European Aviation Safety Agency

Comment-Response Document 2015-01

Performance-based navigation implementation in the European air traffic management network

CRD TO NPA 2015-01 — RMT.0639 — 28.7.2016

Related Opinion: 10/2016

EXECUTIVE SUMMARY

This Comment-Response Document (CRD) contains the comments received on NPA 2015-01 (published on 19 January 2015) and the responses, or a summary thereof, provided thereto by the Agency.

Based on the comments and responses, Opinion No 10/2016 was developed.

Applicability		Process map	
Affected regulations and decisions:	Regulation (EU) No 1332/2011; Regulation(EU) No 965/2012.	Terms of reference (ToR):	25.6.2014
Affected stakeholders:	Member States; ATM/ANS providers; aerodrome operators.	Concept paper:	No
Driver/origin:	Efficency/proportionality; Commission Regulation (EU) No 716/2014 — Pilot Common Project.	Rulemaking group:	No
Reference:	European Commission PBN mandate MOVE E2/EMM D(2011) (6.4.2011).	RIA type:	Full
		Technical consultation during NPA drafting:	No
		Publication date of the NPA:	19.01.2015
		Duration of NPA consultation:	3 months
		Review group:	No
		Focused consultation:	Yes
		Publication date of the Decision:	2017/Q1

Table of contents

1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this CRD in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity, RMT.0639, is included in the Agency's Rulemaking Programme 2016-2020[3], under RMT.0639. The scope and timescales of the task were defined in the related Terms of Reference (see process map on the title page).

The draft Regulations have been developed by the Agency. All interested parties were consulted through NPA 2015-01[4], which was published on 19.1.2015. 720 comments were received from interested parties, including industry, national aviation authorities and EU organisations

The text of this CRD has been developed by the Agency with the aid of focused consultations with specific stakeholders.

The process map on the title page contains the major milestones of this rulemaking activity.

1.2. The structure of this CRD and related documents

This CRD provides a full set of individual comments received to NPA 2015-01 and the responses thereto.

1.3. The next steps in the procedure

This Opinion proposes the repeal of Regulation (EU) No 1332/2011[5] and the amendment of Regulation (EU) No 965/2012[6] (hereinafter referred to as the 'Air OPS Regulation') resulting from the repeal. It is addressed to the European Commission to be used as a technical basis to prepare a legislative proposal.

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1 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 (OJ L 79, 19.3.2008, p. 1) (http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1464170711619&uri=CELEX:32008R0216).

2 The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such a process has been adopted by the Agency's Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (http://www.easa.europa.eu/system/files/dfu/EASA%20MB%20Decision%2018-2015%20on%20Rulemaking%20Procedure.pdf)..

3 https://www.easa.europa.eu/system/files/dfu/Final%20RMP%202016-2020%20v6%2020151210.pdf

4 http://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2015-01

5 Commission Regulation (EU) No 1332/2011 of 16 December 2011 laying down common airspace usage requirements and operating procedures for airborne collision avoidance (OJ L 336, 20.12.2011, p. 20) (http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1464703333021&uri=CELEX:32011R1332).

6 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) (http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1464703399540&uri=CELEX:32012R0965).

The decision amending ED Decision 2012/002/R[7], containing the related acceptable means of compliance (AMC) and guidance material (GM) will be published by the Agency when the related regulations are adopted by the European Commission.

[7] Decision 2012/002/R of the Executive Director of the Agency of 8 March 2012 on the Acceptable Means of Compliance and Guidance Material for Common Airspace Usage Requirements and Operating Procedures 'AMC/GM to AUR' (http://www.easa.europa.eu/system/files/dfu/ED%20Decision%202012-002-R.pdf).

2. Summary of comments and responses

Please see the related Opinion for the summary of the comments received.

3. Individual comments and responses

In responding to comments, a standard terminology has been applied to attest the Agency's position. This terminology is as follows:

(a) **Accepted** — The Agency agrees with the comment and any proposed amendment is wholly transferred to the revised text.

(b) **Partially accepted** — The Agency either agrees partially with the comment, or agrees with it but the proposed amendment is only partially transferred to the revised text.

(c) **Noted** — The Agency acknowledges the comment but no change to the existing text is considered necessary.

(d) **Not accepted** — The comment or proposed amendment is not shared by the Agency.

(General comments)	-

comment *1* comment by: *South Sweden School of Aeronautics*

General Aviation interested in IFR flying has in the recent past been obliged to invest in IFR approved area navigation (GPS) and 8.33 KHZ communication equipment. This has in most (nearly all) cases been accomplished by installing a Garmin 430 unit. This has been at a substantial cost for the community operating light piston aircrafts.

To now implement a requirement of GPS guided holding and vertical navigation approaches, which the Garmin 430 is not capable of, will require a several times larger expense to this community with no benefit.

The holding procedures have allways been done manually with no remarks. As well it is very seldom theese aircrafts have to enter holding as the airports frequented have low traffic volume.

Vertical guidance, baro VNAV and LPV, is desirable but not in proportion to the cost involved. There is no detoriation of safety in having LNAV only, as minima becomes higher. To apply for LPV capability of an aircraft is a "Major Modification" and the cost for the paperwork for the approval is prohibitive.

It is in the Agency´s interest to promote safety. It is by some estimates 30 times safer to fly IFR as compared with VFR. In order to promote safety, the Agency should promote and simplify IFR. To make IFR for theese users prohibitive will deteriorate safety.

Bo Gartner
Head of Training
South Sweden School of Aeronautics
+46 762 63 95 50
bo@southsweden.se

response | *Noted.*

It should be recognised that the proposal does not include any obligation for an operator to modify their aircraft. The requirement is for ATS providers or aerodromes operators to provide the PBN routes and procedures. If an operator wishes to benefit from these PBN routes and procedures it needs to be suitable approved.

Following the comments received, the Agency recognised that the RNAV holding requirement as initially proposed in the NPA may be too demanding and the requirement has been deleted.

comment | *102* comment by: *EBAA*

EBAA identified the following key comments:
· There is a lack of global harmonization. The European should cover all PBN functionalities as defined at ICAO level.
· EASA needs to develop standardised RNP1 and APV rules applicable to all stakeholders:
o *The EASA NPA proposes a vision but does not include any detailed conditions to implement it-the publication of the EASA CS-ACNS approval material is not foreseen earlier than in the course of 2016.*
o *However there is a need to start developing:*
§ *New crew & pilots training requirements to cope with the RNP1 alert and monitoring function in the cockpit*
§ *New requirements to redesign the TMA and ATC applications*
§ *New ATCO training requirements, specifically in view of handling mixed mode operations (meaning with aircraft being equipped with RNP technology and aircraft not being equipped continuing to use the conventional ground-based navigation aids and procedures).*
o *There is a need to simplify the requirements common core pilot qualification without specific pilot qualifications.*
· There is a need to promote LPV SBAS, less costly solution for AUs and quickly applicable across Europe.
· We also wish to promote the implementation of PBN at regional airports while the EASA NPA makes it compulsory only at the 25 European largest airports.

Response | *Noted.*

The proposed regulation provides the obligation for the harmonised application of PBN in the European airspace that is applicable to those aerodromes within the scope of the Basic Regulation, which exceeds the 25 aerodromes to which the Pilot Common Project regulation is applicable.

The Agency recognises the need to ensure that the majority of additional material as mentioned is available as an enabler to PBN operations, not only within Europe but also globally. The preparation and adoption of this additional material is subject to other rulemaking tasks.

comment | *111* comment by: *Finavia*

The objective of the NPA to ensure a safe, efficient and harmonized PBN implementation in Europe is supported. However, the approach selected in the NPA of not proposing any direct obligation to aircraft operators, with the requirement to maintain non-PBN procedures and the supporting navigation infrastructure for an undefined time period in the future and without any exceptions, is not in line with the objective of the RMT to ensure an efficient and harmonized PBN implementation in Europe. The effective implementation process requires consistent progress of both the aircraft capabilities and the procedures/routes.

Thus, the proposed provisions shall be modified to:

1. not include the obligation for maintaining the availability of non-PBN routes and procedures without any exceptions.
2. require aircraft operators to have PBN capabilities consistent with the navigation specifications required in the European PBN applications within a clearly defined timeframe.
3. allow and define means for more controlled regional transition to the application of the new PBN navigation specifications within each applicable airspace.

Instead of the general obligation for ATSPs and aerodrome operators to provide non-PBN procedures, such decision must be taken on the local level based on the evaluation of the needs of the concerned airspace users with the associated costs and benefits. The obligation to provide non-PBN applications everywhere, without any exceptions is exceeding the operational need in many cases and induce additional, non-justified costs to all stakeholders. These costs have not been assessed on the appropriate level of accuracy in the RIA.

It is also necessary to recognize the current PBN implementation status in Europe. The ATS route network is already relying on PBN, based on the navigation specification RNAV 5 and at many airports there are SIDs and STARs in operations based on the navigation specification RNAV 1.

More controlled transition to RNP 1 within applicable airspaces is necessary, in order to minimize the risk of the mixed RNAV 5 and RNP 1 (or RNAV 1 and RNP 1) requirements within the same airspace. Thus, instead of the fixed date applicable for each individual route implementation, the regulation shall focus on airspace changes where all the routes and procedures of an airspace are subject to change. In the context of individual route implementations to the existing airspace structure, the regulation should not prevent the application of the navigation specification already taken in use within the airspace.

In case it turns out that not all aircraft are capable for RNP 1 requirements, RNAV 5 shall be the alternative in support of PBN implementation to ATS routes, instead of the reliance on conventional navigation.

response

Not accepted.

The proposal requires PBN routes and procedures to be installed where a performance benefit can be achieved, dependent upon the performance required. ATS providers are required to have procedures available (not necessarily based on conventional navigation aids) for non-PBN capable aircraft. However, it is recognised that such procedures do not need to be available at all time, can be limited in their application and will be subject to local requirements.

Regarding the comment related to the ATS Routes, the Agency recognises the existence of the current RNAV 5 standard and proposes to maintain it.

It should be noted that the proposed regulation does not impose the introduction of PBN routes and procedures; these are to be introduced only when a performance benefit can be achieved, thus allowing an effective transition to PBN operations.

comment

149 comment by: *skyguide Corporate Regulation Management*

- **General comment**: The initiative of EASA to ensure a safe, efficient and harmonised implementation of PBN in Europe is acknowledged. However, the proposal does only require actions from ATSP and aerodrome operators and no requirements on airspace users which does generate significant mixed mode operations making most of the PBN benefits impossible.

- **Whole document** : Replace the terminology ATSP by the commonly used term ANSP. The terminology ATSP (air traffic service provider) is unusual. ICAO internationally defined and harmonised the terminology ATSP as follows: ATS: A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

- **Implementation date**: The implementation should be realigned to fit with the requirements of ICAO and the EU Regulation 716/2014 PCP

response

Noted.

With regard to the implementation dates, please see the response to the major concerns identified section of the Opinion regarding ICAO. With respect to the alignment with Regulation (EU) No 716/2014, this proposal only requires PBN to be implemented where required based on local performance requirements at all aerodromes. An end date for implementation is not set

Regarding the use of the term ATSP or ANSP, the Agency accepts your comment and will refer to ANSPs.

comment

169 comment by: *EUROCONTROL*

General comments of a strategic nature made by EUROCONTROL

EUROCONTROL strongly supports, from both the civil and military perspectives, the Performance-Based Navigation (PBN) implementation in the European Air Traffic Management Network (EATMN). Concerning the comments made from a military perspective, it is important to note that they support, complement and are fully aligned with the conclusions of the Military ATM Board (MAB/16 on 31/03/2015).

EUROCONTROL welcomes the related Notice of Proposed Amendment, namely NPA 2015-01, as it addresses the safety, interoperability, proportionality and coordination issues.

However, from a strategic perspective EUROCONTROL confirms that there are still two significant issues concerning:

1. Proposed dates and associated Performance Requirements
2. Mixed Mode operations

These points are elaborated below:

PROPOSED DATES & ASSOCIATED PERFORMANCE REQUIREMENTS

PBN regulatory dates are compared in the table below:

Proposed Dates	RAD (obsolete)	PCP (25 major TMAs)	EASA NPA
2018	RNP APCH (2018=End Date)		RNP 1 + RF *Advanced RNP + FRT* (2018=Regulation effective date)
2020	RNP 1 + RF (2020=End date)		
2023/2024	*Advanced RNP + FRT (2023=End date)*	RNP APCH RNP 1 + RF (2024=End Date]	RNP APCH (2024=End date)

In context:

- RNP APCH is for the final approach segment;
- RNP 1+RF is for SIDs/STARs;
- Advanced RNP (1NM TSE) is for fixed, published ATS routes that are not SID/STARs.

Note: The RNP APCH date of 2018 was coordinated through ICAO EUR office with a follow through to ICAO Montreal in full coordination with stakeholders. The original ICAO date of 2016 for RNP APCH being based on ICAO safety concern (see below).

The RAD included a clear mandate for both the air and ground segments, meaning that aircraft and ANSPs were both impacted since a number of specific actions had to be taken within the framework of the mandate.

The PCP IR AF#1 mandated RNP1+RF and RNP APCH, both for **2024** in 25 of the major TMAs in Europe.

During the formal consultation on the EASA NPA on 9th March 2015, EASA explained that the (EUROCONTROL) RAD [performance requirements] and the PCP [performance requirements and dates] had constrained them in the selection dates/performance requirements. This explanation is incomplete and therefore not entirely precise.
Whilst the EASA NPA partially maintained the RAD and PCP's performance requirements for RNP1+RF, RNP APCH and Advanced RNP + FRT (PCP excl.);
- the date for RNP1+RF and Advanced RNP+FRT was advanced to a 2018 regulation effective

date (instead of 2024 end-date as mandated by the PCP or 2020/2023 end-dates as proposed in the RAD); and
- the date for RNP APCH was pushed back to a 2024 end-date (from 2018 end-date as proposed by the RAD) so as to be aligned with the PCP 2024 end-date.
o The NPA introduces mixed mode operations.

EUROCONTROL highlights three, potentially significant consequences from these changes:

- Regarding the 2018 Regulation effective date of 2018 and performance requirements for all ATS routes, including SIDs/STARs:

For SIDs/STARs in particular, and all ATS routes more generally, stakeholders have focussed on the 2018 date for RNP 1 + RF/Advanced RNP+FRT and stated that 2018 is simply not viable because it is already certain that achieving certification of the entire ECAC fleet for RNP 1 + RF/Advanced RNP+FRT for 2018 is impossible. [Aircraft maintenance cycles, when such authorisation/retrofits are carried out, and the non-availability of EASA's CS-ACNS are the two main reasons].

Associating this date of 2018 with RNP 1 +RF brings with it the high probability that use of RNP1+RF as a tool for SID/STAR design would be prevented, despite being needed in places for environmental mitigation and airspace efficiency reasons.

The main consequence of this 'too early' date of 2018, means that ANSPs are insisting on RNAV 1 (offering lower performance requirements) to be required by 2018 (as significant portions of the ECAC fleet are appropriately qualified for RNAV 1). Mindful of the context of this 'reaction' – triggered primarily by the date, regulating exclusively for RNAV 1 would be counter-productive as it would mean that an FMS with 1970s functionalities, is mandated for a regulation-effective date of 2018. This would also mean blocking any real opportunity for RNP SID/STARs implementation for another 20 years *(By 2018 it will be 20 years since the mandate for B-RNAV/ RNAV 5 was adopted)*. Taking the above into account, EUROCONTROL recommends a rule in which RNAV 1 is the default requirement for SIDs/STARs and RNP 1+RF is to be used where required with a regulation effective date of 2024. On other ATS Routes, Advanced RNP with 1 NM TSE with FRT, where required, with the same regulation effective date of 2024. This would be achievable and would have the merit of confirming that RNP has become a reality (which would also be in line with the ICAO, SESAR, ATM Master Plan and EC Strategy given their PCP regulation).

In doing so, a genuine performance improvement is enabled and achieved, ANSPs have the right tools in their toolbox for their own use when the need arises and honour of the relevant parties is preserved.

- Note that as regards Advanced RNP (1) (+ FRT, where required) on en-route ATS routes, and RNP 1+RF on SIDs/STARs, mean that seamless connectivity can be ensured between different phases of flights. Information received recently from the FAA indicates that they have pushed for an Advanced RNP certification requiring all functionalities. In this respect EUROCONTROL finds it useful to quote an extract from the relevant email from the FAA representative at SC227: 'further the development of the RNP MOPS, & our efforts included an effort to achieve consensus on the RNP equipment classes. *That is, we discussed the delineation of equipment classes around the concept that the highest class of RNP equipment shall meet all of the functional requirements to support Advanced RNP implementations by States. From*

*a TSO or an aircraft TC perspective, the result would be recognition of Advanced RNP eligibility with **no** deviations permitted. The committee participants accepted this proposal!'* Despite this, we are mindful that Business Aviation, an increasingly emerging market, has a challenging time with FRT, as does General Aviation and some regional aircraft.

- Regarding the 2024 end date for RNP APCH implementation

The proposed NPA mandates RNP APCH with a 2024 end-date, with the understanding that the underlying objective is to enhance safety. However, delaying the date from 2018 (RAD) to 2024 implies that safety does not seem to be given the highest priority any more in the rule-making of this particular area of ATM. This implicit message contradicts the clear ICAO's global intentions as reflected in the ICAO Resolution 36-23, superseded by Resolution 37-11, the ICAO GANP and ASBUs.

Both ICAO Assembly resolutions dealing with PBN were built on an urgent safety push for RNP APCH and the date in these resolutions is 2016. The EUROCONTROL/ICAO EUR PBN TF had agreed with ICAO HQ on 2018 as being a viable date within the EUR region (exchange of letters EUROCONTROL/ICAO in late 2013/early 2014), a solution to which the relevant stakeholders agreed. This 2018 date is in line with the ASBUs to the extent that ICAO is thinking of going for the 2018 date anyway. Furthermore, ICAO's highest stated priority in the GANP is PBN.

In summary, opting for a 2024 date for RNP APCH implementation is not appropriate. It does not stem from RAD and is out of global synchronisation. Several stakeholders are troubled by this delay – particularly IATA, and ICAO.

MIXED MODE OPERATIONS

The EASA NPA introduces mixed mode for the simple reason that this rule does not read like a mandate and has not been interpreted as a mandate. Numerous simulations have demonstrated, and this has been confirmed in the field, that ATC will generally revert to radar vectoring when the operation permits mixed navigation performance within the airspace.

In context, it is important to note that the RNAV 1 everywhere and RNP 1+RF where required does not risk the same pitfall, because where RNP 1+RF would be required, proximate routes would have the same requirement, and along straight segments; both navigation specifications have the same TSE of 1NM. Intelligent use of the navigation specifications could result in a seamless operation, which would not be the case with conventional navigation being maintained.

It is submitted that provisions for conventional navigation should be retained for contingency only but not as an accepted nominal mode.

General comments of a technical nature

The general consensus is that NPA 2015-01 cannot really be seen as an example of the expected Total System Approach. Moreover, it is a somewhat difficult and cumbersome

document to read due in particular to the large number of internal cross-references.

EUROCONTROL therefore raises several issues, makes a number of comments, asks a few questions needing answers and proposes corrections or adaptations for some parts of the NPA.

1. On document

The document lacks clarity even for regulation experts who will probably have difficulties to discuss with experts in this field. It contains too many cross references, which hampers the easy understanding of what is actually mandated.
It is therefore proposed to include a summary table of the PBN IR RAD (that is referenced in page 10). In addition, as an example to improve reading or even understanding, since the only PBN specification that complies with requirements for ATS routes is A-RNP, why not just using A-RNP?

