1C2B**	**1C2C**
	SPA for holders of 'old' IR	**Mandatory training for holders of 'old' IR**	**Competence assessed at the first periodic check**
Assessment	Disruption of the current practices, not harmonised with the FAA practices for Part 91 operators.	An enforced training in order to gain a common level of knowledge would be a unique approach to this thematic in the world	In line with "Better regulation" approach.
Score (un-weighted)	-3	-5	3
Weight		Multiply the score by 1	
Score (weighted)	**-3**	**-5**	**3**

4.8.3 Comparison of options

Using the multi-criteria analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed:

Options	1C2A	1C2B	1C2C
	SPA for holders of 'old' IR	**Mandatory training for holders of 'old' IR**	**Competence assessed at the first periodic check**
		Weighted score	
Safety	-9	15	15
Environment	0	0	0
Social	-3	-5	5
Economic	-1	-3	3
General Aviation & Proportionality	-3	-3	3
Regulation and Harmonisation	-3	-5	3
Total	**-19**	**-1**	**29**

According to the MCA, the only option which provides a significantly positive total score is 1C2C (i.e. PBN competence assessed at first periodic check). This Option is optimal also in terms of safety.

Option 1C2A (SPA for holders of 'old' IR, including for general aviation) has a significantly negative overall impact and is negative also in terms of safety.

Option 1C2B (mandatory training), though equivalent to 1C2C from the safety point of view, is negative from any other perspective and slightly negative in general.

4.8.4 Conclusions on issue 4

Option 1C2C (i.e. PBN competence assessed at first periodic check) is the preferred one.

4.9 Issue 5: Transition for ATO, FI and FE

4.9.1 Policy options

Having selected Option 1C2C on the transition for pilots already holding an IR, it is clear that the same transition issue is relevant also for approved training organisations (ATO), flight instructors (FI) and flight examiners (FE).

This paragraph covers the transition for them, in which case the baseline is the mentioned selected Option 1C2C. In other words, at this point of the RIA, the option 'do nothing' in no longer possible.

Rule ORA.GEN.130(c) requires that for all changes not requiring prior approval, the ATO shall manage them and notify them to the competent authority, as defined in the procedure approved by the competent authority in accordance with ARA.GEN.310(c).

Furthermore, rules in Part ARA require the competent authority to exercise periodic oversight on the ATO it has certified.

Mechanisms therefore exist to leave the transition for ATO led by market forces (but notifying changes) within a given deadline, or to require an ad-hoc specific audit by the competent authority. The former possibility would allow ATO and authorities, to possibly link the transition to the planned periodic oversight cycle.

For instructors, according to rule FCL.940, an FI certificate is valid, in the majority of the normal cases, for three years.

FCL.940.FI (FI — Revalidation and renewal) requires that for revalidation of an FI certificate, the holder shall fulfill 2 of the following 3 requirements:

(1) complete at least a certain number of hours of flight instruction in the appropriate aircraft category during the period of validity of the certificate as FI. If the privileges to instruct for the IR are to be revalidated, 10 of these hours shall be flight instruction for an IR and shall have been completed within the last 12 months preceding the expiry date of the FI certificate;

(2) attend an instructor refresher seminar, within the validity period of the FI certificate; or

(3) pass an assessment of competence.

Letter (b) of same FCL.940.FI requires that at least each alternate subsequent revalidation in the case of FI(A) or FI(H), the holder shall have to pass an assessment of competence in accordance with FCL.935 (i.e. assessment every six years).

Therefore, in principle, even for FI the option of 'market led' (within a deadline) transition or ad-hoc assessement do exist.

The same applies to FE.

The following two options have hence been identified:

Table 9: Identified policy options

No.	Short title	Description
1C2C1	Market driven within a deadline	Option 1C2C1: SPA removed for some PBN types. Part FCL rules on training and checking for IR adapted to reflect the change in pilot's TK and PS required to cover PBN. Maintain only the reasonably required conventional navigation elements in an updated IR, while adding PBN elements for initial qualification of future IR pilots. This implies additional LO for TK. Amend requirements for training and checks in flight to cover also PBN, without extending their duration. IR holders, who achieved their IR before the applicability of the updated IR, will need to update their TK on PBN. Competence in PS shall be demonstrated in courses or in the first periodic check. No mandatory training in PS. Plus: Leave to the market to force ATOs, FIs and FEs to comply with the changed FCL and IR (i.e. driven by pilot demand), but within an established **deadline**, not later than 25 August 2016 (i.e. applicability date of Part NCC and Part NCO) and using procedures already established in current rules.
1C2C2	Ad hoc assessment or check	Option 1C2C2: SPA removed …. …. No mandatory training in practical skill (PS). Plus: Introduce a rule for **ad-hoc** audit of ATO on PBN and ad-hoc check for FIs and FEs.

4.9.2 Impact analysis

4.9.2.1 Safety impact

The principal mission of an ATO is to deliver initial training to young pilots, including applicants for IR. It seems hence beneficial for safety if the syllabuses used at ATOs are amended to include PBN in the shortest time period, but without adding additional procedural burden for the ATO and the competent authority.

For FI, in Option 1C2C1, the right to instruct in an integrated or modular course for the ATPL or IR in accordance with the new IR rules, would be given once the FI has complied with the requirements set out for the transition of the pilots, but within one year.

Due to the fact that one could observe that:

- several IR FI are already competent in PBN;
- FI are experienced pilots and therefore, during the transition, abstaining from teaching subjects on which they may have not sufficient competence, is left to their professionalism;
- relying on the professionalism of the involved persons is one of the cornerstones of the General Aviation Safety Strategy, already recalled in this RIA.