2. On mandates

There is no mandate on the aircraft operators outside of RNP APCH – which has already been mandated in the PCP and that would cover the majority of the fleet.

There is as well no consideration for helicopter operations and allowance to use RNP0.3. It could even be understood that those aircraft not certified for RNP1 will be handled on the same routes by alternate procedures.
Again, it is surprising not to see any mandate on aircraft equipage. Without such a mandate there is a high risk to be faced with a significant proportion of non-equipped aircraft. The reference made to the Regulation (EU) Nr 923/2012 of 26 September 2012 (SERA) on airborne equipage must be made explicitly applicable only for civil aircraft. EASA should therefore confirm clearly to which category of aircraft does the SERA rule apply.

3. On mandate dates

It seems that little regard has been paid to the agreed dates achieved already with the stakeholders and documented in the RAD document. The RAD dates of 'by end 2020' for RNP1+RF SID/STARs and 'by end 2023' for the A-RNP ATS Routes are compatible with the date stipulated in the draft rule (6/12/2018 - the last AIRAC date of that year) included in the NPA. However the NPA proposed date for RNP APCH approach (2024) is questionable when compared to the date stated in the ICAO resolution 37/11 (2016) and the agreed date of the RAD (2018) which was still providing more time.

response

Noted.

The comments are addressed in a generic manner in the response to the major concerns identified section of the Opinion.

comment *187* comment by: *ENAV*

- 1 Operational deficiencies:

The EASA IR, unlike Eurocontrol proposal, is not calibrated on an operational aspect and its harmonization with other EASA regulations appears only partially achieved;

- 2 Misalignment with ICAO recommendations:

The IR proposal is neither aligned nor compatible with the ICAO PBN Manual requirements (instead this is present in the Eurocontrol version) and it does not take into account ICAO priorities regarding the introduction of RNP approach procedures (EANPG #55 Satement 55/1 and Assembly Resolution A37 / 11).
It is proposed to keep the target dates proposed in the Eurocontrol's Regulatory Approach Document on PBN for APV approaches in all instrument runway ends by end of 2018. The scope of Reg. 716/2014 PCP IR intended for high density TMAs and should not be confused with the objective of ICAO AR 37-11.

- 3 Lack of infrastructure approach:

The IR proposal does not deal at all one of the crucial points that stakeholders pointed out in the first IR, i.e. how to address the issue of GNSS. On the occasion of the previous consultation some ANSPs, including ENAV, DSNA and ENAIRE observed that the IR would somehow have to also take responsibility to solve the difficulty associated with the use of GNSS in European airspace. Eurocontrol took charge of this aspect and declared its willingness to explore the possibility to write up a dedicated Safety Assessment.

- 4 Incorrect identification of navigation specification:

The EASA proposal misses the operational objective developed by Eurocontrol with the introduction of A-RNP specification linked to mandatory RNP 1 requirement . The application of this requirement would solve some inconsistencies in the EASA IR proposal;

- 5 As mentioned above the proposed timing is not acceptable because:

· The requirement RNP 1 + FRT for the en-route phase is not present as described in the PBN Manual, so it would be an exception to the current criteria and also if the A-RNP requirement had been mentioned as well in the IR, it would have created something completely different; the navigation infrastructure is currently not ready for such extended application of the RNP 1 concept, for which it would be desirable to wait at least for the introduction of a more robust GNSS infrastructure like the dual-frequency GPS (position shared by several ANSPs);
· Above considerations can be used as well as for the SIDs and STARs, but with EASA approach, the development of RNP 1 SIDs / STARs, in airports where radar service is not available, would be very difficult, in contradiction with the provisions of the PBN Manual (for which the specific RNP 1 is ideal for low-medium traffic airspace without radar service);
· The timing of the proposal may not be sufficient to ensure the introduction of RNAV 1 procedures within TMAs and control regions, according to the approach adopted by most European ANSPs to set RNP 1 requirement mandatory, effectively blocking the introduction of PBN procedures;
· The risk of fragmentation feared by EASA does not exist because the PBN manual is very clear in attributing the different navigation details to each route phase.

It is therefore desirable:

- a review of the IR in the sense of setting A-RNP specification for SID/STAR and en-route phase (as provided by the PBN Manual);
- a realignment of the implementation timetable with the original Eurocontrol Regulatory Approach Document;
- introduce the APV approach procedures also as backup for the precision approaches;
- take a clear position on the necessary infrastructure to support RNP navigation requirement for the departure, en-route, and arrival phase of flight.

response

Noted.

The review the IR in the sense of setting A-RNP specification for SID/STAR and en-route phase, the realign the implementation dates with the original EUROCONTROL Regulatory Approach Document and the introduction of the APV approach procedures also as backup for the precision approaches have already been addressed in a generic manner in the response to the major concerns identified section of the Opinion.

Regarding the last bullet point, this proposal requiring the use of RNAV and RNP, where required, recognises the use of the GNSS infrastructure and potential increase in the use of EGNOS (including Galileo augmentation) in the future. The detailed use of these systems shall be subject to a rulemaking task at a later stage.

comment

295 comment by: *AvinorANSP*

This is a general comment to chapter 4: RIA

Comment:

The document estimates numbers for increased safety, less environmental impact, and less cost for diversions. This is all related to the aircraft operators. However, we cannot see that one of the major economic drivers for ATSPs and aerodrome operators are discussed at all: The savings anticipated when being able to de-commission conventional nav-aids such as NDBs, VORs and Localizers along with IAP based on these nav-aids. As this is not discussed, it becomes less evident that the postponement of implementation badly affect the business case for PBN implementation for the ATSPs and aerodrome operators.

response

Noted.

This costs of de-commissioning navigational aids is recognised as a potential benefit when implementing PBN applications. However, it is difficult to quantify this in a generic RIA applicable to the European environment as it is dependent upon the local situation. The potential benefits of decommissioning conventional NAV-Aid will be part of the assessment of the local performance needs.

comment

301 comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

It does not seem appropriate and also not very economically justified that everyone in

Europe shall apply the same navigation specification regardless of traffic volume and complexity. Some technology is still missing in smaller aircraft for them to be able to fly these procedures.

response *Noted.*

In principle, the Agency agrees that requiring the application of the same navigation specification at all locations is non optimal. However the proposal now permits the use of either RNAV 1 for the initial application or RNP 1 where additional performance is required. It should be noted that the proposal only requires PBN routes to be implemented where performance benefits can be established.

comment *302* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

We can see no CBA in the RIA; Will you provide one?

response *Noted.*

No additional RIA is envisaged to be published.

comment *336* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
In relation to the passing through comitology of the implementing rule coming out of this rulemaking task, care must be taken to address the process in a proper manner.	It must be observed that the implementing rule coming out of this rulemaking task will affect regulations pertaining both to the EASA Committee and the SSC. In fact, this is already the case with the regulation stemming from **EASA Opinion No 04/2014** (SERA Part C). This has been brought to the EASA Committee of 20-21.01.2015 and is currently being addressed by the EC (DG MOVE E2 and E3).

response *Noted.*

comment	*376* comment by: *CAA-NL* **General comment #1** In general, The Netherlands supports Option 1 for a harmonized implementation of PBN within the EU. Furthermore, the entry into force date of 6 Dec 2018 of the Rule is supported, however further clarification is sought on " progressive" implementation.
response	*Noted.* PBN routes should only be implemented to meet the performance needs of the individual aerodromes.

comment	*407* comment by: *Carl Norgren, Swiss Int Air Lines* We have taken note of NPA 2015-01 and support it without further comments.
response	*Noted.*

comment	*429* comment by: *CANSO*
	
	CANSO believes it is very important that this regulation is implemented correctly and in a way that will support speeding up harmonised Performance-Based Navigation (PBN) implementation.
	We believe that implementing new technologies is achieved not just by rulemaking but also by involving and getting the buy-in from all the major European implementation actors.
	We would like to offer our support to EASA and the European Commission to help understand the real implementing issues which need to be addressed to reach the PBN benefits and to work together in improving the requirements included in the draft regulation proposal.
	
	CANSO recommends:
	
	• To review the IR in the sense of setting A-RNP specification for Approach, SID/STAR and en-route phase (as provided by the ICAO PBN Manual).
	• To realign the implementation timetable with ICAO recommendations and EU Reg. 716/2014 PCP IR:
	  ○ 2018: APV in all instrument runway ends
	  ○ 2024: RNP 1 required in those European TMAs where it has been proven that RNAV1 does not meet the performance requirements
	• To introduce the APV approach procedures also as a backup for the precision approaches in line with ICAO AR37/11 and EANPG 55 recommendations.

- To clarify the necessary infrastructure to support RNP navigation requirement for the departure, en-route, and arrival phase of flight.
- To consider that appropriate PBN approval should be made mandatory for operators. The function, purpose and access rules for the non-PBN procedures in PBN airspace must be clearly regulated.
- To develop harmonised guidance material on contingency mitigation in case of GNSS failure.
- To create "National PBN Implementation Plans".
- To have an ad-hoc meeting of EASA with all the major European PBN implementation actors, to discuss all the above mentioned issues.

response

Noted.

Regarding your concerns on the use of A-RNP, the implementations dates, intent of ICAO's resolution A37/11 and the use of non-PBN procedures please refer to the response to the major concerns identified section of the Opinion.

Regarding CANSO's recommendation #4, the proposal requiring the use of RNAV and RNP where required, recognises the use of the GNSS infrastructure and potential increase in the use of EGNOS (including Galileo augmentation) in the future. The detailed use of these systems will be subject to separate rulemaking task at a later stage. .

Regarding CANSO's recommendation #5, this is accepted and has already been implemented in accordance with the air operation regulations.

Regarding CANSO's recommendation #6, the Agency understands that the AMC proposed in the NPA needs further definition to ensure a harmonised approach. The Agency is willing to work with CANSO and other stakeholder to develop this AMC/GM material.

Regarding CANSO's recommendation #7, the Agency does not see the need to require Member States to create "National PBN Implementation Plan". The PBN is not required at all locations, it is to be implemented only where a performance benefit is established.

comment

438 comment by: *DGAC/DTA*

EASA position not to propose a RNP1 on board mandate is supported as there is no clear and general benefit that could justify a general RNP1 equipment mandate. Though, ANSP may demonstrate local benefits for implementation of RNP1 or RNAV1.

In that case, Member States should be able to mandate carriage of certain equipment (this mandate should be consistent with the NAV SPECs of the ICAO Doc 9613 PBN Manual of course for flying in some specific airspace areas). Indeed, the provision laid down in ORO.GEN.110 (« operators should be equipped and its crews are qualified as required for the area and type of operation ») seems all but self-sufficient to fulfil such an objective.

This is why DGAC France strongly supports the inclusion of a hook in the regulation giving the clear possibility to publish local mandates (if operational benefits have been demonstrated, if this mandate has been coordinated with airspace users etc.)
Justification:
The French DGAC have already faced this situation (trying to introduce RNAV 1 in Paris TMA) and have experienced that without an aircraft equipage mandate, the benefits of PBN operations become really difficult to achieve. Local mandates have been included, just as proposed in the present comment, in interoperability regulations (e.g. IR VCS, IR DLS ...).
Proposal:
Setting provisions to enable Member States to mandate that all civil aircraft operators be equipped in dedicated airspace areas around some aerodromes.

response *Noted.*

The proposed implementing rule enables "local mandates" by permitting possible limitations on the availability of procedures to support non-qualified aircraft.

comment *492* comment by: *ENAC IT*

1. GNSS as primary means of navigation. Whereas the nav specifications selected (RNP1 and RNP APPCH) are based upon GNSS, this NPA was expected to clarify the problem related to GNSS to be defined as primary means of navigation. It is known as this is a very critical issue for the States. Many Study Groups, Task Forces and Panels are discussing about that. Therefore, this NPA was expected to define some requirement/recommendation about this issue (e.g.: performance monitoring of GNSS parameter vs. Annex 10).
2. Contingency procedure. The contingency procedures do not clarifies enough what is to be applied in case of GNSS outage.
3. Mandates on Air Operators. Mandates on Air Operators (AO) and equipment onboard miss. The NPA's approach to refer to other regulations related to Operations (965/2012) and Rule of the Air (923/2012) could be not effective enough because while ANSP's are going to implement PBN procedure and route, AO's could continue to operate with traditional navaids. This prejudices a full PBN environment over the time.
4. Mixed operations. Same scenario of previous bullet: there is no deadline for mixed operations, and many AO's could maintain traditional equipment onboard. Again, this could prejudices a full PBN environment over the time.
5. ICAO Resolution. The NPA does not consider ICAO Resolution A37/11, that seems to be more flexible. According to ICAO, RNP APPCH will be implemented on every instrument runway end, with APV where possible and LNAV as a minimum. As opposite, this NPA requires APV only on Non Precision Approach IRE. Not flexible enough. Moreover, some airports could not need APV procedure.
6. ILS back up. Also, the NPA does not require APV as back up of ILS: this feature is very important during maintenance of ILS facilities.

response *Noted.*

With respect to comments 3, 4, 5 & 6 please refer to the response to the major concerns identified section of the Opinion.

With respect to comment 1, the proposal requiring the use of RNAV and RNP where

required, recognises the use of the GNSS infrastructure and potential increase in the use of EGNOS (including Galileo augmentation) in the future. The detailed use of these systems will be subject to a separate rulemaking task when required. It should also be noted that Member States have already agreed to the use of GNSS as the RNP navigation means as a result of the adoption of Regulation (EU) No 716/2004.

With respect to comment 2, the Agency recognises that the AMC proposed in the NPA needs further definition to ensure a harmonised approach. This will be ensured following the adoption of the implementing rule.

comment *497* comment by: *AEA*

General Comments

1. The identified bottlenecks for the future growth in the ATM systems are strongly linked to the lack of sufficient TMA and runway capacity. Both of which need to be radically improved for which the implementation of PBN functionalities and associated ATM tools and procedures are key. RNP1 functionality in the TMA will allow the design of de-conflicting arrival and departure routes for capacity and efficiency reasons. It is also recognized that whilst airlines demand growth at many of their critical airports in Europe, this must be delivered in a safe, harmonized, coordinated and environmental friendly way.
2. Much needs to be done to achieve the 6 Dec 2018 entry into force deadline such as: implementation of pilot / controller procedures and ATC gaining experience to cope with RNP1 and its “alert and monitoring” function; and last but not least to safely cope with a mixed aircraft environment.
3. A strong PBN program management (PM) across Europe, which shall be installed immediately, is of utmost importance to ensure that deployment gaps are filled and to avoid non-synchronized and un-coordinated PBN implementation, otherwise it is feared that RNAV1 will ultimately prevail and airline investments in RNP1 will have been wasted.

The PM shall ensure that the ATC ground infrastructure (ATC tools and systems, like AMAN, DMAN, SMAN etc., routes and associated ICAO recognized procedures) must be readily available and validated as early as possible to support the investments in PBN to gain benefits and to stimulate further relevant PBN equipage by and beyond Dec 2018.

4. In conformity with ICAO Annex 11 it is strongly advised that new RNP1 procedures shall be consulted with “lead carriers” (often home based airlines) as early as possible in the design process to take benefit of local, operational and aircraft performance knowledge.
5. Many of the aircraft in operation with the members of the Airline Associations already have the required PBN capabilities on board. Therefore, the provision of the ‘Best Capable Best Served’ (BCBS) concept as developed by SESAR and allowed by this NPA needs to be fully embraced. Application of BCBS has high economic value for the mainline aircraft that comprise 67 % of the flights and occupy 85 % of the flying hours (Ref. Eurocontrol Regulatory Document). For aircraft that are not or cannot be PBN equipped, due to economic viable reasons, conventional routes will be offered (as proposed in this NPA).
6. Alignment and coordination of aircraft capability requirements with NEXTGEN and global requirements is needed.

7. Accelerate availability of new and/or improved ICAO SARPS is essential and necessary to allow for the envisaged increased capacity.
8. **The NPA is proposing two options, i.e. Option 0 and Option 1**

Option 0: *The 'Baseline' option 0 is to be considered as the reference scenario where* ***no further regulatory measures*** *are taken regarding PBN implementation in Europe. The implementation will be on a pure voluntary basis*

Option 1: *Aims at ensuring a safer and more efficient implementation of PBN in Europe by accelerating the implementation of APV approach procedures where there are only non-precision approaches in place and by enabling a harmonized PBN implementation in general.*

Option 1 consists in 2 types of measures:

a. *Mandatory requirements in the field of PBN approach procedures for ATSPs or aerodrome operators; and*
b. *Non-mandatory requirements:*

- *only when ATSPs decide to implement PBN for SID and STARs ATS routes, they will have to follow specific requirements to ensure a progressive harmonised implementation;*
- *the operators have still the possibility to decide to use these PBN requirements or to continue with conventional ones.*

Comments:
Option 0 means that no regulatory action will be taken, and allows continued fragmentation. Option 1 is the Airspace User Associations preference, although a real quantitative CBA is missing, which makes it difficult for airlines to decide to invest in RNP1 for retrofit purposes.

response *Noted.*

The Agency fully recognises that the implementation of PBN routes and procedures in conjunction with improved flow management tools will have a positive impact on the aviation community.
Regarding the alignment and coordination of aircraft capability with NEXTGEN, the Agency understands the rational for your request and via this proposal intends to harmonise the application of PBN within the European environment in accordance with ICAO standards. It should be noted that the ICAO Navigation Specifications are a tool box that Member States and region are able to use,

comment *516* comment by: *Thales Avionics*

Comment: RNAV Holding is currently expressed as RNAV/RNP hold (in last PBN issue) or even RNP Hold (in MASPS).
Proposed formulation/Recommended Change: replace "RNAV Holding" by "RNAV/RNP Holding" or "RNP Holding"

response *Not accepted.*

The requirement to use RNAV Holding has been removed from the proposal.

comment	*524* comment by: *IATA*

General Comments

The consolidated IATA/AEA comments are provided below by both Associations.
We wish to highlight that the comments are endorsed by IATA/AEA member airlines representing the vast majority of traffic in Europe, therefore the associations expect that our response be treated with a relatively high weight.

The identified bottlenecks for the future growth in the ATM systems are strongly linked to the lack of sufficient TMA and runway capacity. Both of which need to be radically improved for which the implementation of PBN functionalities and associated ATM tools and procedures are key. RNP1 functionality in the TMA will allow the design of de-conflicting arrival and departure routes for capacity and efficiency reasons. It is also recognized that whilst airlines demand growth at many of their critical airports in Europe, this must be delivered in a safe, harmonized, coordinated and environmental friendly way.

A strong PBN program management (PM) across Europe, which shall be installed immediately, is of utmost importance to ensure that deployment gaps are filled and to avoid non-synchronized and un-coordinated PBN implementation, otherwise it is feared that RNAV1 will ultimately prevail and airline investments in RNP1 will have been wasted.
The PM shall ensure that the ATC ground infrastructure (ATC tools and systems, like AMAN, DMAN, SMAN etc., routes and associated ICAO recognized procedures) must be readily available and validated as early as possible to support the investments in PBN to gain benefits and to stimulate further relevant PBN equipage by and beyond Dec 2018.

Alignment and coordination of aircraft capability requirements with NEXTGEN and global requirements is needed.

Accelerate availability of new and/or improved ICAO SARPS is essential and necessary to allow for the envisaged increased capacity.

response	*Noted.*

The Agency concur that the inefficiency in the ATM are linked to TMA operations and that PBN can help to improve the efficiency of such operations. Regarding the requirement for strong project management, while it is recognised to be beneficial, such proposal is outside the scope of this task. Regarding the alignment and coordination of aircraft capability with NEXTGEN, the Agency understands the rational for your request and via this proposal intends to harmonise the application of PBN within the European environment in accordance with ICAO standards.

comment	*578* comment by: *AEA*

Before General Comments:
The consolidated IATA/AEA comments are provided below by both Associations.
We wish to highlight that the comments are endorsed by IATA/AEA member airlines representing the vast majority of traffic in Europe, therefore the associations expect that our

response be treated with a relatively high weight.

response

Noted.

comment

589 comment by: *British Airways*

British Airways fully supports the PBN IR using RNP 1 and RF Legs in the TMA. The fact is that British Airways is retiring aircraft that are fully PBN capable so this mandate is far overdue for us. The British Airways position and comments on the PBN IR/EASA NPA 2015-01 is as submitted by IATA.

British Airways has the following additional general comment:
The PBN IR allows for Instrument Runway Ends (IREs) to have procedures implemented only when there is a Performance Benefit predicted by the Airport Authority. It would be very helpful to have a list of all the IREs that are envisaged as being encompassed by the PBN IR, so those affected airfields are fully aware of the expectations upon them. Also, the PCP mandate covers most of the busiest 24 airports in Europe and having these airports specified in the PCP means that transparent project plans can be drawn-up for implementation and coordination by the Deployment Manager.
However, the PBN IR has no definitive plan or project management provisions. It seems prudent to divide the list of IREs into several tiers so that it becomes possible to identify an order of priority for the implementation of PBN for the airports. Implementation progress could be more easily enforced based on a clear order of priority at the outset.

response

Noted.

With the exception of RNP APCH implementation, there is no specific obligation to implement PBN procedures at all locations. PBN procedures are only to be implemented based on a local assessment with respect to the performance improvements associated with PBN, where performance improvement has been demonstrated that implementation plans will be required.

With respect to providing a specific list of the affected runways, the Agency will investigate the possibility and the appropriate location for such a listing.

comment

599 comment by: *CAA-N*

Attachment #1

The CAA Norway (CAA-N) questions the rationale of mandating RNP1 with FRT capacity enroute, allready from 2018. In due time there might be a rationale for this for SID/STARs, but the amount of non-compliant/certified Aircraft will be significant and complicate mixed mode operations.
CAA-N consider the requirements for RNP1 and RF stemming from the Eu 716/2014 Pilot Common Project to be a more reasonable target for Airspace development.

Recently completed large Airspace project on a national level implementing RNAV1, are still facing a number of non-compliant Aircraft. CAA-N experience the 2018 time-scale as an over-reactive concept - driving more Challenges than sollutions for the ATM environment.

CAA-N sugest that Article 6.2. are being repealed.

Without prejudice to Eu 716/2014 Pilot Common Project the requirements in AUR.PBN.2015(3) for SID/STAR sould be as for RNAV1.

The Eight year delay of the ICAO A37-11 APV to Instrument Runway Ends (IRE) is a serious turn down of the safety intent of ICAO A37-11. Enquiries to Norwegian Air Carriers confirms an almost resignation attitude. This must clearly be ouside the ICAO Assemblys intention. The ICAO A37-11 has been transposed in to Norwegian national regulations. The national ANSP has performed satisfactively at present with the APV implementation. We have a lot of local IFR Airports in challenging surroundings pressing the need for APV and improved safety forward.

CAA-N suggest deleting Article 6, 2. This will set december 2018 as a mandating date for APV to Instrument Runway Ends. That is an acceptable two year delay for the ICAO A37-11 and according to Eurocontrols previously RAD document.

CAA Norway would like to state that we need a more a clear definition of Instrument Runway End related to APV. In our State there are some Instrument Runway ends equipped, but APV is not possible because terrain and obstacle contraints does not meet the design criteria. These Runway ends are not included in the national target number for APV implementation.

CAA-N do agree with the priority aspect of APV to IRE with only non-precision approaches.

Please note the enclosed file with NPA 2015-1 position from the Norwegian Military Airspace Authority. The Document is solely an Action Paper from the Military ATM Board, and covers the view of the Norwegian Military Airspace Authority. The document is uploaded by CAA-N as a technical support for the MIL in the hearing process itself, and the content is solely the responsibility of the MIL Authorities. The CAA-Ns view on the NPA is described throughout the CRT hearing document.

response *Partially accepted.*

The majority of CAA-N comments with respect to the use of RNP 1 standard with additional functions are acknowledged and the proposal has been amended such that the RNAV 1 standard is the basic standard to be applied and RNP 1 should only be used where the performance benefits fully justify its use.

With regard to the implementation dates with respect to that required by ICAO resolution A37/11, please see the Response to the major concerns identified section of the Opinion.
The content of the EUROCONTROL paper submitted by Norway's Military authority is noted.

comment *636* comment by: *BE CAA*

Reference	Comment	Proposed action
General 1	The text makes several references to ATSPs and aerodrome operators. In all cases both terms refer to an organization that provides an air traffic service. Apparently, the authors felt that in cases where an aerodrome operator provides an air traffic service, this needs to be identified as different from the cases where a dedicated organization does so. We believe that viewed from a service provision/operational perspective, there cannot be a difference in the air traffic service provided by different organizations.	Instead of using the terms "ATSP and aerodrome operators", the expression "the organization providing air traffic service" should be used. *Note: See also the comment under Article 3.*
General 2	The text makes ATSPs and aerodrome operators responsible for achieving the stated objectives. It is however well known that in some cases political or other factors effectively prevent such organizations from taking steps necessary for achieving the objectives.	Include text that makes it clear that organizations providing air traffic service are responsible for achieving the objectives only in as much as it is in their power to do so.
General 3	The NPA does not contain any provisions requiring aircraft equipage. Experience shows that airspace users will not equip on a wide scale and in a coordinated manner even when the benefits of a given new feature are evident. This results in situations where the benefits take a very long time to materialize.	Include a mandate for aircraft equipage, discussed and agreed with the industry.
Article 1	Although it is understood that military and State aircraft face difficulties to become PBN-compliant, those flying IFR/GAT in the affected airspace should be within the scope of the PBN-regulation. One should realize that the efficiency of any operation in any airspace, is always constrained by the least equipped party. Hence, while it is understood that for certain categories of airspace users, a longer transition period might be desired (or even required), the absence of any obligation to transition to full PBN-compliant operations for all users in a designated airspace, will limit the benefits of any PBN-implementation in Europe.	Change the text to make it clear that military/State aircraft flying as IFR/GAT are subject to the PBN-regulation.
Article 3	The term "Air Traffic Service Providers (ATSPs) and aerodrome operators" is often used in the text in the context of service provision and procedure development. This	Change the text to refer to "States" rather than individual stakeholders within a State.

	definition should be widened to all entities responsible for the deployment of the related items, including the aviation oversight bodies of each Member State. This is especially true in countries where the ANSP and/or individual aerodrome operators have little or no authority to impose/publish instrument flight procedures. ICAO usually refers to 'States' rather than referring to individual stakeholders within that State.	
Article 6	In the text, RNP APCH APV procedures are mandated by 2024 only for runway ends that have published Non Precision Approaches. This is much later and narrower than the ICAO requirements of 2016 for ALL instrument runway ends. The late date of 2024 will potentially brake the momentum of implementation that is in evidence in many States to-day. The requirement for RNP1 for new SIDS/STARS (and even en-route airspace) from December 2018 is too early and not in line with the ICAO PBN vision.	Change dates to be in line with the ICAO specified dates as much as possible and ensure that if different dates are chosen for whatever reason, these are still suitable for maintaining the implementation momentum already achieved.+-
AUR.PBN.1005	The text declares that it is the ATSPs and/or aerodrome operators who are responsible for the implementation of this NPA. In reality, those organizations are often just the executors of the directives coming from State authorities and as such, cannot be held responsible on their own for the implementation.	Change the text to reflect that it is State authorities who are responsible for the implementation of this NPA. *Note: See also the comments under General 1 and Article 3.*
AUR.PBN.2005 (3)	The text uses the expression "…airspace performance needs". This "performance" is undefined and it is also unclear who has the authority to define it.	Define "airspace performance needs" or remove term and replace with another appropriate, defined term.
AUR.PBN.2005 (4)	The text uses the term "network performance needs". This term is undefined.	Define "network performance needs" or remove term and replace it with another appropriate, defined term.
AUR.PBN.2015 (3)	The requirement described here in effect forces the implementation of RNP1 in order to meet the "airspace performance needs", which is itself an undefined term. This is in contradiction with the provisions	Reformulate the text to follow the intention of Doc. 9613 and allow the implementation of any of the ICAO proposed solutions to meet the "airspace performance

	in ICAO Doc. 9613 which makes it possible to select from several possibilities without forcing the use of just one of them.	needs". *Note: See also the comment under AUR.PBN.2005 (3).*
AUR.PBN.2015 (3) (Continued)	It is to be noted that: -Requirements (a) and (d) imply RNP1 for terminal procedures (SID/STAR). RNP1 currently implies "GNSS" as there is no alternative. GNSS implies now as well as for the foreseeable future, GPS L1, as there is no alternative yet. -The RF legs mentioned in Requirement (c) are an *optional* capability for use with RNP 1, RNP 0.3 and RNP APCH and NOT a minimum requirement. The number of RNP1-capable aircraft that support the RF-functionality is still very limited. -The due date of 6 December 2018 is overly optimistic. According to a recent survey (March 2015), based on the submitted flight plans, only 38% of the departures out of Brussels Airport report having a Basic RNP1-capability. -Not less than 90% of aircraft departing Brussels are RNAV1 compliant. -A 'WINDOW' constraint is a common function for a modern FMS, but not foreseen in 'legacy' systems. With the above considerations in mind, the only conclusion that can be drawn is that RNP1 is the wrong baseline for SID/STAR implementation in 2018.	Replace RNP1 with RNAV1 as the baseline requirement for SID/STAR implementation in 2018.
AUR.PBN.2005 (4)	Reference is made here to a non-existent performance level, namely RNP1 en-route. It is to be confirmed that the provisions contained herein refer to new routes established after 6 December 2018.	Replace with the correct performance level. Improve text to make meaning clear.
AUR.PBN.2010 GM1	It is an inescapable fact that when both the navigation and surveillance pillars of the ATM system rely on a single source of positioning information (GPS L1), there is a	Align the requirements in this NPA and the SPI IR to ensure that the investment of airspace users in mandated

	major reliability issue to be addressed. At the same time, the SPI IR is obliging airspace users in Europe to equip their aircraft of MTOW in excess of 5700 kg with ADS-B capability by 2020. The NPA text under reference now tells the airspace users that their obligatory investment in ADS-B will bring practically no return in busy European airspace. This is a situation that must be resolved.	capabilities provide the expected benefits.
AUR.PBN 2015 (4)	ICAO Doc 9613 does not intend to use RNP1 in the en-route environment. Here is the relevant text for reference: *"The RNP 1 specification is limited to use on STARs, SIDs, the initial and intermediate segments of IAPs and the missed approach after the initial climb phase. Beyond 30 NM from the ARP, the accuracy value for alerting becomes 2 NM."* The provisions in the NPA section under reference talk about "±1 NM for at least 95 % of the total flight time" and "on-board performance monitoring and alerting". This combination can only be satisfied by RNP1. As stated above, this is contrary to the ICAO provisions. Furthermore, the future ATM concept of operations and the corresponding airspace use concept calls for the implementation of direct routings/free routes and NOT closely spaced ATS routes. The NPA provisions under reference do not seem to be a good fit for the new airspace use concept.	Align text with the ICAO provisions and the new airspace use concept.
AUR.PBN.2020	Contingency. – ATSPs and aerodrome operators are obliged to develop appropriate contingency procedures, however it is not said that these need to be uniform or at least harmonized everywhere. Without this requirement, there is a very real danger that such procedures will differ even at different aerodromes in a single country. While it is recognized that contingency measures	Include text requiring that contingency measures at different locations be uniform or at least harmonized to the extent possible and practicable.

	essentially reflect the local aeronautical environment and this will differ from place to place, harmonization to the extent possible and practicable seems to be essential.	
AUR.PBN.2020 (Continued)	Contingency procedures are meant to be used when there is a reduction of navigation performance. If the airspace structure where this occurs has been developed to take full advantage of the required navigation specification, conflicts may arise when contingency procedures need to be applied. This risk needs to be mitigated.	Until a valid second navigation source becomes available, refrain from using navigation techniques fully reliant on GNSS (GPS L1), such as RNP1. This is to be clearly explained in the text of the NPA.
AUR.PBN.3005 (1)	Mixed operations. Mixed operations can only be accepted as part of a transition period. In the NPA the provisions for mixed operations are not shown as part of a transition period but are an open ended, standard feature. This is not acceptable.	The part on mixed operations must clearly state that this is part of a transition period with a well-defined obligatory end date. The end-date is to be specified.
AUR.PBN.3005 (2)	The meaning of this requirement is not clear.	Clarify the practical meaning of this requirement.
AUR.PBN.3010 (1)	Coordinated deployment. The text is not clear whether it is meant that coordinated deployment needs to be agreed on the state or regional level. Coordination on only the State level is not sufficient.	The requirement must state clearly that coordinated deployment must be achieved on the European level. The mechanisms of coordination (who, with whom, purpose, etc.) are to be clearly stated.
AUR.PBN.3010 (2)	The obligation is expressed that the airspace users must be informed of a planned implementation of PBN elements 36 months prior to the implementation date. At its simplest, this is not always feasible. However, even more importantly, the text as it now stands seems to imply that airspace users would be sent a multitude of notifications, many with widely different dates even if implementation is coordinated to a certain extent. The lack of a finite transition period and a very clear mandate for aircraft equipage does result in the need to specify this pre-notice period, however, this is not workable in practice.	Delete the section on pre-notification in toto. Introduce a mandate for aircraft equipage. Introduce an end-date to the transition period.

response	*Noted.* The following responses are as per your comments. General 1: Not Accepted. While the Agency agrees with your assessment with respect to the provision of the service, the organisation providing air traffic service may not be the organisation responsible for the provision of the routes and procedures. General 2: Partially accepted. The text has been revised to refer to performance objectives. This can be understood to relate to environmental and other societal objectives as well as operational objectives. General 3: Please see the response in the response to the major concerns identified section of the Opinion Article 1: Not Accepted This provision has been removed, direct obligation of state aircraft cannot be made, however Member States must take due regard of the provisions of the proposed regulation. Article 3: Not Accepted This article is applicable to all regulated parties. The Subparts with the Annex further define the regulated parties for that subpart. With respect to the PBN subpart, the obligation are for the ATSP or aerodrome operators to ensure that PBN routes and procedure are implemented only when a performance benefit can be achieved, recognising that the full process will require other entities. Article 6: Please refer to the response to the major concerns identified section of the Opinion. AUR.PBN.1005. Please see the response to General 1 and Article 3 above. AUR.PBN.2005 (3): Partially accepted. The text has been revised to refer to performance objectives. This can be understood to relate to environmental and other societal objectives as well as operational objectives. AUR.PBN.2005(4): Accepted The term has been deleted; the objectives of the en-route ATS network (ERN) are well defined in Annex I to Regulation (EU) No 677/2011. AUR.PBN.2015 (3) & (4): Partially accepted. See the response to the major concerns identified section of the Opinion with respect to the proposed navigation specification. The objective of the task was to ensure the safe, efficient and harmonised implementation of specific PBN specifications and functionality in the

EATMN.

AUR.PBN.2020: Accepted.
The text has been amended to include the need for harmonised procedures. The Agency recognised the benefits associated with harmonised contingency procedures where practical and their need for local adaption. Regarding your proposal not to use navigation specifications using GNSS as the navigation source, please see the response to the major concerns identified section of the Opinion related to the proposed use of the RNAV 1 specification as a minimum. However, if the optional RNP 1 is used, the contingency procedure will need to reflect the use of such specification. These should also be harmonised as far as practically possible.

AUR.PBN.3005 (1): Not accepted.
The Agency notes that the full benefit of PBN operations can only be achieved when 100% of the fleet are capable to ensure such operation. However, in such a mandate, the transition period would be long and would enable local decisions to be applied as to the availability of Non PBN procedures thus enabling local benefits to be achieved sooner.

AUR.PBN.3005(2): Partially accepted
The text has been amended for clarity.

AUR.PBN.3010 (1) & (2): Not accepted.
As noted in the comment, the implementation is to occur only on identification of performance need. It is therefore advisable to notify all affected users so that they can plan accordingly.

comment *670* comment by: *UK CAA*

General Comment

Comment: The UK CAA is strongly supportive of the implementation of PBN in the EATMN and is taking significant steps through the UK Future Airspace Strategy (FAS) to modernise its airspace structures in the en-route and in the airport environment.

The UK CAA also supports the deployment of SESAR through the Commission Implementing Regulation (EU) No. 716/2014 – 'Pilot Common Project' and is working towards the introduction of ATM Functionality AF#1 at London Heathrow, Gatwick, Stansted and Manchester by January 2024.

However, the UK CAA believes that outside of the PCP, PBN implementation is a local matter and it is felt that the proposed regulation is neither sufficiently proportionate nor flexible to help make PBN an enabler for airspace modernisation. It takes no account of existing State/ANSP/airport implementation plans nor recognises the timescales involved in establishing required equipage prior to introducing airspace changes. Furthermore, it makes no allowance for the use of the full range of PBN Specifications in order to meet local performance objectives in a cost effective and proportionate approach.

Justification: Our experience has shown that such airspace changes cannot be introduced overnight with major airspace changes typically taking anything from 5-7 years from planning to delivery. With compliance with the PCP at our major airports as our goal for January 2024, we firmly believe that a proportionate and flexible approach is required for deployment of PBN across airspace environments which are both diverse and have differing objectives affecting safety, capacity, flight efficiency and environmental impact. As drafted, the NPA has a major impact on current UK PBN implementation plans in terms of lost opportunities to generate early benefits and is not consistent with an approach towards transitioning to meet the PCP objectives, where density of movements and airspace complexity justify the implementation of more advanced PBN standards.

Suggested Resolution of Comments

The UK CAA fully endorses the plans within the PCP and therefore the principle of introducing RNP 1 and RF by 01 January 2024 at high density airports. It is recognised that some form of Acceptable Means of Compliance (AMC) is required to support the PCP and this regulation is seen as providing that material.

In proposing changes to the NPA, one option would be to remove the provisions for RNP APCH at all non-precision runway ends by January 2024 and the optional introduction of RNP 1 and RF on SIDs and STARs and Advanced RNP and FRT in the en-route environment from December 2018. In essence, restrict the regulation to support the PCP airports only. Alternatively, revisit the PCP Regulation with targeted and self-contained "enhanced" System Requirements in the Annex for ATM Functionality #1.

A further suggestion is to align the APV mandate portion of the NPA to the original proposal from the EUROCONTROL Regulatory Approach Document i.e., end of 2018. Stakeholders have already invested in meeting the 2016 date which by agreement between EUROCONTROL and ICAO-EUR was changed to the end of 2018 to accommodate European progress. However, we recognise that the PCP has the same 2024 timeframe as the PBN.AUR regulation and any change of date for the APV mandate should be discussed with the EC.

The UK CAA would wish to continue to see the adoption of PBN in airspace designs and believe that the most proportionate and targeted approach is to adopt the principles already laid down in ICAO Assembly Resolution A37-11. That translates into RNAV 1 everywhere inside TMAs and RNP 1 + RF where required e.g., as a minimum in the PCP 25 airports. There is still a question of the upper level STARs and no regulation should force use of a PBN specification where it is impractical or inappropriate, this runs counter to the performance need concept and the principles of Better Regulation.