Similarly, for FEs one could observe that:

- several IR FE are already competent in PBN;
- FE are very experienced pilots and therefore, until the transition, abstaining from assessing competence in subjects on which they may have not sufficient experience, is left to their professionalism.

Based on the considerations above, the two identified options are compared as summarised in the table below:

Options	**1C2C1**	**1C2C2**
	Market driven/deadline	**Ad-hoc assessment or check**
Assessment	Transition to the new syllabus for ATO is mainly driven by customer demand. But all ATO must comply with the updated IR syllabus by 25 August 2016, which is the same date as the end of the derogation period for Part NCC and Part NCO. Therefore, all ATO compliant when necessary for non-commercial operators. This option is considered satisfactory from the safety perspective and the taking into account the FI professionalism, including for general aviation.	ATOs, FIs and competent authorities forced to additional procedures to transition, possibly even before the date of applicability of Part NCC and NCO. No evident safety advantage in comparison with 1C2C1
Score (un-weighted)	3	3
Weight	Multiply the score by 3	
Score (weighted)	**9**	**9**

4.9.2.2 Environmental impact

All the two identified Options for this issue are neutral (i.e. score 0) from the environmental perspective.

4.9.2.3 Social impact

All the two identified Options for this issue are neutral (i.e. score 0) from the social perspective in relation to ATO.

However, most FIs would be highly dissatisfied if the rulemaking authorities demonstrate not to give credit to their professionalism. The same would apply to FEs.

Based on the above considerations, the two identified options are compared as summarised in the table below:

Options	**1C2C1**	**1C2C2**
	Market driven/deadline	**Ad-hoc assessment or check**
Assessment	Neutral for ATO. No change beyond the reasonable demand that the FIs and FEs have passed the same checks required by normal pilots.	Neutral for ATO. Demonstrated mistrust by rulemaking authorities in the professionalism of FIs and FEs. Gross dissatisfaction among instractors and examiners.
Score (un-weighted)	3	-5
Weight	Multiply the score by 1	
Score (weighted)	3	-5

4.9.2.4 Economic impact

Any change in the syllabus requires a financial investment to bring the courses up to date. Furthermore, several ATOs would have to invest in new or upgraded training equipment (e.g. FSTDs) to be able to perform the training as set out in the syllabus.

It is clear that a shorter transition, as implied by Option 1C2C2, would be more demanding in economic terms for the ATOs.

Equally, a mandatory ad-hoc revalidation assessment of all current FI and FE certificates, not linked to the normal procedures in FCL.940.FI, would impose an economic burden on FIs and FEs.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2C1**	**1C2C2**
	Market driven/deadline	**Ad-hoc assessment or check**
Assessment	Transition for ATOs in about three years and supported by fees paid by pilots. Minimum financial burden on ATOs. No significant additional economic burden on FIs and FEs, as the transition of the normal pilot license applies to them as well.	ATOs are all forced to invest before a specified date in new means of training. Since this time would be publicly known, prices from suppliers would most probably try to profit on the deadline. Additional economic burden on FIs and FEs.
Score (un-weighted)	3	-3
Weight	Multiply the score by 1	
Score (weighted)	**3**	**-3**

4.9.2.5 General Aviation and proportionality issues

SMEs and flying clubs offering IR training might be hardly pressed to come up with the necessary resources to upgrade their training courses and equipment if the transition is too short.

However, flying clubs offering training only for VFR operations would not be affected.

FIs in general aviation are usually not full time professionals and are therefore more sensitive to changes requiring immediate training or reassessment, which is a burden not only in monetary terms, but also in time required and administrative procedures.

Hence, ad-hoc revalidation would be more burdensome for general aviation than for commercial aviation, whose FIs are normally pilots engaged full time by respective employers.

The same applies to FEs.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2C1**	**1C2C2**
	Market driven/deadline	**Ad-hoc assessment or check**
Assessment	SME and flying clubs are not forced to early capital investment in the absence of market demand. An approach based on the revalidation rules for all pilots would lead to no additional disruption of established practices for FIs and FEs in flying clubs and general aviation.	SME and flying clubs forced to early capital investment. Burden to general aviation FIs and FEs in terms of time, administrative procedures and cost.
Score (un-weighted)	3	-3
Weight	Multiply the score by 1	
Score (weighted)	**3**	**-3**

4.9.2.6 Impact on 'Better Regulation' and harmonisation

Currently the ATOs' compliance with the requirements in Part FCL is verified during their assessment and periodic audits. A deadline at which the ATO would have to comply and send a notification of the changes based on ORA.GEN.130 would not require additional effort and paperwork for competent authorities.

Furthermore, for the pilots the Option of using the (normal) periodic proficiency checks has already been preferred in this RIA with which both option 1C2C1 and 1C2C2 are compatible. In case Option 1C2C2 would be selected for ATOs, there must be sound justification for this non-harmonised solution.

Applying the same conditions for FIs and FEs as for the pilots would be fully harmonised with the current and proposed regulatory approach.