The justification for an RNAV 1 mandate from December 2018 is as follows:

1. There is already a high percentage of RNAV 1 equipage/approval and mandating the standard would not present as great a financial impact to operators as the proposed RNP requirement. A mandate would create a baseline performance level on which to transition to RNP 1 and RF and Advanced RNP and FRT. A mandate in December 2018 would be sufficient notice to comply.

2. There are already a number of planned RNAV 1 airspace deployments at various

	stages of development and implementation across Europe. 3. It is arguable that except for the very early stages of departure and late stages of arrival, the RNAV 1 standard can provide a performance based framework which can deliver almost as much as the RNP standard, without the necessity to compromise airspace design because of a range of fleet capabilities. 4. Mandating RNAV 1 at this stage provides a common performance baseline, from which users and ANSPs can progressively migrate to SESAR PCP compliance for the affected airports in an achievable timeframe. It also allows those airspaces and airports not captured within the PCP to develop their own plans for RNP implementations where appropriate and necessary, which start from a known PBN capability level. 5. The RNAV 1 standard does not require GNSS as a minimum to enable benefits and removes the need to place a dependency on the integrity and robustness of the current GNSS environment. The principle of harmonisation is endorsed, as is the notion of interoperability. The latter is arguably more important in terms of safety and it is questionable whether mixed operations support this aim. Achieving a homogeneous PBN environment (RNAV 1 as a minimum) offers the potential to realise local, lower-level performance objectives with the potential to transition to advanced PBN routes and procedures, where it is justified. The aircraft fleet compliance numbers required to support RNP 1 + RF and Advanced RNP + FRT in the 2018 timeframe are insufficient. By only offering these navigation specifications there is no flexibility or proportionality within the proposed rule. A 'one size fits all' approach is highly unlikely to deliver the optimum outcomes across Europe without incurring significant costs. Finally, the Cost Benefit Assessment needs to take account of the equipage issues and in this respect the EASA NPA does not appear to reflect the findings from the EUROCONTROL RAD ANNEX E. The UK CAA is willing to support EASA and the Commission in helping to develop a regulation that supports the cost effective and most efficient implementation of PBN in the European Air Traffic Management Network. PBN remains the UK's number 1 priority as we seek to modernise our airspace, however this can only be achieved within realistic timescales.
response	*Partially accepted.*
	The majority of your comments with respect to the use of the RNP 1 standard with additional functions are acknowledged and the proposal has been amended such that the RNAV 1 standard is the basic standard to be applied and RNP 1 should only be used where the performance benefits fully justify its use within a TMA. No change is being proposed with respect to the en-route network which will remain RNAV 5. With regards to the implementation dates, please see the response to the major concerns identified section of the Opinion.

comment	*671* comment by: *UK CAA* General Comment **Comment:** The UK CAA believes there has been insufficient stakeholder/industry/community consultation on the development of the PBN proposals outside of the PCP requirements. The UK CAA is of the view that, in the absence of a coherent PBN Implementation strategy and plan across Europe, development of this NPA should have been conducted through a Rulemaking Group whereupon group members, representing NSAs and other interested parties, could have assisted in the formulation of the requirements. The UK CAA proposes that: a) The PCP requirements be taken forward; b) EASA establish a RMT to follow due process for development of further requirements to meet local/network performance objectives and the ICAO A37-11 Resolution, which can then take account of evolution of PBN developments since the EUROCONTROL work in March 2013. This will also provide for full stakeholder engagement. **Justification:** The development of this NPA does not appear to have followed the normal EASA Rulemaking Process. The PBN IR started out as a EUROCONTROL mandate from which no formal consultation was undertaken and a Regulatory Approach Document was delivered to the Commission in March 2013. The PCP then took PBN as part of AF#1, but only for the EU 24 major airports.
response	*Not accepted.*
	This rulemaking task followed the EASA rulemaking process. This procedure was accepted by the Agency's consultative bodies.

comment	*672* comment by: *UK CAA* General Comment **Comment:** In the absence of any consultation prior to the publication of this NPA, it is unclear whether EASA has taken account of the State Implementation Plans and Policies required by ICAO through Assembly Resolution A37-11. It is the view of the UK CAA that the views and experiences of the States are essential in developing any Europe-wide PBN policy outside of the PCP. It is recommend that further consultation be undertaken to capture existing plans for transition to the PCP standards envisaged by 2024. **Justification:** The NPA, as written, does not acknowledge existing PBN implementation plans nor recognise the timescales involved in establishing required equipage prior to introducing airspace changes. Indeed, in some cases it puts those plans and the investment that is already spent on them, into doubt.

response	*Not accepted.*
	No further formal consultation is envisaged prior to the publication of the Opinion.

comment	*673* comment by: *UK CAA* General Comment. **Comment:** It is understood that the Preliminary Economic Impact Assessment prepared by EUROCONTROL as ANNEX E to the Regulatory Approach Document has been used as a basis for development of this NPA. The UK CAA notes that in paragraph E.3.2.4 (Current levels of equipage), EUROCONTROL estimated 44% of aircraft were capable of performing the Radius to Fix function and only 18% the Fixed Radius Transition (FRT) function. In paragraph E.3.2.5 the projected levels of equipage for full PBN capability by the end of 2018 were estimated at approximately 75%, achieving only 90% at the beginning of 2024. The UK CAA believes that the equipage rate from December 2018 renders uneconomic any airspace development utilising the RNP standards exclusively for terminal and en-route airspace. UK experience suggests that in high density airspace an equipage rate in the order of 95% is required to support an efficient airspace implementation. The UK CAA also believes that an unintended consequence of this NPA is that airports and ANSPs will delay PBN implementation i.e., “do nothing”, waiting for equipage rates to improve. Furthermore, UK CAA believes that local airspace performance objectives could be realised through use of RNAV 1 standards in the proposed timeframe where we have evidence of much higher equipage rates at the majority of airports. **Justification:** Disproportionate rulemaking proposals **Proposed Text:** Amend Subpart PBN in PART-AUR to address stakeholder concerns and take account of the earlier EUROCONTROL Preliminary Economic Impact Assessment work.
response	*Noted.*
	Please see the response to the major concerns identified section of the Opinion related to the use of RNAV 1.

comment	*674* comment by: *UK CAA* General Comment.

Comment: In UK airspace (in common with many European TMAs), STARs terminate at Holds supporting sequencing to the airport with connectivity provided through either tactical means or an Open or Closed Transition. The STARs are therefore considered as providing connectivity from the en-route flight phase and are considered as ATS routes (per the ICAO Annex 11 definition) and specified as requiring RNAV 5.

The UK CAA proposes that the NPA be amended to recognise this airspace design concept and provide for, depending on the airspace, RNAV 5 where STARs terminate in either linear or orbital holding.

Justification: The UK CAA does not consider it necessary to specify these routes as requiring RNP 1 and RF. It would be an over-specification and does not comply with the principles of Better Regulation in terms of offering proportionality.

Proposed Text: Amend Subpart PBN in PART-AUR to address this concern.

response *Accepted.*

Please see the response to the major concerns identified section of the Opinion related to the use of RNAV 5.

comment *675* comment by: *UK CAA*

General Comment.

Comment: Apart from operations on SIDs, STARs, en-route and approach, PBN can also offer flexibility in terms of operations meeting performance objectives for other airspace users.

The UK CAA proposes that, subject to consideration through the rulemaking activity as previously suggested, the NPA be amended to acknowledge the application of other PBN specifications for different airspace use. This would better reflect varying levels of complexity and capacity within differing airspace environments and acknowledge the fact that variable solutions to airspace requirements may be more appropriate.

Justification: The text proposed in the NPA would unnecessarily constrain the application of PBN to the PCP standards and Advanced RNP in en-route and in so doing, the flexibility to accommodate other airspace users who have legitimate PBN applications using a range of navigation specifications available in the ICAO PBN Manual.

With reference to ICAO Doc 9613, PBN Manual, RNP 0.3 offers access to helicopter operators in all flight phases. Furthermore, RNAV 2 is the most suitable navigation specification for application in Free Route Airspace (FRA) and Advanced RNP can be applied in terminal airspace utilising scalable RNP from 0.3 to 1.0.

The absence of a provision to take advantage of these PBN specifications may discourage and delay the introduction of PBN, thereby having an adverse impact on capacity and flight efficiency.

response	*Partially accepted.*
	The proposal has been amended to enable the use of various PBN specifications dependent upon the need. The objective of the task is to ensure the safe, efficient and harmonised implementation of specific PBN specifications and functionality in the EATMN.

comment	*676* comment by: *UK CAA* General Comment. **Comment:** Although there is no mandate for SIDs and STARs, the NPA does not appear to recognise the nature of long term investment in airspace change, i.e., through the five year planning and control periods established in the SES Performance Scheme, and the difficulty in changing specifications in those plans without an adequate lead-time. It is recommended that account be taken of existing plans across the EU and ensure adequate transition towards the PCP standards envisaged by 2024. **Justification:** There are no transitional arrangements for extant plans up to 2020 which this regulation would place at risk and by changing to RNP 1 and RF, would incur increased costs.
response	*Noted.*
	The application of the PCP within the RP3 reference period is outside the scope of the task. As stated, the application of SIDs/STARs is not mandatory and can therefore be used as required in achieving the performance plans.

comment	*677* comment by: *UK CAA* General Comment. **Comment:** It is not clear whether due consideration has been given to the current lack of ATC (2012) Flight Plan provisions for RF, FRT and Advanced RNP. **Justification:** Without provisions in Doc 4444 (PANS ATM) as then implemented through FF-ICE and SWIM, it will be difficult for ANSPs to process flight plans without an indication of the aforementioned capabilities. In the proposed timescales, it is the view of the UK CAA that operators will not be able to flight plan the advanced PBN capabilities even though they may be equipped. This will hinder ANSPs in providing the appropriate level of service to aircraft that are suitably equipped.
response	*Noted.*
	The revised proposal as described in the response to the major concerns identified section of

	the Opinion and is compatible with the flight planning requirements.

comment	*678* comment by: *UK CAA* General Comment **Comment:** The applicability of the proposed rule to the military needs to be fully reflected within the rule through appropriate references to Regulations 549/2004, 216/2008 and 677/2011. It must be recognised that the impacts of the regulation as proposed are not limited to military/state airspace users/aircraft operators, but also those military aerodromes from which such operations are carried out (specifically the instrument flight procedures associated with military or (if applicable) paramilitary aerodromes). Clarification as to how the proposed rule would apply in such circumstances is requested. **Justification:** Clarity.
response	*Partially Accepted.*
	The text has been amended accordingly. Reference to Regulation (EC) No 549/2004 and the applicable articles of Regulation (EC) No 216/2008 indicate that those military facilities and operations are required to comply in accordance with the conditions specified in the articles.

comment	*715* comment by: *Julian Scarfe, PPL/IR Europe* PPL IR Europe welcomes the standardization of procedures and operations across the EU. We feel that the proposed regulation needs more precision to be useful in achieving the aim, not necessarily in being more prescriptive, but rather in clarifying what is *required* in what circumstances, what is *good practice*, and what is left entirely to local considerations.
response	*Accepted.* The Agency also recognises the need for better clarification and, as such, the proposed regulation has been simplified.

comment	*724* comment by: *European HEMS & Air Ambulance Committee (EHAC)* Whereas from the HEMS operators point of view some operators have quite advanced implementation plans for RNP 0.3 in all phases of flight (e.g. Swiss and Norwegian GNSS Low Flight Networks for helicopters); Whereas pretty urgently needed helicopter flight procedures to save lives or at least to

	alleviate unnecessary suffering cannot be implemented if the AMC material for RNP0.3 in all phases of flight, PinS and steep approach operations for helicopters is not adopted by EASA; whereas the procedures and materials have already been adopted by ICAO as save and innovative procedures since considerable time; Therefore, EHAC strongly regrets the decision to remove AMC material for RNP0.3 in all phases of flight, PinS and steep approach operations for helicopters from the CS-ACNS. EHAC kindly asks EASA to integrate these provisions for urgently needed helicopter flight procedures again. We appreciate EASAs effort to speed up rulemaking processes by limiting the scope, but in this case EASA would leave the rotorcraft community with very little guidance on certification for CRIs and thus with vague chances of success to realise innovative and safety-enhancing projects.
response	*Accepted.* CS-ACNS will include the airworthiness certification requirements associated with RNP 0.3 and will be addressed by RMT.0519.

comment	*725* comment by: *Swiss Air-Ambulance Rega* Whereas some HEMS operators have quite advanced implementation plans for RNP 0.3 in all phases of flight (e.g. Swiss and Norwegian GNSS Low Flight Networks for helicopters); Whereas pretty urgently needed helicopter flight procedures to save lives or at least to alleviate unnecessary suffering cannot be implemented if the AMC material for RNP0.3 in all phases of flight, PinS and steep approach operations for helicopters is not adopted by EASA; Whereas besides the loss in possible and realistic flight safety and innovation would also result in unnecessary morbidity of emergency patients with all subsequent economic and health costs; Whereas the procedures and materials have already been adopted by ICAO as save and innovative procedures since considerable time; Therefore, Swiss Air-Ambulance strongly regrets the decision to remove AMC material for RNP0.3 in all phases of flight, PinS and steep approach operations for helicopters from the CS-ACNS. Swiss Air-Ambulance Rega kindly asks EASA to integrate these provisions for urgently needed helicopter flight procedures again. We appreciate EASAs effort to speed up rulemaking processes by limiting the scope, but in this case EASA would leave the rotorcraft community with very little guidance on certification for CRIs and thus with vague chances of success to realise innovative and safety-enhancing projects like the Swiss Low Flight Network.
response	*Accepted.* CS-ACNS will include the airworthiness certification requirements associated with RNP 0.3 and will be addressed by RMT.0519.

Title p. 1

comment *540* comment by: *HungaroControl*

CANSO recommends to:
- To review the IR in the sense of setting A-RNP specification for Approach, SID/STAR and en-route phase (as provided by the ICAO PBN Manual).
- To realign the implementation timetable with ICAO recommendations and EU Reg. 716/2014 PCP IR:
2018: APV in all instrument runway ends
2024: RNP 1 required in those European TMAs where it has been proven that RNAV1 does not meet the performance requirements
- To introduce the APV approach procedures also as a backup for the precision approaches in line with ICAO AR37/11 and EANPG 55 recommendations.
- To clarify the necessary infrastructure to support RNP navigation requirement for the departure, en-route, and arrival phase of flight.
- To consider that appropriate PBN approval should be made mandatory for operators. The function, purpose and access rules for the non-PBN procedures in PBN airspace must be clearly regulated.
- To develop harmonised guidance material on contingency mitigation in case of GNSS failure.
- To create “National PBN Implementation Plans”.
- To have an ad-hoc meeting of EASA with all the major European PBN implementation actors, to discuss all the above mentioned issues.

response *Noted.*

With regard to the use of the A-RNP specification for approach, SIDs/STARs and en-route, the alignment of implementation dates, equipage requirements for aircraft operators and the access requires for Non PBN aircraft, please refer to the responses in the response to the major concerns identified section of the Opinion.

With regard to the recommendation for harmonised guidance material for contingency procedures, the Agency understands the need for harmonisation and will further develop the AMC material.

With regard to the creation of “National PBN Implementation Plans”, as the proposals do not require PBN to be implemented at all locations, but only implemented where a performance benefit is established, the Agency does not foresee the need to require the creation of a National PBN Implementation Plans.

Executive Summary p. 1

comment *7* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
PBN approach procedures with vertical guidance (APV) (RNP APCH) at all instrument runway ends where there are currently only non-precision approach procedures published before January 2024.

COMMENT:
This paragraph is not fully consistent with **AUR.PBN.2005 Routes and procedures.**
AUR mandates RNP APCH "at all instrument runway ends which are not served by a precision approach procedure." This may include:

- Instrument runway ends (according to ICAO Annex 14) without any instrumental approach procedure promulgated in the AIP;
- Non-instrument runway ends, in which according to ICAO Annex 14, an instrument approach procedure can be flown to a point beyond which the approach may continue in visual meteorological conditions.

These options are discarded if the executive summary formulation is followed.

Suggestion: rewrite the executive summary to make it consistent with the core NPA, i.e.
PBN approach procedures with vertical guidance (APV) (RNP APCH) at all instrument runway ends which are not served by a precision approach procedures published before January 2024.

response *Accepted*

The suggested text is better and more accurate than that published in the NPA.

comment *103* comment by: *Heathrow Airport Limited*

Whilst Heathrow Airport Limited fully supports airspace modernisation, this document does not support current UK CAA guidance and is not in line with current UK airspace projects such as LAMP. The time scale suggested here is unrealistic and could jeopodise these projects. In addition, as subsequent comments highlight, we have the following concerns:

- The Social Impact of PBN trials in the UK has been enormous, therefore this should be considered and not dismissed in one sentance.
- There does not appear to be an environmental assessment of this proposed change in terms of noise.
- The Benefit section takes no account of the cost of airspace consultation which results in an incomplete assessment.
- Mixed conventional and PBN operations are not supported by the UK CAA.

Consequently, this NPA is not supported by Heathrow Airport Limited.

response *Noted.*

	Please see the response in the response to the major concerns identified section of the Opinion that addresses your concerns with respect to the LAMP project.

comment	*144* comment by: *European Helicopter Association (EHA)* General Comments: 1) This NPA and the navigation specifications addressed in it are applicable to aircraft, so according to "EASA aircraft definition", this means that the NPA is applicable both to airplanes and helicopters but the NPA does not consider PBN specifications suitable for helicopters. In particular RNP 0.3 for en route and terminal operations. It should be noted that the RNP 0.3 navigation specification has been developed specifically for helicopter and it is included in the latest edition of the PBN manual. 2) What it i stated in the ToR of this NPA 2015-01 states that "Each State, ATM/ANS provider or aerodrome implementing a navigation aspecification and functionality of their choice would lead to a fragmented inefficient and unsafe PBN implemenentation in the European airspace. It is therefore necessary to harmonise the approach and reduce the number of options that may be applied. To achieve a safe and efficient PBN implementation in the EATMN, regulatory measures are therefore required". This is also applicable to PBN implementation for helicopters: although there are European implementations of PBN applications for helicopters, each implementation (at the current date) has been undertaken as a local implementation meaning that some requirements, safety evaluations, ATC procedures etc. are all different. This does not enable airspace users or ATC service providers to standardise effectively, thus potentially reducing acceptance and increasing costs. This could lead to a fragmented, inefficient and unsafe PBN implementation for RC. 1.
response	*Accepted.*
	The requirement to use the RNP 0.3 standard routes and procedures supporting helicopter operations has been introduced into the proposal.

comment	*264* comment by: *ESSP-SAS* Helicopter operations are not covered within the NPA, but heliports are under the scope of Reg. No 216. Helicopter RNP specifications should be included in the regulation.
response	*Accepted.*
	The requirement to use the RNP 0.3 standard routes and procedures supporting helicopter operations has been introduced into the proposal.

comment	*265* comment by: *ESSP-SAS* The document establishes a mandate for implementing PBN Appoach Procedures with Vertical guidance (APV) conforming to the ICAO RNP APCH requirement. But the case of ATS routes, SIDs and STARs is to be done ONLY IF PBN-based ATS routes and SID/STARs are to be implemented. It would be advisable to further emphasize this "optional" aspect all along the document.
response	*Noted.*

comment	*266* comment by: *ESSP-SAS* The IR shall also impose a mandate on EASA to have the RNP1 operational approval material with sufficient anticipation before the entry into force of the regulation.
response	*Not Accepted.*
	The supporting regulations and means of compliance to enable the implementation of PBN in Europe are already in progress and should be available in time to support the proposal.

comment	*377* comment by: *CAA-NL* **General comment #2** The Netherlands points out that the following statement in the executive summary: *This NPA proposes that Air Traffic Service Providers (ATSPs) and aerodrome operators implement:* *¾ PBN Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) and Air Traffic Service (ATS) routes as required to meet locally defined performance objectives that conform to RNP1 performance requirements as of December 2018; and* could be read as if it is proposed by this NPA to make the implementation of PBN SIDs, STARs an ATS routes mandatory as of December 2018. In our view, this is not supported by the rest of the document. The interpretation of the Netherlands is that the derived performance and functionality requirements as defined in AUR.PBN.2015 are mandatory when implementing PBN SIDs, STARs and ATS Routes, however the implementation of PBN SIDs, STARs and ATS routes as of 2018is not a requirement as such.
response	*Noted.*
	The interpretation by The Netherlands is correct, this is the intent of the regulation.

comment	*379* comment by: *NATS National Air Traffic Services Limited* General: The legislation should be accompanied with formal Route Spacing Guidance For SIDs & STARs within high density Terminal Airspace, the current Eurocontrol Route Spacing guidance based on CRM proposes conservative distances. These would not enable advanced airspace designs using the performance inherent in the PBN specifications. In effect new designs would look very similar to old designs and the benefits may be limited. Suggested resolution: Regardless of the mandated navigation specification, EASA is requested to publish Advanced Route Spacing Guidance suitable for high density Terminal Airspace, which builds upon existing studies.
response	*Noted.*
	RMT.0445 on airspace design is on-going. The objective of this task is to ensure that flight procedures and airspace structures are safely designed, validated and surveyed in a harmonised and consistent manner. It is considered that the development of such proposed material would be an extension of said task.

comment	*432* comment by: *ICAO* the proposed timelines are inconsistent with the timelines agreed globally at the ICAO Assembly. specifically for RNP APCH, the ICAO Assembly Resolution targets 2016 for all instrument runway ends. although 2016 may not seem to be realistic to achieve full implementation, 2024 appears to be to delayed. We observe a very good implementation progress in the EUR and it is important to keep the momentum.
response	*Noted.*
	Please see the response in the general comment section that relates to compliance with ICAO assembly resolution A37/11.

comment	*433* comment by: *CAA-N* The CAA Norway (CAA-N) questions the rationale of mandating RNP1 with FRT capacity enroute, allready from 2018. In due time there might be a rationale for this for SID/STARs, but the amount of non-compliant/certified Aircraft will be significant and complicate mixed mode operations. CAA-N consider the requirements for RNP1 and RF stemming from the Eu 716/2014 Pilot Common Project to be a more reasonable target for Airspace development.

	Recently completed large Airspace project on a national level implementing RNAV1, are still facing a number of non-compliant Aircraft. CAA-N experience the 2018 time-scale as an over-reactive concept - driving more Challenges than sollutions for the ATM environment. The Eight year delay of the ICAO A37-11 APV to Instrument Runway Ends (IRE) is a serious turn down of the safety intent of ICAO A37-11. Enquiries to Norwegian Air Carriers confirms an almost resignation attitude. This must clearly be ouside the ICAO Assemblys intention. The ICAO A37-11 has been transposed in to Norwegian national regulations. The national ANSP has performed satisfactively at present with the APV implementation. We have a lot of local IFR Airports in challenging surroundings pressing the need for APV and improved safety forward. CAA-N do agree with the priority aspect of APV to IRE with only non-precision approaches. Without clear mandates for the Operators, how could we expect cost allocation for PBN investment when they can remain under the Mixed Mode umbrella. Specially for the turbo-prob segment.
response	*Noted.*
	With regard to the use of the RNP1 with FRT for en-route, the alignment of implementation dates, equipage requirements for aircraft operators and the access requires for Non PBN aircraft, please refer to the responses in the response to the major concerns identified section of the Opinion.

comment	*590* comment by: *IACA International Air Carrier Association* **P1 – Executive summary** Acknowledging that a significant number of aircraft fleet already have on-board PBN capabilities, the concept of 'Best-Capable-Best-Served' as developed by SESAR needs to be fully embraced. For aircraft that cannot economically be modified for PBN, due to economic viable reasons, conventional routes will be offered (as proposed in this NPA).
response	*Noted.*

comment	*726* comment by: *AOPA Sweden* Comment to the statement: "aircraft operators..... will be required to ensure that their aircraft and crew are approved": With the GA-road map objective no. 1 in mind, there should be consideration given if a specific approval is necessary. In the united states, aircraft and crew are able to fly RNAV

	(GPS) approaches also without the excessive administration of approvals. Please consider the requirements given in the FAA system for aircraft and crew in GA operations and make a benchmark so that EU does not Too extensive requirements for approvals of crew and or aircraft would prevent many GA aircraft from taking benefit of the new technology and the proposed regulation. We are aware that these specific requirements are not handled directly in this NPA. However for the system of infrastructure it is of utmost importance that as many GA-aircraft and GA-crews as possible can make use of RNP procedures under IFR. An example: The Garmin 430 GPS receiver is used for GPS approaches into almost 6000 airports in the USA but only appx 1300 ILS approaches are available.
response	*Noted.*
	The requirement specific approval has already been addressed; please see EASA Opinion 03/2015 http://easa.europa.eu/document-library/opinions/opinion-032015

comment	*737* comment by: *AOPA Sweden* AOPA Sweden supports the comments to this NPA given by PPL/IR Europe.
response	*Noted.*
	Please see the response to PPL/IR Europe.

1. Procedural information p. 4-5

comment	*3* comment by: *DGAC/DTA* §1.4 Such as it is written, the Agency will publish simultaneously the CRD and the opinion, there isn't any possibility for Member States to comment the CRD before the opinion will be issued. Due to the major importance of PBN for potential capacity benefits, including at congested airports, this should be definitely avoided
response	*Noted.*
	The Agency is progressing in accordance with the accepted procedures and due to the

urgency of the task will proceed with a simultaneous publication.

comment *365* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Procedural Information Section 1.2	In the second line of the paragraph, where it says '**Section 3**' it should say '**Chapter 3**' instead.	Typographical error

response *Noted*

comment *434* comment by: *EUROPEAN COMMISSION GNSS Programmes*

The EC Satellite Navigation Programmes have direct interest on the implementation of PBN operations, namely those ones related to satellite-based navigation procedures. Several comments uploaded in this CRT are of key importance for the market uptake of EGNOS so we would particularly welcome a focused consultation and eventual consequent thematic review meeting(s), as established by paragraph 1.4 "The next steps in the procedure".

response *Noted.*

The Agency thanks you for your support for the proposal. The suggested thematic/focused stakeholder consultation occurred.

comment *612* comment by: *General Aviation Manufacturers Association / Hennig*

Attachment #2

The General Aviation Manufacturers Association (GAMA) appreciates the opportunities to comment about EASA NPA 2015-01 about Performance-based Navigation in the European Air Traffic Management Network (EATMN).

GAMA has previously provided detailed technical comments to the consultations by

	Eurocontrol about the deployment of PBN during earlier stages of this activity. GAMA appreciates EASA having considered some of these comments in the development of the NPA. GAMA, however, is concerned that the comments that were previously provided to Eurocontrol about building a ATM environment based on existing capabilities of aircraft has not been fully considered. Included is a copy of GAMA12-83 that was provided to Eurocontrol. Concerns specifically about Fixed Radius Turn (FRT) capability required and business and general aviation aircraft typical capability (see comment number 2, 3, and 5 in the attached document) which warrant additional consideration by EASA and GAMA has identified in separate comments areas of the NPA that would benefit from a review and modification by the agency.
response	*Noted.*
	Please refer to the response in the major concerns identified section of the Opinion related to the specification to be included in the proposal.

2. Explanatory Note - 2.1. Proposed provisions p. 6-8

comment	*8* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** *Air Traffic Service Providers (ATSPs) when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives shall conform to RNP 1 perfomance requirements as of December 2018;* **COMMENT:** Initial segments of SIDs could fall under the responsibility of aerodrome operators (not in the case of Spain). It is suggested to widen the scope to include them, as in the case of approaches. New suggested text for 2.1: *Air Traffic Service Providers (ATSPs) **and aerodrome operators**, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives shall conform to RNP 1 perfomance requirements as of December 2018;*
response	*Noted.*
	The suggested text correctly reflect that of the rule. However, the Agency proposes to keep the text of the explanatory note.

comment	*9* comment by: *ENAIRE*
	NPA 2015-01 REFERENCE: *Air Traffic Service Providers (ATSPs) and aerodrome operators shall implement PBN Appoach Procedures with Vertical guidance (APV) conforming to the ICAO RNP APCH requirements at all instrument runway ends where currently, there is only a non-precision approach procedure in place by January 2024.* **COMMENT:** 1) ICAO RNP APCH requirements (from Assembly Resolution 37-11) admit the possibility of LNAV-only implementation in some cases: Implementation of straight-in LNAV-only procedures [...] 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; Therefore, it does not seem correct to equalize the APV-only objectives defined in NPA 2015-1 with the ICAO RNP APCH requirements, as the text seems to do. 2) Editorial comment: replace "Appoach" by "Approach". New suggested text: *Air Traffic Service Providers (ATSPs) and aerodrome operators shall implement PBN Approach Procedures with Vertical guidance (APV) at all instrument runway ends where currently, there is only a non-precision approach procedure in place by January 2024.*
response	*Noted.*
	Reference to ICAO RNP APCH in the NPA is correct as this permits approach to LNAV or LP minima. The intent of the NPA was to require the implementation of vertical guided approach as these enhance safety.

comment	*10* comment by: *ENAIRE*
	NPA 2015-01 REFERENCE: *No direct obligation has been proposed to aircraft operators. The obligation to equip and qualify flight crew is already addressed in the existing regulations, whereas the relevant requirements for aircraft operators are set out in [...]* **COMMENT:** The NPA assumes that "a significant number of the current and future aircraft population" will be PBN-capable (p. 7), but the European P-RNAV experience provides evidence against this type of hypotheses. When no mandate for users to become equipped and operationally approved exists, the rhythm of upgrade and/or certification between different airspace users differs. In the P-RNAV case, a non-coordinated implementation programme was undertaken at each

	European State- resulting in TMAs with mixed, non-optimized conventional/ P-RNAV SID/STAR procedures. Furthermore, the lack of common European mandatory approval provisions led to different criteria for the issuance of P-RNAV operational approvals being applied by each NSA. Proposal: Some type of mandate for airspace users is necessary in order to ensure a truly consistent and homogeneous PBN implementation in Europe. It is suggested that the NPA explicitly includes such a mandate.
response	*Not Accepted.*
	Please see the response in the response to the major concerns identified section of the Opinion.

comment	*11* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** *Commission Regulation (EU) No 965/20125* *'ORO.GEN.110 Operator responsibilities* **COMMENT:** Commission Regulation (EU) 800/2013 should be mentioned to include non-commercial operators. For instance, the following section could be applicable: ***NCC.IDE.A.250 Navigation equipment*** *(a) Aeroplanes shall be equipped with navigation equipment that will enable them to proceed in accordance with:* *(1) the ATS flight plan, if applicable; and* *(2) the applicable airspace requirements.* Suggestion: that this section is reviewed to include any applicable extracts from 800/2013.
response	*Noted.*
	Regulation (EU) No 800/2013 amends Regulation (EU) No 965/2012. It is assumed that referring to Regulation (EU) No 965/20102 also includes its amendments. The correct wording should be Regulation (EU) No 965/2012 as amended. The text on the explanatory note will not be amended.

comment	*56* comment by: *ENAC ATM* Precise why RNP1 would be mandatory when RNAV1 is sufficient for terminal areas equipped with ATS surveillance services. Precise why RNP1 would be mandatory in En Route airspace where ATS surveillance service is provided. Transition from RNAV5 to RNAV1 would be a valuable step. What happens in case of GNSS core constellation outage? No possible reversion to DME/DME.
response	*Noted.*
	Please see the response in the response to the major concerns identified section of the Opinion related to the RNP/RNAV usage. With respect to the outage of the GNSS core constellations, the Agency understands that the AMC proposed in the NPA needs to be further developed to ensure a harmonised approach. This development will occur concurrently with the draft regulation adoption.

comment	*69* comment by: *CANSO* **Requirement for ANSPs to conform to RNP 1 performance requirements as of December 2018 for SID and STARS** This NPA is proposing timeframes and milestones for implementation that seem not to be achievable taking into account previous experiences like the European P-RNAV, now RNAV1 under the PBN concept. For instance, the December 2018 target to meet network PBN objectives is unrealistic in the light of the P-RNAV lessons learnt. What CANSO understands from this requirement is that any new PBN SID/STAR implemented after December 2018 should cease to be designed with PBN RNAV 1, as is mostly the case today, but should alternatively be compliant with the recent RNP 1 PBN navigation specification. The proposed timeline is not implementable for several reasons: 1) CANSO Members' experience of implementing PBN at high density airports has shown that it may take close to 10 years to migrate from a given navigation environment (for example, as Basic-RNAV + was implemented in Paris TMA in the pre-PBN era, to a new one, as RNAV 1 today). • It is acknowledged, as a hypothesis, that "a significant number of the current and future aircraft population" will feature the expected PBN capabilities, but the P-RNAV case has demonstrated that this assumption could be incorrect. When a lack of an obligation to be equipped and operationally approved exists, the rhythm of upgrade and/or certification varies very significantly between different airlines and ANSPs. In Europe, this provoked uncoordinated implementation programmes in each European State, resulting in TMAs with mixed conventional/RNAV traffic and non-optimised P-RNAV SID/STAR procedures. • The main issue is the time required to migrate toward a homogeneous user equipage. In this respect, the 2024 timeline of the Pilot Common Project (PCP) applicable to 24 European TMAs was certainly more adapted than the early proposed 2018 timeline. 2) Mandates on airspace user equipment are required at high density airports and TMAs to

support capacity handling through a close to 100% user equipment rate. Amsterdam issued a RNAV 1 mandate in 2012 for its TMA. In this respect, Paris and London TMAs are now in the process to issue RNAV 1 mandates accordingly. However, user equipment mandates are excluded from the NPA. There is therefore absolutely no chance that this requirement could be successfully implemented at high density airports within the NPA conditions.

3) CANSO understands how GNSS equipped aircraft might obtain a RNP 1 operational approval, even though no regulation yet exists in Europe. However, CANSO does not understand how DME/DME or DME/DME/IRU equipped aircraft, either as the main area navigation system, or as a backup navigation system, which today have an operational approbation to fly RNAV 1 SID and STARS, may be approved directly to support RNP 1 SID and STARS with DME/DME.
While the feasibility of a straightforward migration of GNSS from RNAV to RNP is well accepted within the aviation community, the case of DME/DME usage to support RNP operations is much more complex, which is e.g. clearly demonstrated by a lack of consensus at the highest international level (e.g. ICAO PBN SG), after many years of discussion, and may thus require specific additional airborne functions to achieve a DME/DME RNP compliant status. This is because within even basic GNSS avionics, specific errors of individual satellites are naturally compensated and/or alerted to the crew, making GNSS "naturally" compatible with RNP operations, while most of the DME/DME area navigation systems may be vulnerable to different errors, such as the ones introduced during DME ground stations' maintenance operations without detection or crew alerting.
If ANSPs cannot therefore be ensured that they will be able to use the DME/DME area navigation reversion capability when being forced by this regulation to migrate to RNP 1, e.g. in case of sustained loss of GNSS, as is today the case "naturally" with RNAV 1, then this creates a very significant weakness in the concept, which taken alone might mean a no-go to migrate to RNP 1, from the CANSO perspective.

4) In addition, subject to understanding what the performance objectives are, if these can be met by a re-designed airspace with RNAV1, it is not clear why RNP1 is required.

Requirement for ANSPs to conform to RNP 1 performance requirements as of December 2018 for En-route

What CANSO understands from this requirement is that any new PBN route designed after December 2018 should cease to be designed with RNAV 5, as is mostly the case today, but should be compliant with the RNP 1 PBN navigation specification.
This is a non-implementable requirement in the experience of CANSO Members, at the proposed timeline; for several reasons:
1) All the issues mentioned above are again valid here, with an emphasis on the lack of airspace user mandate, which was a key factor in the past for the rapid and successful implementation of B-RNAV in Europe (further denominated RNAV 5 through PBN), and makes it absolutely impossible to ANSPs to be sure that any new RNP 1 route will be flyable by all users transitioning within the airspace by 2018.
2) The RNP1 navigation specification in the ICAO PBN concept is only intended for TMA procedures and not for en-route. RNP2 is the specification intended for implementing on en-route environment. CANSO Members do not understand if this NPA is suggests creating a specific deviation to the PBN concept by proposing a "special" RNP 1 en-route concept for Europe, or that ANSPs implement the PBN Advanced-RNP navigation specification by 2018. This second option certainly supports RNP 1 but also requires additional airborne functions such as Fixed Radius Transition (FRT), which are not yet generalised within the fleet, and will

definitively not be by 2018.
From the point of view of lateral separation between routes, beyond 30NM from aerodromes, RNP1 specification is switched from 1NM to 2NM horizontal alert limit which makes identical the distance needed to properly separate parallel routes to those based on RNP2. That is, on en-route environments, considering RNP1 does not provide any advantage in comparison with RNP2.
As a consequence, to try to implement RNP1 on en-route airspace can lead to a non harmonised PBN implementation which can be an issue for the non-European operators.
Instead, it is suggested to consider the A-RNP specification for airspace users to achieve operational approvals to simplify administrative processes and potentially reduce costs. The proposed A-RNP approval would only keep RNP2+FRT, RNP1+RF and RNP APCH as main applications to be used by ANSPs when developing new PBN implementations as per NPA 2015-01. That proposal follows one of the overall objectives of the EASA system: to promote cost-efficiency in the regulatory and certification process. Moreover, even considering a mixed European en-route scenario with RNAV5 and RNP2 applications, the A-RNP specification can be the optimum solution, since it also addresses RNAV5.

response *Noted.*

Please see the response in the response to the major concerns identified section of the Opinion.

comment *70* comment by: *CANSO*

No mandate on operators equipment

For airborne equipage requirement, the NPA refers to two other pieces of EU Legislation (Reg.965/2012 and Reg.923/2012 SERA) where it is stated that aircraft have to have the appropriate navigation capability to meet the navigation performance requirements of the airspace. But the NPA clearly gives users the option to either equip or not equip, depending on the business case to upgrade their fleet. Therefore there is a consequent requirement on ANSPs to maintain conventional procedures and supporting conventional infrastructure. There is inconsistency in the manner of compliance, which will lead to implementation issues for all stakeholders.

We do not understand how users will make this association in practice, leading to compliance issues. If there is a requirement for users to have the navigation capability, then this should be explicitly stated in the legislation, which coincidently has a common title of “Airspace Usage”.

The above mentioned absence of a real mandatory request on the operators for getting the appropriate PBN operational approval/s, jointly with the request to ATSPs to keep “conventional” ATS routes and the lack of a defined role for either already existing or future RNAV procedures can lead, without clear access rules and extensive safety analysis, to non-desirable mixed scenarios featuring diverse combinations of conventional, RNAV and RNP elements.