Based on the above considerations, the three identified options are compared as summarised in the table below:

Options	**1C2C1**	**1C2C2**
	Market driven/deadline	**Ad-hoc assessment or check**
Assessment	In line with current practices for ATO and not requiring any significant additional effort for ATOs and competent authorities. No change in the practice established through current rules for FIs and FEs.	Noteworthy amount of related paperwork and efforts for the competent authorities or ATOs. Ad-hoc revalidation would be a very novel approach for FIs and FEs, neither harmonised with the aviation tradition, nor with existing rules.
Score (un-weighted)	3	-3
Weight	Multiply the score by 1	
Score (weighted)	**3**	**-3**

4.9.3 Comparison of options

Using the multi-criteria analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed:

Options	1C2C1	1C2C2
	Market driven/deadline	**Ad-hoc assessment or check**
	Weighted score	
Safety	9	9
Environment	0	0
Social	0	0
Economic	3	-3
General Aviation & Proportionality	3	-3
Regulation and Harmonisation	3	-3
Total	**18**	**0**

Both Options are equally positive in safety terms.

However, according to the MCA, the best Option with a total significantly positive score is 1C2C1 (i.e. transition lead by market forces and professionalism, within a reasonable deadline and using established procedures in line with rules and aviation tradition).

Option 1C2C2 has a neutral total score but it significantly negative from the economic, proponality and harmonisation perspectives.

4.9.4 Conclusions on issue 5

Option 1C2C1 is hence the preferred one (i.e. transition lead by market forces and professionalism, within a reasonable deadline and using established procedures in line with rules and aviation tradition).

4.10 Conclusions from the RIA

In conclusion, it appears in general advisable to possibly maintain safety through better pilot training and checking, while improving the efficiency of the regulatory processes (ref. Article 2.2(c) of Basic Regulation).

More in particular, the severity of a crash of a large aeroplane (100 or more passengers) would always remain a 'catastrophic' event, and this cannot be improved. Equally the probability of such an event in relation to PBN is already 'extremely improbable', which is in fact the tolerable level of safety, which does not need to be improved.

According to the philosophy CS-23 the crash of a small general aviation aircraft (2-3 people on board) is considered 'hazardous' and again the severity cannot be improved. But the probability of this event is estimated today as 'remote' and margins of improvement do exist, to make it at least 'improbable', through:

- facilitating the spreading of PBN which can contribute to prevent CFIT, by making the related administrative procedures less burdensome; and
- improving training and periodic checking of IR pilots on PBN topics.

As a result the risk matrix could change as below (i.e. risk index for general aviation lowered from 15 to 10):

Table 10 Evolution of the safety risk matrix

Probability of occurrence		**Severity of occurrence**				
		Negligible	**Minor**	**Major**	**Hazardous**	**Catastrophic**
		1	2	3	5	8
Extremely improbable	1					**CAT (8)**
Improbable	2				**G.A. (10)**	
Remote	3					
Occasional	4					
Frequent	5					

Based on the preceding RIA, the following detailed conclusions (2B3C1A1) are reached concerning the SPA for the PBN procedures:

- SPA are removed for some PBN types;
- Part FCL rules on training and checking are adapted in order to reflect the changed requirements in TK and PS in order to cover PBN;
- retain the reasonable and required elements in the IR while adding the PBN elements for the initial qualification of the IR pilots while keeping the scope similar in duration;

- existing IR holders will need to update their TK on PBN while PS shall be demonstrated in courses or on the first periodic check;
- ATOs will comply by 25 August 2016 and notify the competent authority;
- FI transition will be governed by the existing rules for revalidation;
- examiner transition and competences are assured through the periodical refresher seminar;
- SPA is retained for RNP AR APCH, RNP 0,3 and some cases of Advanced RNP, no difference between commercial and non-commercial operators.

The introduction of these changes will keep the European aviation competitive, harmonised and adjusted to the individual needs of the different operators while retaining and improving the safety of the overall system.

5 Appendices

5.1 Appendix 1 List of items to be considered for removal of SPA

Tentative list of items to be considered by the Drafting Group to advice Agency for deciding to introduce, maintain or remove SPA for certain PBN operations:

1. legal tools available to the authorities competent for safety, in order oversee all the actors in the 'total aviation system';
2. the aircraft, including its navigation avionics, has an airworthiness approval covering the type of envisaged IFR operations;
3. the complexity of said IFR operations does not present particular challenges for pilots and operators;
4. the concept and systems upon which the IFR operation will be carried out are mature enough (= not 'new'; standards and requirements validated and proved by experience);
5. the risk associated with normal, abnormal and emergency operations (including to third parties in the air or on the ground) is tolerable;
6. accuracy, integrity, availability and continuity of radio-navigation signals is ensured, under responsibility of a Navigation Service Provider (NSP);
7. appropriate standards for quality and management by procedure designers are established;
8. accuracy and integrity of NAV database is ensured;
9. appropriate training and checking standards for pilots exist and are implemented;
10. requirements on experience and currency of pilots;
11. availability of operator training programmes;
12. availability of operating procedures and check lists;
13. provision of information (e.g. MMEL and training requirements) from holders of Type Certificates (TC) to air operators, throughout the life cycle of the aircraft is ensured (e.g. through Operational Suitability Data); and
14. AIS information (including NOTAM) is provided by an AIS Provider.

5.2 Appendix 2 Underlying principles for this NPA

The European General Aviation Safety Strategy has been adopted by the Agency, the Commission and the Member States through the AGENCY Committee, and sets out the following principles and guidelines (only guidelines considered relevant to this NPA have been included):

P1. GA should be handled separately from CAT and merits a different, proportionate approach based on an acceptable risk hierarchy.

G1.1: Recognise GA does not achieve nor necessarily aim at reaching an equivalent level of safety as CAT, and ensure this is understood by all GA participants.

G1.2: Do not start work from existing regulation which has essentially been designed for CAT, but take a fresh approach by establishing whether and what regulations are most appropriate to GA in all fields: initial and continuing airworthiness, licensing, operations, airports, and ATM.

P2. Adopt a philosophy of minimum necessary rules focusing on the main risks.

G 2.1: Draft regulations on a 'minimum necessary' and 'focused on the main risks' basis for the relevant activity, starting from the simplest cases in terms of design and operations, and adding 'building blocks' as necessary to cope progressively with more complex issues and environments, and possible interfaces with other aviation users.

G 2.2: Where GA can interact with CAT, develop appropriate measures, including regulations as necessary, to prevent undesired events.

G 2.3: Consider favourably new proposed technologies by OEMs and manufacturers, and demonstration of enhanced safety through an innovative approach.

P3. Adopt a risk-based approach to targeted safety initiatives and rulemaking, based on risk assessment, and supported by empirical evidence in the form of good quality accident rate and causal data from which statistically significant trends are identified.

G 3: Always consider alternative means to regulation, including the 'do nothing' option, based on robust risk assessment and cost benefit analysis methodologies specific to the sector.

P4. Protect 'grandfather rights', unless there are demonstrable and statistically significant safety reasons for not doing so.

G 4.1: Give specific attention to transitional arrangements, so that no activity is stopped, including unexpected specific cases, if it had not raised a statistically significant safety issue prior to the implementation of the new rules. Rely on proven competencies, and on NAAs' oversight and reporting to the Agency for transparency and sharing of good practice.

P5. Minimise bureaucracy and apply EU 'Smart Regulation Principles', taking into account the specificities of GA.

G 5.2: Have more confidence in participants to 'do the right thing', thereby reducing the multiple layering of a priori safety nets, and focusing more on declarative processes and individual commitment for managing safety, subject to appropriate downstream oversight by the NAA.

G 5.4: Put more emphasis on soft law than hard law: limit implementing rules to required objectives, and develop technical means in industry standards, in certification specifications or in acceptable means of compliance supported by detailed guidance material, to be defined with users; use standardisation to check relevance and assure dissemination of best practices.

G 5.5: Take into account the best global practices for GA, through consideration of various practices inside and outside EU.

G 5.6: Adopt a more comprehensive 'competency-based' approach for personal licensing.

P6. Make best use of available resources of expertise and devolve responsibilities and delegate tasks to the level where they can be exercised most efficiently, including to GA organisations.

These principles and guidelines are considered under the individual issues and options below.

5.3 Appendix 3 Comparison with ICAO Doc 9997

ICAO Doc 9997 1st edition		Proposal in this NPA	Notes
Par.	**Subject**		
Foreword	Job aids only with reference to 1st edition of Doc 9613	Reference to 4th edition of Doc 9613	Job aids do not need to be copied and pasted in this NPA, since authorities and inspectors can directly consult Doc 9997
1.1.1	Tutorial on conventional radio-navigation	N.A.	No regulatory material in 1.1.1
1.1.2	Tutorial on PBN	N.A.	No regulatory material in 1.1.2
1.1.3	Operational approval need not to be a complicated process for either applicant or operator	The spirit of the sentence is fully reflected in this NPA	No regulatory material in 1.1.3
1.1.4	Successful PBN implementation depends on knowledge and experience	Learning Objectives for pilots. Transition measures for ATO, FI and FE Credit to previous pilot experience	Fully compliant
1.2.1	Tutorial on PBN	N.A.	No regulatory material in 1.2.1
1.2.2	Aircrew procedures and training and navigation databases relevant in addition to aircraft systems	Amendments to Part FCL and associated AMC/GM	Integrity and accuracy of navigation databases covered by RMT.0593 and RMT.0594
1.2.3	Only reference to Appendix A	N.A.	No regulatory material in 1.2.2
1.3.1	Tutorial on difference between RNAV and RNP	N.A.	No regulatory material in 1.3.1
1.3.2	Tutorial on RNP	N.A.	No regulatory material in 1.3.2
1.4	List of PBN navigation specifications (aligned with 4th edition of Doc 9613	Table in GM1 SPA.PBN.100	No regulatory material in 1.4, although the same list (but more detailed) is used in this NPA
1.5	Tutorial on PBN applications	N.A.	No regulatory material in 1.5
2.1. a)	PBN approval should consider initial airworthiness aspects	N.A.	Covered by AMC 20-XX
2.1 b)	Continuous airworthiness necessary, but not directly addressed in the Manual	N.A.	Fully compliant
2.1 c)	Approval of PBN should consider operating procedures, crew training and competence, MEL, operations manual,	SPA.PBN.105	SPA.PBN.105 includes all the necessary elements from par. 2.1 c) with the following differences:

ICAO Doc 9997 1st edition		Proposal in this NPA	Notes
Par.	**Subject**		
	checklists, instrument procedure approval, navigation data base, dispatch procedures, etc.		• SPA.PBN.105 in addition requires to integrate PBN into the operator's safety management; • Operations manual, checklist and similar are not repeated, since covered elsewhere in AIR-OPS; • Approval of the instrument procedure is omitted, since not responsibility of the operator but of the airspace designer (the latter part of the family of Air Navigation Service Providers)
2.2.1	States should develop regulatory material on PBN	N.A.	In the EU States do not need to transpose common rules developed by the Agency, since them are directly applicable to all the citizens in the Union. EU rules on PBN are already available. This NPA proposes only amendments
2.2.2	Tutorial on the respective roles of the State of Design, of Registry and of Operator	N.A.	No regulatory material in 2.2.2
2.2.3	States should not duplicate approval processes	N.A.	Article 11 (Recognition of certificates) in Basic Regulation is complaint with 2.2.3 does not need to be repeated at the level of implementing rules or AMC/GM
2.3.1	Identification of competent authority	N.A.	Already covered by AIR-OPS
2.3.2	Six factors influencing decision to require a formal specific approval: a) Existence of criteria for airworthiness approval b) Complexity of PBN operations c) Maturity d) Risks	N.A.	This paragraph is addressed to States and not to operators. Therefore it does not need to be transposed. In any case airworthiness aspects of PBN are covered by AMC 20-XX, while this NPA proposes to remove the SPA only for operations not more complex than Cat I and for which consequently the risks are similar.