In addition, it is important to note that currently RNAV5 (former B-RNAV) is the en-route European standard. Is it reasonable, safe and cost-effective to change all the route network from RNAV5 to RNP2? Or just some specific parts, the most congested airspaces, of the network? Again, the comparison with the P-RNAV example must be taken into consideration: the lack of an obligation for the operators caused very different rhythms of upgrade/approval and led to inefficient mixed scenarios. Even, in reference to another recent example, that lack of mandatory material has been generating difficulties in implementing RNP APCH (and GBAS procedures) and very different rhythms of implementation.

To sum up, all these issues have caused different criteria/requirements/constraints for the issuance of the operational approvals by each NSA: existence of a significant amount of aircraft non capable or non-approved, increase of ATC workload to manage conventional vs. RNAV or RNP traffics, less efficiency of the airspaces and big difficulties to implement operational measures associated to RNAV or RNP implementations (CDA, CDO, point merge,), etc.

In order to avoid that situation, the appropriate PBN approval should be made mandatory for operators. The function, purpose and access rules for the non-PBN procedures in a PBN airspace must be clearly regulated.

response *Not accepted.*

Please see the response in the response to the major concerns identified section of the Opinion.

comment *84* comment by: *CANSO*

RNP APCH to all instrument runway ends
CANSO is concerned that the current regulation proposal is neither aligned nor compatible with the ICAO PBN Manual and it does not take into account ICAO priorities regarding the introduction of RNP approach procedures.

ICAO Assemblies 36 and 37 have recommended (A37-11 resolution refers) that RNP APCH with vertical guidance (where possible) be implemented by 2016 over virtually any IFR runway end, with specific time lines (e.g. 70% implementation achieved by 2014). Many ANSPs in the world have indeed understood the benefits of this type of PBN operations (increasing safety and accessibility, reducing environmental nuisances, reducing ANSPs infrastructure costs) and launched dedicated programmes in this respect.

The NPA proposes to delay APV to 2024 which creates a number of issues:

- During the recent High Level Safety Conference held in ICAO Montreal in Feb 2015, the PBN paper submitted by ICAO emphasised again that for the sake of increasing safety, in particular reducing CFITs, it was very important that ANSPs progress PBN implementation quickly and make every effort to meet the 2016 schedule.
- The lack of mandate to equip with APV, as discussed above, will not help to reduce

CFITs; the users will have no incentive to equip toward APV, as ANSPs are asked to maintain a conventional approach for users not equipped with APV, even after 2024.
- In addition, ANSPs will also not be in a position to achieve infrastructure rationalisation benefits, through the absence of mandates and the requirement for ANSPs to maintain conventional systems to support unequipped users.
- RNP APCH down to LNAV minima must also be considered, as a solution for some specific scenarios without enough LPV nor LP performance and no local barometric information source, in accordance to ICAO resolution A37-11.

However, it is also necessary to understand the reasons why many European ANSPs in Europe are late. Examples of typical aerodromes with runway ends with no instrument procedures or only non-precision approach procedures are normally due to:

- The runway end does not have facilities according to ICAO Annex 14 (aerodrome surfaces, lighting, conventional navaids, etc.) for implementing APV approaches because of the type or the amount of traffic and a not very demanding local meteorology, or both. Some NSAs interpret that there is a need to observe the requirements for precision approaches when implementing APV procedures. That leads to a situation where the RNP APCH implementation is not viable in terms of costs.In the same way, and very frequently associated with the same aerodromes mentioned in the previous bullet, some States require a minimum standard of ATS (FIS or ATC) when an instrument procedure is put in place, which makes the implementation cost prohibitive. Even more so when there is not enough traffic to justify the requirement for an ATS. Instrument procedures should not necessarily be synonymous with ATS.
- Complex scenarios in terms of terrain, where very commonly Visual Segment Surfaces (VSS) are penetrated. In these situations each European NSA has different criteria solutions, or no criteria, that impact directly in their capacity to implement (or not) such procedures. Some of these complex scenarios prevent the implementation of RNP APCH solutions and request other solutions like RNP AR APCH or RNAV visual.

It is known that all those constraints above mentioned have been managed differently by each State and have led them to avoid some RNP APCH implementations, or have enlarged excessively some deployments. In addition to all of them, the low number of aircraft capable/approved for RNP APCH in some cases has helped to worsen the cost-benefit balance. Consequently, it is suggested that these constraints should be solved from a harmonised point of view.

response

Noted.

Please see the response in the response to the major concerns identified section of the Opinion. With regard to your comments related to the constraints, the rule is applicable to those aerodromes that are within the EASA BR scope. As the proposal requires the implementation of RNP APCH, the constraints above should no longer be valid.

comment	*104* comment by: *Heathrow Airport Limited* As previous comment And this section states that we have to maintain conventional procedures as well - this is not neccesarily practical or cost effective in all cases
response	*Noted.*
	Please see the response in the response to the major concerns identified section of the Opinion.

comment	*112* comment by: *Finavia* The proposed provisions as described in the text and in the Figure 1 shall be modified to: 1. not include the obligation for maintaining the availability of non-PBN routes and procedures without any exceptions. 2. require aircraft operators to have PBN capabilities consistent with the navigation specifications required in the European PBN applications within a clearly defined timeframe. 3. allow and define means for more controlled regional transition to the application of the new PBN navigation specifications within each applicable airspace. The approach selected in the NPA of not proposing any direct obligation to aircraft operators, with the requirement to maintain non-PBN procedures and the supporting navigation infrastructure for an undefined time period in the future and without any exceptions, is not in line with the objective of the RMT to ensure an efficient and harmonized PBN implementation in Europe. The effective implementation process requires consistent progress of both the aircraft capabilities and the procedures/routes. Instead of the general obligation for ATSPs and aerodrome operators to provide non-PBN procedures, such decision must be taken on the local level based on the evaluation of the needs of the concerned airspace users with the associated costs and benefits. The obligation to provide non-PBN applications everywhere, without any exceptions is exceeding the operational need in many cases and induce additional, non-justified costs to all stakeholders. It is also necessary to recognize the current PBN implementation status in Europe. The ATS route network is already relying on PBN, based on the navigation specification RNAV 5 and at many airports there are SIDs and STARs in operations based on the navigation specification RNAV 1. More controlled transition to RNP 1 within applicable airspaces is necessary, in order to minimize the risk of the mixed RNAV 5 and RNP 1 (or RNAV 1 and RNP 1) requirements within the same airspace. Thus, instead of the fixed date applicable for each individual route implementation, the regulation shall focus on airspace changes where all the routes of an airspace are subject to change. In the context of individual route implementations to the existing airspace structure, the regulation should not prevent the application of the navigation specification already taken in use within the airspace. In case it turns out that not all aircraft are capable for RNP 1 requirements, RNAV 5 shall be

	the alternative in support of PBN implementation, instead of the reliance on conventional navigation. Recent assessment of the fleet navigation capabilities in Finland, for example, indicated that less than 1 % of the civil IFR traffic was not capable for RNAV 5.
response	*Noted.*
	Please see the response in the response to the major concerns identified section of the Opinion.

comment	*150* comment by: *skyguide Corporate Regulation Management* **2.1 (and elsewhere throughout the document)** In order to enable the introduction of PBN within the EATMN, a Performance-Based approach has been adopted by the Agency. Whereby it is recognised that PBN routes should only be implemented where required to meet defined local performance objectives, with the exception of approach procedures for which a mandate is proposed. The entities directly affected by the proposed regulation and their obligations, as summarised in Figure 1, are: — Air Traffic Service Providers (ATSPs) when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives shall conform to RNP 1 performance requirements as of December 2018; Comment: It is unclear how these performance objectives are defined: by whom, based on what criteria, and how they will be standardised across the member states. It should be noted in CH that SIDs and STARs are owned by the airport operator and not by the ATSP.
response	*Noted.*
	Performance objectives may/can relate to environmental and other societal objectives as well as operational objectives that are defined locally, based on the specific local conditions and the anticipated performance improvements the application of PBN may be used to achieve the goal. The Agency recognises that, in the Member States, various different entities are responsible for the provision of approach procedures as well as SIDs and STARs. Therefore the regulation is applicable to ANSPs or aerodrome operators.

comment	*170* comment by: *EUROCONTROL* **Page 6 - 2.1 Proposed provisions - 1st. "-"** EUROCONTROL has a question:

Are aircraft of lower performance still be handled conventionally even if they are RNAV1 capable but the aerodrome has not invested in RNAV1 procedures prior to December 2018?

Page 6 - 2.1 Proposed provisions - 3rd. "-"

EUROCONTROL raises a point:
The PCP has already indicated January 2024 but surely the 37/11 resolution should be the focus. An earlier end date for implementation of non-PA runways would seem more logical.

Page 7 - 2.1 Proposed provisions - 1st. paragraph

EUROCONTROL has a question:

The proposed text implies that only RNP1 can be used post 2019. In this case, what about helicopter ops and RNP0.3?

Page 7 - 2.1 Proposed provisions - 3rd paragraph

EUROCONTROL makes a comment and asks a question:
The requirement to ensure that non-PBN procedures are available for non-equipped aircraft removes any incentive for operators to equip. However experience has shown that PBN benefits cannot be realised in a mixed mode environment.

It should be noted that a separate discussion took place within the Military ATM Board for the specific case of State aircraft. The subsequent civil-military comments included in EUROCONTROL's comments on NPA 2015-01 are also based on the outcome of this discussion.

Does the proposed text mean that the non-PBN (conventional) procedures will need to be re-introduced after they have been withdrawn?

EUROCONTROL makes a concrete observation:

EASA assumes that "a significant number of the current and future aircraft population already have, or are planned to have, the on-board capabilities to perform most of the PBN operations". This assumption justifies why no aircraft equipage is mandated. However, when analysing flight plans for the first six months of 2013, only 42% of them indicate that flights have a RNP1 capability.

Page 7 - 2.1 Proposed provisions

EUROCONTROL raises a serious concern relating to mixed mode operations:

Mixed mode operations (for both the traffic and applications) would have a negative impact on cost efficiency, interoperability and potentially on safety. The negative impact of mix mode in the RIA has been almost completely underestimated. Having an alternative airspace structure cannot be a viable option. If mixed mode operations cannot be avoided it could be suggested to introduce a transition period of 5 years after the applicability dates. At the end of this period the conventional ATS routes, SIDs/STARs and approaches should be decommissioned.

	Page 7 - 2.1 Proposed provisions - Figure 1 EUROCONTROL has two questions: As RNP1 and RNP APCH both require a GNSS sensor, how does EASA address those EU States that do not allow the use of GNSS for certain operations? Who is affected? When stating “In addition to the introduction of the obligations for PBN, a change has been proposed to the scope of the regulation… limiting its applications with respect to aircraft undertaking maintenance, delivery or flight testing”, the same approach could be taken to integrate the exclusions/constraints valid for State aircraft.
response	*Noted.*
	Page 6 - 2.1 Proposed provisions - 1st. "-" EUROCONTROL’s reference to lower performance aircraft is not fully understood. An aircraft either holds a valid approval to operate a PBN procedure or has no approval; there is no low performance standard. Regarding the handling of aircraft at a specific aerodrome, aircraft need to be handled in accordance with the published procedures, conventional or PBN. Page 6 - 2.1 Proposed provisions - 3rd. "-" Please see the response in the response to the major concerns identified section of the Opinion. Page 7 - 2.1 Proposed provisions - 1st. paragraph The requirement to use the RNP 0.3 standard routes and procedures supporting helicopter operations has been introduced into the proposal. Page 7 - 2.1 Proposed provisions - 3rd paragraph The use of Non-PBN conventional procedures is subject to local operational performance needs. This could be permanent or time limited dependent upon the local operational requirements. If, until now, non PBN conventional procedures have been withdrawn, it is not foreseen for them to be reintroduces as the local decision has already been made. The observation regarding the number of RNP equip flights is 2013 is duly noted. Page 7 - 2.1 Proposed provisions Please see the response in the general section **Page 7 - 2.1 Proposed provisions - Figure 1** Pertaining to the sole use of GNSS as the navigation sensor, the proposal has been amended to require RNAV 1 as the initial PBN application. This navigation specification does not require GNSS as the only sensor, therefore if a Member State does not permit GNSS RNAV is the only alternative option is via DME/DME. It should be noted that no Member State has notified the Agency that it does not permit GNSS use. A generic exemption is not appropriate. State aircraft should conform to the performance

	standards or accept any operational limitation imposed for mixed mode operations.

comment	*200* comment by: *French State Aviation Safety Authority (DSAÉ)* Military air operations and training entail the need for unrestricted access to airspace and aerodromes, including where PBN requirements will apply. Those military operations and training will be conducted by **non PBN-equipped State aircraft** and shall be facilitated, within safety limits, irrespective of its GAT (or OAT) status and mixed mode environment. **Limitations, restrictions and constraints are not acceptable for military aircraft on operations.**
response	*Noted.*
	Such a generic exemption to permit operations of non-PBN approved aircraft will have a negative impact on any local performance improvements enabled by PBN. Therefore operation of non-PBN approved aircraft need to take place in accordance with the established procedures. Furthermore Member States shall ensure that such activities or services have due regard as far as practicable to the objectives of this Regulation.

comment	*214* comment by: *ESSP-SAS* The NPA does not follow the ICAO Assemblies 36 and 37 resolutions recommending: • The 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. • The implementation of APV procedures should be completed by 2016, with a specific milestone of 70% implementation achieved by 2014. NPA proposes the delay of APV to 2024 and reduces the scope of the mandate to runway ends only with non-precision approaches. Drawbacks of the NPA: • ICAO's resolutions reflect the agreed opinion of the Global Aviation Community. It is not understandable that an EU Regulation is set against such resolutions. • Though it is understood that the primary ICAO target dates are not feasible due to current progress in the implementation process, the delay in this target date will surely imply also a delay in the use of RNP APCH (in particular for EGNOS based operations). • Several ANSPs have already done significant effort to comply with ICAO recommendation (in particular for EGNOS based operations) and EC/GSA tools

currently are and will be in the future in place to support such implementations.
- The reduction in the scope regarding runway ends will lead to a severe limitation in the use of RNP APCH (in particular for EGNOS based procedures).
- In many cases there are precision approach procedures based on ILS which have none or one non-precision approach procedure as a backup or there are several non-precision approach procedures in place, which do not provide sufficient performance. In both cases, if implementing APV, there is room to rationalise the ground infrastructure and there are benefits in accessibility, for instance, in cases of ILS maintenance or, if missing, when the cloud base is lower than the published NPA minima.
- The NPA sets 2024 as deadline for APV implementation to be consistent with the Pilot Common Project, which target high density TMAs. This will not be the case of most of the airports impacted by this NPA, which won't have the same difficulties in terms of traffic mix (conventional vs new SIDs/STARs) which can be a reason to aim for an earlier implementation dealine.

Proposal of modification to the NPA:

- To keep the ICAO resolution's scope of APV for all instrument runway ends. Having such procedures as back-up of the precision approaches would increase the level of safety of this operations (enhancing available contingency procedures). The only exception would be for Precision Approaches based on SBAS (see ICAO Annex 6 definitions), for which having another APV at the same runway end would not suppose any safety benefit but an extra cost.
- To keep the target date proposed in the Eurocontrol's Regulatory Approach Document on PBN for APV approaches in all instrument runway ends: end of 2018.

response | *Noted.*

Please see the Agency's response in the response to the major concerns identified section of the Opinion.

comment | *215* comment by: *ESSP-SAS*

The NPA puts an obligation on ATSPs/aerodrome operators to keep approaches procedures, SIDs, STARs and ATS Routes based on non-PBN applications and infrastructure to a not well defined certain level (the operational use of such approach procedures and routes may be limited, commensurate with the operational performance needs). In this way some level of conventional infrastructure must be maintained.
But one of the major economic benefits derived from PBN/RNP APCH for ATSPs/aerodrome operators is the replacement of conventional navaids. In some airspaces, mixed conventional and PBN traffic can reduce capacity significantly.

Drawbacks of the NPA:

- The obligation is ambiguous because of the uncertainty of the level of non PBN applications to be kept.

- If it is understood by the ATSPs/airport and aircraft operators as permanent obligation to keep the conventional infrastructure and procedures based on that, this may discourage them to see the benefits and need for RNP APCH procedures (in particular EGNOS based approaches).
- This section requires ATSPs and aerodromes to make non-PBN APCHs, SIDs and STARS available to non PBN equipped aircraft but it does not establish a minimum or maximum duration for such provision, which will not guarantee a smooth transition in Europe. It doesn't specify what percentage of users should be covered and what the procedure will be if new users, with different specifications, intend to use the aerodrome.

Proposal of modification to the NPA:

- It is understood that mixed operations will be needed during a determined period of time (and kept onwards to a minimum level) until the vast majority of the operators are PBN capable and ATSPs/aerodrome operators have the proper PBN applications in place. But this minimum period of time to have massive PBN operations should be defined within the NPA.
- In order to define this period of time the proposal is to keep the dates of Eurocontrol's Regulatory Approach Document on PBN and EU Reg. 716/2014 PCP IR alligned in order to guarantee that a significant percentage of the operations will be PBN based in the future. Those target dates are as follows:
  - 2018: APV in all instrument runway ends
  - 2020: RNP 1 required in European TMAs.
  - 2024: Six improved TMA functionalities implemented in the European high density TMAs (see PCP IR).

response | *Noted.*

Please see the Agency's response in the response to the major concerns identified section of the Opinion.

comment | *216* comment by: *ESSP-SAS*

The NPA does not put any direct requirement on operators to get equipped for PBN operations and in particular for APV approaches (and therefore it is not included in the scope of the AUR.PBN.1005 section). In EASA's opinion, current Regulation (Reg.965/2012 and Reg.923/2012 SERA) already establishes requirements for the operators to ensure that their aircraft are equipped and aircrew qualified as required for the area and type of operation (in particular PBN routes and procedures). But this is lax enough for operators to put the pressure on the ANSPs to keep non-PBN applications to a satisfactory level for operators and still comply with the applicable Regulation.

Drawbacks of the NPA:
If no obligation is imposed, there is less motivation for airlines to get equipped for PBN operations, losing some of the benefits of PBN. Furthermore, as exposed in the previous comment, there will always be the possibility to perform non-PBN operations at an

unspecific certain level.

Proposal of modification to the NPA:
To put a specific requirement on operators, to encourage them to be equipped for PBN operations. Exemptions should be allowed under severe conditions. To be consistent with ICAO and European ATM strategy this dates should be 2018 for RNP APCH and 2020 for RNP 1 in TMA, with the possibility of giving them some extra time for adapting to the new PBN scenario.

response | *Noted.*

Please see the Agency's response in the response to the major concerns identified section of the Opinion.

comment | *218* comment by: *ESSP-SAS*

It is not quite clear which entities are affected by the proposed regulation.
ATSPs are identified, but a FIS provider (also a ATSP according to Reg.549 Art.2.11) is not expected to implement SIDs/STARs/ATS Routes.
It is understandable to keep the scope to Air Navigation Service Providers instead of keeping it at a higher less concrete level such as ATM/ASM, but the proposal would be to refer to ATC Providers for SIDs/STARs/ATS Routes (where aerodrome operators are also excluded) and ATSPs/Aerodrome Operators for RNP APCH (an AFIS provider can actually foster such implementation, though probably with a strong participation of an ATC provider or even an AIS provider).
This should be consistent with NPA section 2.7 where currently only ATC is refered to.

response | *Partially Accepted.*

The proposal has been amended to refer to ANSPs as one of the generic entities responsible for the provision of SIDs/STARs and approach procedures.

comment | *219* comment by: *ESSP-SAS*

Obligation to maintain non-PBN approaches, SID/STAR and ATS routes shall be relaxed as in some environments it is unfair for ANSPs/aerodromes from an economic point of view, for three reasons. First of all, if ATC APP is available, then non-PBN aircraft can be safely vectored towards final approach by ATCOs. In this situation, non-PBN aircraft will be able to operate during the APP service hours. Secondly, if existing conventional procedures are not compatible with the new and optimal airspace structure for PBN, there should not be obligation to maintain conventional as it would require a re-design also of the conventional procedures, and this cost, again, (ATC training, design, flight inspection...) would only be assumed by ANSP/aerodrome. Finally,obligation to keep non-PBN procedures may involve not rationalising navaids that, today, already have plans of decommissioning before the dates set by this IR. Again, this is a cost to be absorbed by ANSP/airport, which can only compensate by risign the operating taxes to aircraft operators, something which for sure

	would not satisfy the operators.
response	*Noted.*
	The obligation in the proposal was for either non-PBN (conventional) SIDs/STARs or for specific procedures, such as described, to be available and published.

comment	*284* comment by: *AvinorANSP*

No direct obligation has been proposed to aircraft operators.