ICAO Doc 9997 1st edition		Proposal in this NPA	Notes
Par.	**Subject**		
	e) Training and checking standards f) Information from TC holders to operators		Furthermore, the newest (less mature) PBN applications from 4th edition of Doc 9613 are proposed for SPA. Finally proper training and checking standards are indeed proposed by this NPA, while the flow of information from TC holders to operators is covered by the rules on Operational Suitability Data (OSD).
2.3.3	Efficient use of regulatory resources	SPA.PBN.100	Indeed SPA.PBN.100 concentrate the resources on the most complex PBN operations, by reducing the administrative burden for the simplest ones
2.3.4	Bundling of approvals	SPA.PBN.100	Most of PBN operations, based on this NPA, can be flown without additional paperwork. Furthermore SPA.PBN.100 clarifies that the approval of RNP AR APCH is applicable to several aerodromes, unless a site specific approval is required in AIP or by the competent authorities
2.3.5	General aviation may not be required to follow the same authorization processes	SPA.PBN.100	Partly compliant. In fact the rules for CAT, NCC and NCO are different for most PBN operations. In the limited cases where a SPA is required, however Annex V to AIR-OPS applies to commercial and non-commercial operators.
2.3.6	Reference to additional guidance material	N.A.	No regulatory material in 2.3.6
2.3.7	Aspects to be considered before granting operational approval	SPA.PBN.105 and several AMCs to it	See the six rows immediately below
2.3.7 a)	Aircraft airworthiness	SPA.PBN.105 (a)	Compliant
2.3.7 b)	Operating procedures	SPA.PBN.105 (d)	Compliant
2.3.7 c)	Control of operating procedures	SPA.PBN.105 (f) and associated AMC1 on RNP monitoring	Compliant
2.3.7 d)	Training and competence of flight crews	SPA.PBN.105 (b) and associated (extensive) AMC	Compliant
2.3.7 e)	Dispatch training	Par. (a) (1) (ii) in	Compliant

ICAO Doc 9997 1st edition		Proposal in this NPA	Notes
Par.	**Subject**		
		AMC1 to SPA.PBN.105 (b)	
2.3.7 f)	Management of navigation database	SPA.PBN.105 (d)(4)	Compliant
2.3.8	Aircraft eligibility	N.A.	Out of scope of this NPA. Covered by AMC 20-XX
2.3.9.1	Standard operating procedures (SOPs) must cover normal and non-normal (contingency) procedures	SPA.PBN.105 (d)(3)	Compliant
2.3.9.2	Approved Flight Manual	N.A.	Covered by Part 21
2.3.9.3	Procedures for general aviation	Part SPA is applicable also to non-commercial operators	Compliant
2.3.10	Control of procedures for general aviation operators not required to have an operations manual	N.A.	Subpart B to Part NCC and to Part NCO already require operating procedures
2.3.11	Flight crew and dispatcher training	SPA.PBN.105 (b) and associated (extensive) AMC	Compliant
2.3.12	Approval of navigation database providers	N.A.	Opinion 01/2005
2.3.13	Navigation errors reporting and analysis	SPA.PBN.105 (f) and associated AMC1	Compliant
2.4.1	Documentation of operational approval	N.A.	Already covered by AIR-OPS rules on the OPS SPECS for commercial operators and list of approvals for non-commercial operators
2.4.2	Consideration of anomaly reports by competent authority	N.A.	Already covered by ARO.GEN.135
2.5	States must publish regulatory material on PBN	N.A.	Requirement not addressed to operators
2.6.1	Approval team needs considerable latitude in making recommendations, since PBN operations may significantly differ in complexity and scope	SPA.PBN.105 (c)	PBN approval based also on safety assessment which describes the operations and associated risks and, where necessary, mitigations
2.6.2	Flexibility in the approval process	SPA.PBN.105 and associated AMCs	SPA.PBN.105 (legally binding) is less than half a page. Associated AMCs, which may be negotiated and adapted, comprise a dozen of pages
2.6.3.1	Best practices for operators before applying	N.A.	Educational suggestions; not regulatory material