Comment:

We find it very unfortunate that this rulemaking task do not include obligations to aircraft operators. ATSPs and aerodrome operators are obligated to maintain/support non-PBN operations and with this there is no real driver to "force" aircraft operators to obtain certifications for PBN-operations. Without obligations to aircraft operators we expect the evolution of PBN-equipage to suffer a delay. As long as ATSPs needs to support alternatives to PBN-applications there is no real need for aircraft operators to upgrade their fleet.

Futhermore, in implementing a performance-based approach, it is recognised that aircraft operators for whom it may not be economical to modify aircraft to operate on PBN routes and procedures should not be excluded from all operations. Therefore, an additional obligation has been proposed for ATSPs and aerodrome operators to ensure that approach procedures, SID/STAR and ATS routes based on non-PBN applications are available but may be limited in application, commensurate with the operational performance needs of the aerodrome or airspace.

Comment:
As B-RNAV (RNAV 5) certification is mandatory for all IFR flights on ATS-routes (en-route) in ECAC states, there should be no requirement for published non-PBN ATS routes (en-route).

The "Explanatory Note" include the essence from AUR.PBN.3005 point 1a, but we miss a representation of AUR.PBN.3005 point 1b in the "Explanatory Note ". Operational procedures (we read this as e.g vectoring service) are important tools to meet the request for non-PBN applications.

Non-PBN applications in Norway will be based upon a combination of the national NAV back-up strategy for loss of GNSS, availability of non-PBN instrument procedures (terminal and/or approach) and operational procedures (vectoring service). The need for non-PBN applications based on these solutions will be taken into account in a local business case/ concept of operations at each airport.

Propose new text:
Futhermore, in implementing a performance-based approach, it is recognised that aircraft operators for whom it may not be economical to modify aircraft to operate on PBN routes

and procedures should not be excluded from all operations. Therefore, an additional obligation has been proposed for ATSPs and aerodrome operators to ensure that instrument approach procedure and SID/STAR based on non-PBN applications are available but may be limited in application, commensurate with the operational performance needs of the aerodrome or airspace. Alternatively ATSPs and aerodrome operators shall ensure operational procedures to handle traffic that do not meet the requirement of instrument approach procedures and SID/STAR based on PBN applications.

Figure 1: Proposed regulatory provisions

Comment:

In order to reflect AUR.PBN.3005 1a **and** 1b, we porpose to change the text in the last orange boxes as follows: "maintain availability of IAP and SID/STAR based on non-PBN applications or ensure operational procedures".

The Agency also acknowledges that a significant number of the current and future aircraft population already have, or are planned to have, the on-board capabilities to perform most of the PBN operations that are currently defined by ICAO

Comment:
Our understanding from earlier analyses related to Eurocontrol Regulatory Approach work found that on-board capabilities related to RNP 1 + RF are insufficient today and assessed to be below 90% as late as 2024.
Are there any new analyses that says this situation is different? Are the aircraft operators really ready for RNP 1?

response *Partially accepted.*

With respect to obligations imposed on aircraft operators and implementation of navigation specifications, please see Agency's position in the response to the major concerns identified section of the Opinion.

Regarding the comment on mixed operations, the text of the explanatory note will not be amended, but the rule proposal (AUR.PBN.3005) incorporates the term "operational" procedures, which encompasses RADAR vectoring or procedural control, depending on the availability of surveillance tools as part of the airspace concept in place.

comment *328* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland*

The initiative of the EASA to ensure a safe, efficient and harmonized implementation of PBN within European airspace is acknowledged. However, mixed operations might not be the most efficient and cost effective way to reach this goal.

response	*Noted.*
	With respect to the operation of aircraft not able to conform to the PBN requirements, please refer to the response to the major concerns identified section of the Opinion.

comment	*380* comment by: *NATS National Air Traffic Services Limited* The NPA states that Standard Instrument Departures (SID)/Standard Instrument Arrivals (STAR)/ATS Routes shall be established in order to meet local performance objectives. No definition and context around what these local performance objectives are or who sets them. 1. 1. The performance objectives are the key to determining implementations. Without a clear understanding of what the criteria for these are, it places risk on ANSPs when demonstrating compliance with the Regulation. 2. It is not clear whether local refers to Airspace, State or FAB, resulting in risk when demonstrating compliance with the Regulation. Suggested resolution: 1. 1. Clarification of the performance objectives to be met i.e. safety, efficiency, environmental. 2. Clarification that local may be Airspace, State or FAB, as determined by the nature and scope of the PBN implementation.
response	*Noted.*
	Performance objectives must be interpreted in a wide sense, as well as the meaning of local needs. These concepts are intended to be developed in the next version of AMC/GM issued by the Agency. Local needs refer to operational requirements and airspace objectives that a new navigation application based on PBN can help to meet. These goals might also be imposed by the performance scheme and its key areas of concern. State plans and FAB initiatives are a source of information to identify these “local” needs and assess if PBN operations could meet safety, efficiency, capacity, environmental or social objectives.

comment	*381* comment by: *NATS National Air Traffic Services Limited* The NPA does not mandate users to equip to the RNP+RF/A-RNP+FRT standard or to any other standard but Article 1(b) states that the Regulation applies to aircraft operations. 1. 1. The NPA allows an operator to "still have possibility to decide to use these PBN requirements or to continue with conventional ones". Where it references EU 965/2012 & EU 923/2012, which require equipage in accordance with the airspace requirements, it is not clear how users will make the necessary association, leading to compliance issues between provider and user. 2. 2. The NPA requires aerodrome operators and ATS providers to design airspace to the RNP standard and to retain conventional procedures to accommodate users who are not equipped. The consequence is a negative impact on an ANSP's navigation infrastructure rationalisation plans, and on the efficiency of the airspace because the reality is that many operators will seek to access the airspace without equipping, because they can, resulting in the airspace performance targets being challenged by the compromise in design i.e. extensive operational procedures to separate equipped/non-equipped users, complicated Network arrangements to enable/disable access at certain times of the day. Suggested resolution: EASA is asked to include in the regulation an obligation on operators to equip to the navigation standard declared for the airspace.
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion.

comment	*382* comment by: *NATS National Air Traffic Services Limited* The NPA is not clear on what 'implementation' means. EASA has verbally confirmed that this means where a new PBN SID/STAR is implemented but it is still not clear whether this means a new SID/STAR where one previously did not exist or the PBN replication of an existing conventional SID/STAR. The scope of any necessary changes may vary considerably depending what needs to be implemented and this will have a cost. Suggest clarification on the scope of 'implementation'.
response	*Noted.*
	The scope of what is to be implemented depends on local needs. The objective of the draft rule is to harmonise the adoption of navigation specifications throughout the European airspace. The costs incurred by the regulated parties depend on local factors varying across Europe and, therefore, are difficult to estimate.

	Please note that any modification of existent PBN applications to meet performance objectives also requires to implement SID or STAR operations in accordance with AUR.PBN.2005. The regulatory text has been revised to improve clarity.
comment	*414* comment by: *LFV* **COST AND BENEFIT** - item 2.1: ”No direct obligation on operators….” - The NPA requirements put very costly actions on the ATSP/Airport, which is in contradiction with the EU requirements for ATSPs to substantially lower their costs. And with no requirements on operators, the objectives in ATM Masterplan/SESAR will not be met for a long time. Is that acceptable if PBN is supposed to be an enabler for SESAR ? EASA claims a ”Total System Approach”, but without involving all parties concerned in the system the approach cannot be considered ”Total”. **LFV proposes -** Requirements on operators to be in line with implementation requirements to increase the possibility for the objectives in AMT Masterplan/SESAR to actually be met on time.
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in respect of obligations imposed on operators. Please bear in mind that the Agency is simultaneously working on a number of rulemaking activities in order to facilitate the implementation of PBN in Europe.
comment	*417* comment by: *LFV* **Clarification and meaning of expressions needed** (what is expected to be the action) - item 2.1 : The meaning of ”non-PBN application” needs to be clearly explained and how it should be understood and related to in different situations described in the NPA.
response	*Noted.*
	A Non-PBN application comprises either area navigation not based on performance requirements or conventional navigation techniques.

comment	*430* comment by: *FNAM* FNAM is fully convinced that this implementation of PBN operations is necessary and will provide many benefits in terms of safety, efficiency and cost-saving. The implementation of APV approachs at all instrument runways currently equipped with only non-precision approach procedures will particularly improve accessibility of these airports. However, FNAM wants to highlight that such a transition cannot occur without an adaptation of air operators and more particularly concerning aircraft equipment and staff training; some costs of ownership being "transferred" from ANSP (cost of ground navaids) to airlines (cost of onboard equipment). Due to the implementation of PBN operations and the numerous benefits of these operations, FNAM is convinced that most of aircraft operators will decid to equip their fleet, in the coming years, to be able to operate PBN routes and approach and enjoy the benefits of such procedures. Nevertheless it is necessary to give some flexibility to operators in the planning of this transition in order to minimize its economical impacts. For instance, it would not be relevant for an airline which has schedulet a fleet renewal in 5 years to be obliged to retrofit its current fleet to operate PBN routes. Consequently FNAM supports EASA position to propose no direct obligation to aircraft operators in its Regulation and to maintain non PBN routes and procedures. The best way to foster the equipment of aircraft is undoubtly to develop european grants program to provide operators with financial support and avoid them fully assuming the transfer of costs from airports and ANSP to air operators . FNAM actively supports its members to participate to such programs (for instance GSA grants programs).
response	*Noted.*

comment	*435* comment by: *CAA-N* P 6: No direct obligation has been proposed to aircraft operators.. This is an impaired mandate compaired to the principles of the Eurocontrol RAD document. Does this also rest on the availability of conventional procedures? When do Operators really have to invest in RNP1+RF capacity in areas outside high-density Airspace? P 7: Furthermore, in implementing... Does this mean that if all the relevant operators have PBN capacity to the extend that operating performance needs are met, the availability of conventional procedures are not needed? Suggest a revised text: "Furthermore, in implementing a performance-based approach, it is recognised that aircraft operators for whom it may not be economical to modify aircraft to operate on PBN routes

and procedures should not be excluded from all operations. Therefore, an additional obligation has been proposed for ATSP and aerodrome operators to ensure that instrument approach procedure and SID/STAR based on non-PBN applications are available but may be limited in application, commensurate with the operational performance needs of the aerodrome or airspace. Alternatively ATSPs and aerodrome operators shall ensure operational procedures to handle traffic that do not meet the requirement of intsrument approach procedures and SID/STAR based on PBN applications."

P 7: The Agency also acknowledge that a significant number of...
Based on the Eurocontrol RAD, Assessments Annex E Preliminary Economic impact assessment, CAA-N consider this to might be an over-hasty conclusion upon quantitative data. As the Annex E assessment concludes with about 92 % of the flights will be equipped, even up to 2030.

response *Noted.*

Please see the response to the major concerns identified section of the Opinion in respect of aircraft equipage.

The availability and continuation of conventional navigation flight procedures and ATS routes is dependent on local needs. The rate of equipped aircrafts depends on local performance needs and it is also important to bear in mind plans for PBN implementation in other parts of the world.

comment *439* comment by: *DGAC/DTA*

The implementing date of January 2024 should be reconsidered and anticipated.

Justification :
There are several reasons for which the implementation date should be anticipated:
- The explanatory note only mentions one aspect of the ICAO resolution A37-11, the one concerning the need to put APV in place (or LNAV), but disregards another very important aspect of this resolution which is the implementation date. Hence, the schedule proposed is inconsistent with ICAO resolution A37-11, which planned completion in 2016 and it is inconsistent with the previous RAD Eurocontrol issued in 2013 (WEF 2018).
- France and others States are still facing incidents related to errors by crews flying conventional approaches without vertical guidance. Consequently, postponing the initial date (2016) by 8 years is not seen as a safety progress.
- The situation may become even more difficult for AFIS aerodromes, as they would be squeezed between NAVAIDs decommissioning and postponed PBN deadlines.
- There are other reasons for which the 2024 deadline seems too late: if, today, carrying out a GNSS approach, with or without vertical guidance, requires an approval according to the AIR-OPS, the NPA 2013-25 to be published sometime in 2016, amends this rule: the SPA.PBN approval is removed and, in return, provisions are included in part FCL, training requirements in the AIR OPS... In this context, it is very important that GNSS approaches be put in place well before 2024 as they should be easily available to Approved Training Organisations and CAT operators.

Proposal:
The deadline for implementation of APV approaches, or RNP APCH where limiting obstacles or terrain exist, should be set by end 2018.

response *Partially accepted.*

The Agency has revised the date of entry into force for APV (AUR.PBN.2005 (1)). The proposed implementing date is 30 January 2020. Please also see response to the major concerns identified section of the Opinion.

comment *511* comment by: *Swedavia*

Comment: The proposed requirements will increase the cost for the airports and ATSPs for improving and modernizing the airspace and procedures. This increased cost could perhaps be justified if it would mean a substantial contribution to achieving the objectives of the ATM Masterplan. Obligations for the aircraft operators would probably increase the chances of achieving the goals and could perhaps help to justify the increased costs.

response *Noted.*

With the exception of PBN procedures with vertical guidance (APV), there are no requirements to modernise other existing flight procedures or ATS routes. Any modifications to these should be implemented in response to local performance objectives. In doing such changes, any cost incurred will be offset by the benefits achieved.

With respect to obligations imposed on aircraft operators, please refer to the response to the major concerns identified section of the Opinion.

comment *541* comment by: *HungaroControl*

Requirement for ANSPs to conform to RNP 1 performance requirements as of December 2018 for SID and STARS

This NPA is proposing timeframes and milestones for implementation that seem not to be achievable taking into account previous experiences like the European P-RNAV, now RNAV1 under the PBN concept. For instance, the December 2018 target to meet network PBN objectives is unrealistic in the light of the P-RNAV lessons learnt.
What CANSO understands from this requirement is that any new PBN SID/STAR implemented after December 2018 should cease to be designed with PBN RNAV 1, as is mostly the case today, but should alternatively be compliant with the recent RNP 1 PBN navigation specification.
The proposed timeline is not implementable for several reasons:

1) CANSO Members' experience of implementing PBN at high density airports has shown that it may take close to 10 years to migrate from a given navigation environment (for

example, as Basic-RNAV + was implemented in Paris TMA in the pre-PBN era, to a new one, as RNAV 1 today).

- It is acknowledged, as a hypothesis, that "a significant number of the current and future aircraft population" will feature the expected PBN capabilities, but the P-RNAV case has demonstrated that this assumption could be incorrect. When a lack of an obligation to be equipped and operationally approved exists, the rhythm of upgrade and/or certification varies very significantly between different airlines and ANSPs. In Europe, this provoked uncoordinated implementation programmes in each European State, resulting in TMAs with mixed conventional/RNAV traffic and non-optimised P-RNAV SID/STAR procedures.
- The main issue is the time required to migrate toward a homogeneous user equipage. In this respect, the 2024 timeline of the Pilot Common Project (PCP) applicable to 24 European TMAs was certainly more adapted than the early proposed 2018 timeline.

2) Mandates on airspace user equipment are required at high density airports and TMAs to support capacity handling through a close to 100% user equipment rate. Amsterdam issued a RNAV 1 mandate in 2012 for its TMA. In this respect, Paris and London TMAs are now in the process to issue RNAV 1 mandates accordingly. However, user equipment mandates are excluded from the NPA. There is therefore absolutely no chance that this requirement could be successfully implemented at high density airports within the NPA conditions.

3) CANSO understands how GNSS equipped aircraft might obtain a RNP 1 operational approval, even though no regulation yet exists in Europe. However, CANSO does not understand how DME/DME or DME/DME/IRU equipped aircraft, either as the main area navigation system, or as a backup navigation system, which today have an operational approbation to fly RNAV 1 SID and STARS, may be approved directly to support RNP 1 SID and STARS with DME/DME.
While the feasibility of a straightforward migration of GNSS from RNAV to RNP is well accepted within the aviation community, the case of DME/DME usage to support RNP operations is much more complex, which is e.g. clearly demonstrated by a lack of consensus at the highest international level (e.g. ICAO PBN SG), after many years of discussion, and may thus require specific additional airborne functions to achieve a DME/DME RNP compliant status. This is because within even basic GNSS avionics, specific errors of individual satellites are naturally compensated and/or alerted to the crew, making GNSS "naturally" compatible with RNP operations, while most of the DME/DME area navigation systems may be vulnerable to different errors, such as the ones introduced during DME ground stations' maintenance operations without detection or crew alerting.
If ANSPs cannot therefore be ensured that they will be able to use the DME/DME area navigation reversion capability when being forced by this regulation to migrate to RNP 1, e.g. in case of sustained loss of GNSS, as is today the case "naturally" with RNAV 1, then this creates a very significant weakness in the concept, which taken alone might mean a no-go to migrate to RNP 1, from the CANSO perspective.

4) In addition, subject to understanding what the performance objectives are, if these can be met by a re-designed airspace with RNAV1, it is not clear why RNP1 is required.

Requirement for ANSPs to conform to RNP 1 performance requirements as of December 2018 for En-route

What CANSO understands from this requirement is that any new PBN route designed after December 2018 should cease to be designed with RNAV 5, as is mostly the case today, but should be compliant with the RNP 1 PBN navigation specification.