ICAO Doc 9997 1st edition		Proposal in this NPA	Notes
Par.	**Subject**		
	for SPA		
2.6.3.2	Application form	N.A.	In the context of AIR-OPS, application forms are published by the competent authorities at national level
2.6.3.3	Evaluation of the application	N.A.	Already extensively covered in Section III of Part ARO
2.6.3.4	Demonstration of compliance	AMC3 ARO.OPS.200	Compliant
2.6.3.5	Documentation of approval	N.A.	Duplicates 2.4.1
2.7.1	Tutorial on some Articles of Chicago Convention and Annex 6	N.A.	No regulatory material in 2.7.1
2.7.2	Reference to Doc 8335 for approval of third country operators	N.A.	Rules on third country operators (TCO) out of scope of this NPA
2.7.3	Operators need to apply to each State into or over which they intend to operate	N.A.	This requirements remains applicable to EU operators flying outside the Union, based on the regulations established by the involved States. It does not apply inside the Union per Article 11 Basic Regulation
3.1	Aircraft eligibility	N.A.	Covered by AMC 20-XX
3.2	Standard operating procedures	CAT.OP.MPA.127, NCC.OP.117, NCO.OP.117, SPO.OP.117 and associated AMCs	Compliant
3.3	Training and checking	Proposals for Part FCL and associated AMCs, as well as AMC1 SPA.PBN.105(b)	Compliant
3.4	Management of navigation data base	SPA.PBN.105 (d)(4)	Compliant
4.1	Operational approval of RNAV 10	N.A.	This NPA does not require specific approval for RNAV 10
4.2	Operational approval of RNAV 5 (Basic RNAV)	N.A.	Commission Regulation (EU) No 965/2012 does not require specific approval for RNAV 5
4.3	Operational approval of RNAV 1 and RNAV 2	N.A.	This NPA does not require specific approval for RNAV 1 and RNAV 2
4.4	Operational approval of RNP 4	N.A.	This NPA does not require specific approval for RNP 4
4.5	Operational approval of RNP 1	N.A.	This NPA does not require specific approval for RNP 1
4.6	Operational approval of RNP APCH (no	N.A.	This NPA does not require specific approval for RNP

ICAO Doc 9997 1st edition		Proposal in this NPA	Notes
Par.	**Subject**		
	authorisation required)		APCH
4.7.1.1	Tutorial on RNP AR APCH	N.A.	No regulatory material in 4.7.1.1
4.7.1.2	Sensor requirements for RNP AR APCH	N.A.	Covered by AMC 20-26
4.7.1.3	OCA/H and DA/H	N.A.	Procedure design aspects out of scope of this NPA
4.7.2	System requirements for RNP AR APCH	N.A.	Covered by AMC 20-26
4.7.3	RNP AR APCH operations	AMC1 SPA.PBN.105 (c)	This NPA requires a safety assessment to define all necessary procedures in order to obtain SPA for RNP AR APCH
4.7.4	Flight crew knowledge and training	AMC1 SPA PBN 105 (b)	Compliant
4.7.5	Navigation database	AMC1 SPA PBN 105 (d)	Compliant
4.7.6	Safety assessment	AMC1 SPA.PBN.105 (c)	Compliant
4.7.7	Flight operational safety assessment (FOSA)	AMC1 SPA.PBN.105 (c)(a)(3)	Compliant
4.7.8	Documentation supporting the application for approval of RNP AR APCH	SPA.PBN.105 and related AMCs	Compliant
Attachment to Chapter 4	Functionality and qualification of FSTD	CS-FSTD(A) and (H)	Compliant
Pages 4-85 to 4-94	Job Aid for inspectors assessing applications for RNP AR APCH	GM1 ARO.OPS.230	Compliant. A specific reference to the job aid for assessing applications for RNP AR APCH is included. Reproducing the about 10 pages of detailed job aid at the level of regulatory material is not felt necessary
App. A par. 1	Tutorial on RNAV in general	N.A.	No regulatory material in par. 1 of App. A
App. A par. 2	Tutorial on guidance and control of RNAV	N.A.	No regulatory material in par. 2 of App. A
App. A par. 3	Tutorial on navigation databases	N.A.	No regulatory material in par. 3 of App. A
App. A par. 4	Tutorial on waypoints	N.A.	No regulatory material in par. 4 of App. A
App. A par. 5	RNAV performance	N.A.	Covered by AMC 20-XX
App. B	Example of regulatory text	N.A.	The content of App. B is only one 'example'. Anyway all the points contained therein are covered by this NPA
App. C	Example of OPS SPECS	Appendix II to Annex II (Part ARO)	AGENCY FORM 139 Issue 1 is complaint with the proposed example, for the PBN

ICAO Doc 9997 1st edition		Proposal in this NPA	Notes
Par.	**Subject**		
			application for which SPA is proposed by this NPA
App. D	Example of application form	N.A.	In the EU regulatory framework application forms are established by the competent authorities; in this case at national level
App. E	Guidance material on FOSA	GM1 SPA.PBN.105(c)	The need and guidance for FOSA is contained in AMC1 SPA.PBN.105(c). The guidance material in Appendix E is referred in GM1, but it is not considered necessary to completely 'copy and paste' it in regulatory material

5.4 Appendix 4 ICAO Resolution A36-23: Performance-based navigation global goals

Adopted by the 36th Session of the ICAO General Assembly (September 2007)

Whereas a primary objective of ICAO is that of ensuring the safe and efficient performance of the global Air Navigation System;

Whereas the improvement of the performance of the Air Navigation System on a harmonized, worldwide basis requires the active collaboration of all stakeholders;

Whereas the Eleventh Air Navigation Conference recommended that ICAO, as a matter of urgency, address and progress the issues associated with the introduction of area navigation (RNAV) and required navigation performance (RNP);

Whereas the Eleventh Air Navigation Conference recommended that ICAO develop RNAV procedures supported by global navigation satellite system (GNSS) for fixed wing aircraft, providing high track and velocity-keeping accuracy to maintain separation through curves and enable flexible approach line-ups;

Whereas the Eleventh Air Navigation Conference recommended that ICAO develop RNAV procedures supported by GNSS for both fixed and rotary wing aircraft, enabling lower operating minima in obstacle rich or otherwise constrained environments;

Whereas Resolution A33-16 requested the Council to develop a programme to encourage States to implement approach procedures with vertical guidance (APV) utilizing such inputs as GNSS or distance measuring equipment (DME)/DME, in accordance with ICAO provisions;

Recognizing that implementation of approach with vertical guidance (APV) is still not wide spread;

Recognizing that the Global Aviation Safety Plan has identified Global Safety Initiatives (GSIs) to concentrate on developing a safety strategy for the future that includes the effective use of technology to enhance safety, consistent adoption of industry best practices, alignment of global industry safety strategies and consistent regulatory oversight;

Recognizing that the Global Air Navigation Plan has identified Global Plan Initiatives (GPIs) to concentrate on the incorporation of advanced aircraft navigation capabilities into the air navigation system infrastructure, the optimization of the terminal control area through improved design and management techniques, the optimization of the terminal control area through implementation of RNP and RNAV SIDs and STARs and the optimization of terminal control area to provide for more fuel efficient aircraft operations through FMS-based arrival procedures; and

Recognizing that the continuing development of diverging navigation specifications would result in safety and efficiency impacts and penalties to States and industry;

The Assembly:

1. *Urges* all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept laid down in the *Performance-based Navigation Manual* (Doc 9613);

2. *Resolves* that:

a) States and planning and implementation regional groups (PIRGs) complete a PBN implementation plan by 2009 to achieve:

1) implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones; and

2) implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014; and

b) ICAO develop a coordinated action plan to assist States in the implementation of PBN and to ensure development and/or maintenance of globally harmonized SARPs, Procedures for Air Navigation Services (PANS) and guidance material including a global harmonized safety assessment methodology to keep pace with operational demands;

3. *Urges* that States include in their PBN implementation plan provisions for implementation of approach procedures with vertical guidance (APV) to all runway ends serving aircraft with a maximum certificated take-off mass of 5700 kg or more, according to established timelines and intermediate milestones.

4. *Instructs* the Council to provide a progress report on PBN implementation to the next ordinary session of the Assembly; and

5. *Requests* the Planning and Implementation Regional Groups (PIRG) to include in their work programme the review of status of implementation of PBN by States according to the defined implementation plans and report to ICAO any deficiencies that may occur.

5.5 Appendix 5 ICAO Resolution A37-11: Performance-based navigation global goals

37th Session of the ICAO General Assembly (September-October 2010)

Whereas a primary objective of ICAO is that of ensuring the safe and efficient performance of the global Air Navigation System;

Whereas the improvement of the performance of the air navigation system on a harmonized, worldwide basis requires the active collaboration of all stakeholders;

Whereas the Eleventh Air Navigation Conference recommended that ICAO, as a matter of urgency, address and progress the issues associated with the introduction of area navigation (RNAV) and required navigation performance (RNP);

Whereas the Eleventh Air Navigation Conference recommended that ICAO develop RNAV procedures supported by global navigation satellite system (GNSS) for fixed wing aircraft, providing high track and velocity-keeping accuracy to maintain separation through curves and enable flexible approach line-ups;

Whereas the Eleventh Air Navigation Conference recommended that ICAO develop RNAV procedures supported by GNSS for both fixed and rotary wing aircraft, enabling lower operating minima in obstacle-rich or otherwise constrained environments;

Whereas Resolution A33-16 requested the Council to develop a programme to encourage States to implement approach procedures with vertical guidance (APV) utilizing such inputs as GNSS or distance measuring equipment (DME)/DME, in accordance with ICAO provisions;

Recognizing that not all airports have the infrastructure to support APV operations and not all aircraft are currently capable of APV;

***Recognizing* that many States already have the requisite infrastructure and aircraft capable of performing straight-in approaches with lateral guidance (LNAV approaches) based on the RNP specifications and that straight in approaches provide demonstrated and significant safety enhancements over circling approaches;**

Recognizing that the Global Aviation Safety Plan has identified Global Safety Initiatives (GSIs) to concentrate on developing a safety strategy for the future that includes the effective use of technology to enhance safety, consistent adoption of industry best practices, alignment of global industry safety strategies and consistent regulatory oversight;

Recognizing that the Global Air Navigation Plan has identified Global Plan Initiatives (GPIs) to concentrate on the incorporation of advanced aircraft navigation capabilities into the air navigation system infrastructure, the optimization of the terminal control area through improved design and management techniques, the optimization of the terminal control area through implementation of RNP and RNAV SIDs and STARs and the optimization of terminal control area to provide for more fuel efficient aircraft operations through FMS-based arrival procedures; and

Recognizing that the continuing development of diverging navigation specifications would result in safety and efficiency impacts and penalties to States and industry;

Noting with satisfaction that planning and implementation regional groups (PIRGs) have completed regional PBN implementation plans; and

Recognizing that not all States have developed a PBN implementation plan by the target date of 2009:

The Assembly:

1. *Urges* all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept laid down in the *Performance-based Navigation (PBN) Manual* (Doc 9613);

2. *Resolves* that:

a) States complete a PBN implementation plan as a matter of urgency to achieve:

1) implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones;

2) implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS), including LNAV only minima, for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014; and

3) implementation of straight-in LNAV only procedures, as an exception to 2) above, for instrument runways at aerodromes where there is no local altimeter setting available and where there are no aircraft suitably equipped for APV operations with a maximum certificated take-off mass of 5 700 kg or more;

b) ICAO develop a coordinated action plan to assist States in the implementation of PBN and to ensure development and/or maintenance of globally harmonized SARPs, Procedures for Air Navigation Services (PANS) and guidance material including a global harmonized safety assessment methodology to keep pace with operational demands;

3. *Urges* that States include in their PBN implementation plan provisions for implementation of approach procedures with vertical guidance (APV) to all runway end serving aircraft with a maximum certificated take-off mass of 5 700 kg or more, according to established timelines and intermediate milestones;

4. *Instructs* the Council to provide a progress report on PBN implementation to the next ordinary session of the Assembly, as necessary;

5. *Requests* the Planning and Implementation Regional Groups (PIRGs) to include in their work programme the review of status of implementation of PBN by States according to the defined implementation plans and report annually to ICAO any deficiencies that may occur; and

6. *Declares* that this resolution supersedes Resolution A36-23.

6 References

6.1 Affected regulations

a) Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011)

b) Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012)

c) Commission Regulation (EU) No 800/2013 of 14 August 2013 amending Commission Regulation (EU) No 965/2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 227, 24.08.2013)

Implementing Rules for Flight Crew Licensing:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:311:0001:0193:EN:PDF

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:100:0001:0056:EN:PDF

Implementing Rules for Air Operations:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:296:0001:0148:EN:PDF

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:227:0001:0074:EN:PDF

Opinions on further Annexes to the Implementing Rules on Air Operations:

http://www.Agency.europa.eu/Agency-measures/docs/opinions/2012/02/Part SPO%20IR%20(Opinion%2002-2012).pdf

6.2 Affected CS, AMC and GM

ED Decision 2012/010/R: Decision 2012/010/Directorate R of the Executive Director of the Agency of 4th July 2012 on the certification specifications for aeroplane flight simulation training devices (CS-FSTD(A)):

http://easa.europa.eu/agency-measures/certification-specifications.php#CS-FSTD(A)

ED Decision 2012/011/R: Decision 2012/011/R of the Executive Director of the Agency of 26th June 2012 on the certification specifications for helicopter flight simulation training devices (CS-FSTD(H)):

http://easa.europa.eu/agency-measures/certification-specifications.php#CS-FSTD(H)

ED Decision 2013/022/R of 23/08/2013: Decision 2013/022/ R of the Executive Director of the Agency of 23 August 2013 on adopting Acceptable Means of Compliance and Guidance Material for Non-commercial operations with other-than-complex motor-powered aircraft (Part NCO): http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part NCO

ED Decision 2013/021/R of 23/08/2013: Decision 2013/021/R of the Executive Director of the Agency of 23 August 2013 on adopting Acceptable Means of Compliance and Guidance

Material for Non-commercial operations with complex motor-powered aircraft (Part NCC): http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part NCC

ED Decision 2013/020/R of 23/08/2013: Decision 2013/020/R of the Executive Director of the Agency of 23 August 2013 on Amending Decision No 2012/019/R of the Executive Director of the European Aviation Safety Agency of 24 October 20121 on Acceptable Means of Compliance and Guidance Material to Part SPA (Amendment 1): http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part SPA

ED Decision 2012/018/R of 24/10/2012: Decision 2012/018/R of the Executive Director of the Agency of 24th October 2012 on acceptable means of compliance and guidance material to Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to Air Operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council. Acceptable means of compliance and guidance material to Part CAT: http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part CAT

ED Decision 2013/019/R of 23/08/2013: Decision 2013/019/R of the Executive Director of the Agency of 23 August 2013 on Amending Decision No 2012/017/R of the Executive Director of the European Aviation Safety Agency of 24 October 20121 on Acceptable Means of Compliance and Guidance Material to Part ORO (Amendment 2): http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part ORO

ED Decision 2013/018/R of 23/08/2013: Decision 2013/180/R of the Executive Director of the Agency of 23 August 2013 on Amending Decision No 2012/016/R of the Executive Director of the European Aviation Safety Agency of 24 October 20121 on Acceptable Means of Compliance and Guidance Material to Part ARO (Amendment 2): http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part ARO

ED Decision 2013/017/R of 23/08/2013: Decision 2013/017/R of the Executive Director of the Agency of 23 August 2013 on Amending Decision No 2012/015/R of the Executive Director of the European Aviation Safety Agency of 24 October 20121 on Acceptable Means of Compliance and Guidance Material to Annex I - Definitions (Amendment 1): http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Definitions

ED Decision 2011/016/R of 15/12/2011: Decision 2011/016/R of the Executive Director of the European Aviation Safety Agency of 15 December 2011 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council. **'Acceptable Means of Compliance and Guidance Material to Part FCL':**

http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part FCL

ED Decision 2013/006/R of 16/04/2013: Decision 2013/006/R of the Executive Director of the Agency of 16th April 2013 on amending Decision No 2012/006/R of the Executive Director of the European Aviation Safety Agency of 19 Avril 2012 on acceptable means of compliance and guidance material to Commission Regulation (EU) No 1178/2011 of 3 November 20111 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council. **'Acceptable Means of Compliance and Guidance Material to Part ARA':**

http://easa.europa.eu/agency-measures/acceptable-means-of-compliance-and-guidance-material.php#Part ARA

http://easa.europa.eu/agency-measures/agency-decisions.php#R

6.3 Reference documents

a) ICAO Doc 4444, Air Traffic Management, 15th edition, 2007 (including amendment 3)

b) ICAO Doc 9613, Performance-Based Navigation (PBN) Manual, 4th edition, 2013

c) ICAO Doc 9997, Performance-Based Navigation (PBN) Operational Approval Manual, 1st edition, 2013