This is a non-implementable requirement in the experience of CANSO Members, at the proposed timeline; for several reasons:
1) All the issues mentioned above are again valid here, with an emphasis on the lack of airspace user mandate, which was a key factor in the past for the rapid and successful implementation of B-RNAV in Europe (further denominated RNAV 5 through PBN), and makes it absolutely impossible to ANSPs to be sure that any new RNP 1 route will be flyable by all users transitioning within the airspace by 2018.
2) The RNP1 navigation specification in the ICAO PBN concept is only intended for TMA procedures and not for en-route. RNP2 is the specification intended for implementing on en-route environment. CANSO Members do not understand if this NPA is suggests creating a specific deviation to the PBN concept by proposing a "special" RNP 1 en-route concept for Europe, or that ANSPs implement the PBN Advanced-RNP navigation specification by 2018. This second option certainly supports RNP 1 but also requires additional airborne functions such as Fixed Radius Transition (FRT), which are not yet generalised within the fleet, and will definitively not be by 2018.
From the point of view of lateral separation between routes, beyond 30NM from aerodromes, RNP1 specification is switched from 1NM to 2NM horizontal alert limit which makes identical the distance needed to properly separate parallel routes to those based on RNP2. That is, on en-route environments, considering RNP1 does not provide any advantage in comparison with RNP2.
As a consequence, to try to implement RNP1 on en-route airspace can lead to a non harmonised PBN implementation which can be an issue for the non-European operators.
Instead, it is suggested to consider the A-RNP specification for airspace users to achieve operational approvals to simplify administrative processes and potentially reduce costs. The proposed A-RNP approval would only keep RNP2+FRT, RNP1+RF and RNP APCH as main applications to be used by ANSPs when developing new PBN implementations as per NPA 2015-01. That proposal follows one of the overall objectives of the EASA system: to promote cost-efficiency in the regulatory and certification process. Moreover, even considering a mixed European en-route scenario with RNAV5 and RNP2 applications, the A-RNP specification can be the optimum solution, since it also addresses RNAV5.

response *Partially accepted.*

With respect to navigation specifications to be adopted, please refer to the response to the major concerns identified section of the Opinion.

comment *542* comment by: *HungaroControl*

No mandate on operators equipment

For airborne equipage requirement, the NPA refers to two other pieces of EU Legislation (Reg.965/2012 and Reg.923/2012 SERA) where it is stated that aircraft have to have the appropriate navigation capability to meet the navigation performance requirements of the airspace. But the NPA clearly gives users the option to either equip or not equip, depending on the business case to upgrade their fleet. Therefore there is a consequent requirement on ANSPs to maintain conventional procedures and supporting conventional infrastructure. There is inconsistency in the manner of compliance, which will lead to implementation issues for all stakeholders.

We do not understand how users will make this association in practice, leading to compliance issues. If there is a requirement for users to have the navigation capability, then this should be explicitly stated in the legislation, which coincidently has a common title of "Airspace Usage".

The above mentioned absence of a real mandatory request on the operators for getting the appropriate PBN operational approval/s, jointly with the request to ATSPs to keep "conventional" ATS routes and the lack of a defined role for either already existing or future RNAV procedures can lead, without clear access rules and extensive safety analysis, to non-desirable mixed scenarios featuring diverse combinations of conventional, RNAV and RNP elements.

In addition, it is important to note that currently RNAV5 (former B-RNAV) is the en-route European standard. Is it reasonable, safe and cost-effective to change all the route network from RNAV5 to RNP2? Or just some specific parts, the most congested airspaces, of the network? Again, the comparison with the P-RNAV example must be taken into consideration: the lack of an obligation for the operators caused very different rhythms of upgrade/approval and led to inefficient mixed scenarios. Even, in reference to another recent example, that lack of mandatory material has been generating difficulties in implementing RNP APCH (and GBAS procedures) and very different rhythms of implementation.

To sum up, all these issues have caused different criteria/requirements/constraints for the issuance of the operational approvals by each NSA: existence of a significant amount of aircraft non capable or non-approved, increase of ATC workload to manage conventional vs. RNAV or RNP traffics, less efficiency of the airspaces and big difficulties to implement operational measures associated to RNAV or RNP implementations (CDA, CDO, point merge,), etc.

In order to avoid that situation, the appropriate PBN approval should be made mandatory for operators. The function, purpose and access rules for the non-PBN procedures in a PBN airspace must be clearly regulated.

response

Noted.

With respect to obligations for aircraft equipage and mixed operations, please refer to the response to the major concerns identified section of the Opinion.

comment

543 comment by: *HungaroControl*

RNP APCH to all instrument runway ends
CANSO is concerned that the current regulation proposal is neither aligned nor compatible with the ICAO PBN Manual and it does not take into account ICAO priorities regarding the introduction of RNP approach procedures.

ICAO Assemblies 36 and 37 have recommended (A37-11 resolution refers) that RNP APCH with vertical guidance (where possible) be implemented by 2016 over virtually any IFR

runway end, with specific time lines (e.g. 70% implementation achieved by 2014). Many ANSPs in the world have indeed understood the benefits of this type of PBN operations (increasing safety and accessibility, reducing environmental nuisances, reducing ANSPs infrastructure costs) and launched dedicated programmes in this respect.

The NPA proposes to delay APV to 2024 which creates a number of issues:

- During the recent High Level Safety Conference held in ICAO Montreal in Feb 2015, the PBN paper submitted by ICAO emphasised again that for the sake of increasing safety, in particular reducing CFITs, it was very important that ANSPs progress PBN implementation quickly and make every effort to meet the 2016 schedule.
- The lack of mandate to equip with APV, as discussed above, will not help to reduce CFITs; the users will have no incentive to equip toward APV, as ANSPs are asked to maintain a conventional approach for users not equipped with APV, even after 2024.
- In addition, ANSPs will also not be in a position to achieve infrastructure rationalisation benefits, through the absence of mandates and the requirement for ANSPs to maintain conventional systems to support unequipped users.
- RNP APCH down to LNAV minima must also be considered, as a solution for some specific scenarios without enough LPV nor LP performance and no local barometric information source, in accordance to ICAO resolution A37-11.

However, it is also necessary to understand the reasons why many European ANSPs in Europe are late. Examples of typical aerodromes with runway ends with no instrument procedures or only non-precision approach procedures are normally due to:

- The runway end does not have facilities according to ICAO Annex 14 (aerodrome surfaces, lighting, conventional navaids, etc.) for implementing APV approaches because of the type or the amount of traffic and a not very demanding local meteorology, or both. Some NSAs interpret that there is a need to observe the requirements for precision approaches when implementing APV procedures. That leads to a situation where the RNP APCH implementation is not viable in terms of costs.In the same way, and very frequently associated with the same aerodromes mentioned in the previous bullet, some States require a minimum standard of ATS (FIS or ATC) when an instrument procedure is put in place, which makes the implementation cost prohibitive. Even more so when there is not enough traffic to justify the requirement for an ATS. Instrument procedures should not necessarily be synonymous with ATS.
- Complex scenarios in terms of terrain, where very commonly Visual Segment Surfaces (VSS) are penetrated. In these situations each European NSA has different criteria solutions, or no criteria, that impact directly in their capacity to implement (or not) such procedures. Some of these complex scenarios prevent the implementation of RNP APCH solutions and request other solutions like RNP AR APCH or RNAV visual.

It is known that all those constraints above mentioned have been managed differently by each State and have led them to avoid some RNP APCH implementations, or have enlarged excessively some deployments. In addition to all of them, the low number of aircraft capable/approved for RNP APCH in some cases has helped to worsen the cost-benefit balance. Consequently, it is suggested that these constraints should be solved from a harmonised point of view.

response | *Noted.*

Please, refer to the response to the major concerns identified section of the Opinion, especially regarding implementation of APV and approaches up to LNAV minima.

comment | *595* comment by: *IACA International Air Carrier Association*

RNP AR (curved approaches)
RNP approaches (straight in approaches) are good from a flight safety perspective when there is only non-precision approach available to the runway end. It does not make that much difference on flight efficiency since most all state-of-the-art aircraft are flying these non-precision approaches based on what is coded in the Navigation Data Base (NDB) / Flight Management System (FMS), and we have vertical guidance coded in the NDB from Final Approach Fix (FAF) / Final Approach Point (FAP).
RNP AR (curved approaches) however are a true enabler to improve fuel efficiency and mitigate noise, and is foreseen to be even more important around European airports in the future. It is however very difficult for airlines to build a positive cost benefit analysis (CBA) since there are so few of these approaches available in Europe. What we need is a widespread implementation of RNP AR in Europe, similar to what FAA is doing in the US. RNP AR operations, especially in 'non-demanding environments' (not defined by ICAO, but that is e.g. Brussels but not Innsbruck) should be considered in the PBN European Implementation Plan, primarily linked no noise issues around airports and fuel efficiency.
As far as we know, FAA nowadays generates a generic RNP AR approval. In today's operation, European airlines need one specific approval for each RNP AR approach from the local regulator. According to EASA Opinion 03/2015 (NPA 2013-25) RNP AR continues to require a SPA approval.

response | *Noted.*

Given that RNP and RF legs maybe combined to achieve the results described, the use of RNP AR APCH specification should be limited for 'challenging environments'. Since RNP AR APCH can be used to increase safety by reducing lateral and vertical obstacle clearance and to give access where other approaches cannot be aligned to runway (like mountainous terrain environments), the proposed rule considers RNP AR APCH implementation where limiting obstacle conditions exist. The implementation of these 'authorisation required' procedures is quite demanding and a widespread implementation might be considered too ambitious, even though the Agency recognises the potential breakthroughs (apart from safety): access to congested airspaces, noise abatement, etc.

comment | *616* comment by: *GSA*

Postponement of the deadline to implement APV approaches. Divergence with the ICAO Assembly Resolution 36 and 37

The NPA does not follow the ICAO Assemblies 36 and 37 resolutions recommending:

- The 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.
- The implementation of APV procedures should be completed by 2016, with a specific milestone of 70% implementation achieved by 2014.
- ICAO's resolutions reflect the agreed opinion of the Global Aviation Community. It is not understandable that an EU Regulation is set against such resolutions.

The EASA NPA proposes 2024 as new deadline to implement APV approaches. This deadline is not consistent with Table 1 "Proposed PBN Requirements" (2.2.2. Selection of PBN Requirements, page 9-10) and the overall strategy seems to significantly deviate from the objective of 2018 as the target for RNP APCH in all instrument runways and 2020 for RNP1 in TMA. The proposed 2024 deadline will have a negative impact on the implementation of satellite-based procedures since it establishes a 6 years delay in the target date.
Though it is commonly understood that some of the primary ICAO target dates would be hardly feasible due to current progress in the implementation process, the delayed target date proposed by the EASA NPA will delay also the use of EGNOS for RNP APCH. Several ANSPs having done already significant effort to comply with ICAO recommendation and EC/GSA tools to promote EGNOS adoption having been already launched, the target date proposed for RNP APCH looks deeply incoherent.

Proposal of modification to the NPA:

- To keep the dates of Table 1 “Proposed PBN Requirements” and EU Reg. 716/2014 PCP IR aligned in order to guarantee that a significant percentage of the operations will be PBN based in the future. Those target dates are as follows:
  - 2018: APV in all instrument runway ends
  - 2020: RNP 1 required in European TMAs.
  - 2024: Six improved TMA functionalities implemented in the European high density TMAs (see PCP IR).

response *Noted.*

Please, refer to the response to the major concerns identified section of the Opinion in relation to A37/11 resolution held by ICAO.

comment *617* comment by: *GSA*

Reduction of the scope to runway ends only with non-precision approach

Air Traffic Service Providers (ATSPs) and aerodrome operators shall implement PBN Approach Procedures with Vertical guidance (APV) conforming to the ICAO RNP APCH requirements at all instrument runway ends where currently, there is only a non-precision approach procedure in place by January 2024.
The above proposition requires the implementation of APV approaches only where a non-precision approach procedure is in place and does not consider the use of APV as a backup to ILS. The scope of the requirement is considerably reduced which means a strong limitation of

	the use of EGNOS based procedures. Having such procedures as back-up of the precision approaches would increase the level of safety of these operations (enhancing available contingency procedures) Proposal of modification to the NPA: • To keep the ICAO resolution's scope of APV for all instrument runway ends • To keep the target date proposed in Table 1 "Proposed PBN Requirements" for APV approaches in all instrument runway ends: end of 2018.
response	*Noted.*
	As precision approach procedures provide for a safety approach, the proposed rule keeps the requirement to implement APV at all instrument runway ends, which are not served by a precision approach procedure, hereby improving the safety of approach operations. APV implementation at other locations should only be implemented where required to meet local performance objectives.

comment	*618* comment by: *GSA* **Lack of mandate for aircraft operators** The proposed NPA doesn't impose any requirement for aircraft operators to get equipped. The rationale behind this is unclear and a negative impact on EGNOS use is expected. Moreover this lack of mandate would not be coherent with the launched EC/GSA actions targeting both aircraft operators and ANSPs, to promote EGNOS. When a lack of an obligation to be equipped and operationally approved exists, the rhythm of upgrade and/or certification varies very significantly between different airlines and ANSPs. In Europe, this provoked non coordinated implementation programs at each European State, resulting in mixed conventional/RNAV traffic and non-optimized procedures. Proposal of modification to the NPA: • To put a specific requirement on operators, to encourage them to be equipped for PBN operations. Exemptions should be allowed under severe conditions. To be consistent with ICAO and European ATM strategy this dates should be 2018 for RNP APCH and 2020 for RNP 1 in TMA, with the possibility of giving them some extra time for adapting to the new PBN scenario.
response	*Not accepted.*
	Please, refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage.

comment	*637* comment by: *DFS Deutsche Flugsicherung GmbH* ***No direct obligation has been proposed to aircraft operators.*** DFS rejects the draft regulation as long as it does not include the obligation/mandate to equip aircraft accordingly. *(No commitment by ATSPs unless the airlines do their part, too).* With this NPA, the on-board part of PBN, in particular the RNP procedures, will remain as optional as it is today. The past decades have shown that self-regulation on the part of the airspace users will not take place. As long as only the ATSPs are obliged to provide RNP procedures, the project is bound to fail in the SID/STAR areas (example: RNAV-1 in Germany). From our point of view, the maximum benefit would be obtained by successfully introducing new operational concepts using RNP procedures in the SID/STAR areas, provided that an aircraft equipage level (RNP-approved) of >95% is achieved and the RNP procedures can (or must) actually be flown.
response	*Noted.*
	Please, refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage.

comment	*648* comment by: *Spanish Air Force Staff* The reference made to the Regulation (EU) Nr 923/2012 of 26 September 2012 (SERA) on airborne equipage must be made explicitly applicable only for civil aircraft.
response	*Noted.*
	Since aircraft shall be equipped with suitable instruments and with navigation equipment in accordance with the applicable air operations legislation, there is no apparent need to emphasise that point. In accordance with the framework Regulation (EC) No 549/2004, the regulatory framework does not cover military operations and training. This aspect is equally considered in Regulation (EU) No 923/2012. To avoid a negative impact on any local performance improvements enabled by PBN, operations of non-PBN approved aircraft need to take place in accordance with the proposed requirements. Furthermore, in accordance with Article. 1(2a) of the Basic Regulation, the Member States shall undertake to ensure that activities or services normally performed by State aircraft have due regard, as far as practicable, to the objectives of that Regulation.

comment	*679* comment by: *UK CAA* **Page No:** 6

Paragraph No: 2.1

Comment: The proposed provisions refer to the need to only implement PBN routes where required to meet 'local performance objectives'.

It is the UK CAA's understanding that this does not necessarily relate to 'performance' in the sense of FAB Performance Plans i.e., specified in Commission Implementing Regulation (EU) 390/2013 (Performance Scheme), but rather a 'local' objective to implement a given navigation performance requirement – such as at a given airport or terminal airspace.

It is recommended that EASA clarify what is meant by local performance objectives and the roles of the respective stakeholders (airport sponsor, ANSP, regulator).

Justification: Clarity.

response *Noted.*

The explanatory note points out that PBN should also be considered to meet those requirements stemming from the performance scheme.

Performance objectives must be interpreted in a wide sense, as well as the meaning of local needs. These concepts are intended to be developed in the next version of AMC/GM issued by the Agency.

comment *680* comment by: *UK CAA*

Page No: 6

Paragraph No: 2.1

Comment: The provisions refer to 'network performance objectives'.

It is the UK CAA's understanding that this does not necessarily relate to 'performance' in the sense of FAB Performance Plans i.e., specified in Commission Implementing Regulation (EU) 390/2013 (Performance Scheme), but rather an objective to implement a given navigation performance requirement at a Network level.

Clarification is requested about who defines/decides upon network performance objectives and the respective roles of the stakeholders.

Justification: Clarity.

response *Noted.*

The explanatory note points out that PBN should also be considered to meet those requirements stemming from the performance scheme.

comment	*681* comment by: *UK CAA* **Page No:** 6 **Paragraph No:** 2.1 **Comment:** The UK CAA believes that it is impracticable to omit the obligations on aircraft operators from this NPA. Despite citing the provisions in ORO.GEN.110 and SERA.5015 any airspace change has to be conducted cognisant of fleet equipage and therefore the Cost Benefit Analysis for the change will have to take account of the potential aircraft retrofit costs. The NPA has overlooked this point. The NPA should highlight the dependency on aircraft fleet equipage and factor this in the Regulatory Impact Assessment (Section 4 of the NPA). **Justification:** Clarity.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage.

comment	*682* comment by: *UK CAA* **Page No:** 6 **Paragraph No:** 2.1 **Comment:** The UK CAA believes it is inappropriate to cite SERA.5015 as justification for the draft regulation. SERA.5015 in itself does not specify what the equipage standards are, just that aircraft need to be suitably equipped. What SERA.5015 actually does is to emphasise the inconsistency between this draft regulation's requirements to be suitably equipped to meet the proposed PBN standard and then insisting on the ANSP/Airport having to maintain conventional procedures for those aircraft that cannot. In addition, aircraft operators may insist on maintaining their conventional capabilities, thus requiring ANSPs to provide mixed operations, ironically in accordance with proposed regulation that seeks to enhance navigational standards in a harmonised manner. The proposed regulation does nothing in a proportionate manner to break the cycle between equipage and service provision. The NPA should remove the inconsistency highlighted and recognise that aircraft fleet equipage and airspace change have to go hand-in-hand. Refer to ICAO Manual on the Use of PBN in Airspace Design Doc 9992 and the European Airspace Concept Handbook for PBN implementation Edition 3.0. **Justification:** It is inconsistent and disproportionate to expect an ANSP/airport to provide conventional procedures and not require the operators to equip for the PBN procedures

whilst stating that operators should be suitably equipped for the intended route to be flown.

response *Not accepted.*

A number of rulemaking tasks are in progress to enable PBN operations in a coordinated manner. These activities address a wide variety of technical subjects allocated as appropriate within each stakeholder's regulatory domain: operational approval criteria, airspace and procedure design, AIS/AIM requirements, global PBN operations, provision of data (DAT) for airspace users.

Please see also the response to the major concerns identified section of the Opinion in relation to aircraft equipage.

comment *683* comment by: *UK CAA*

Page No: 6 and 22

Paragraph No: 2.1 and draft regulation Article 6

Comment: The UK CAA is of the view that the requirements of the proposed regulation are disproportionate, and that the NPA does not fully consider the validity (and value) of options such as RNAV 1. In addition, there appears to be little robust justification for a requirement in law to extend PCP requirements beyond 'enhanced' high density TMAs and the associated en-route sectors and specified airports. Instead, the requirements proposed in AUR.PBN.2005 Routes and procedures should be recast as AMC or GM to the PCP regulation as a means of encouraging the wider adoption of PBN without diversion of resources away from PCP implementation.

Justification: Proportionate regulation.

Proposed Text: Replace AUR.PBN.2005 Routes and Procedures, paragraphs (1) to (4) with the following:

(1) ANSPs or aerodrome operators, responsible for the provision of instrument approach procedures within airspace or at aerodromes not specified within Regulation (EU) 716/2014, should implement approach procedures with vertical guidance, that correspond to the performance and functionality as defined in Regulation (EU) 716/2014 at all instrument runway ends which are not served by a precision approach procedure.

(2) Without prejudice to paragraph 1, where limiting obstacles conditions exist, ANSPs or aerodrome operators, responsible for the provision of instrument approach procedures, may implement approach procedure with vertical guidance to aerodromes that correspond to the performance and functionality as defined in Regulation (EU) 716/2014.

(3) When implementing Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs), using PBN to meet the airspace performance needs, ANSPs or aerodrome operators, responsible for the provision of the routes, should ensure that the routes correspond to the performance and functionality as defined in Regulation (EU) 716/2014.

(4) When implementing ATS routes using PBN to meet the network performance needs, the Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011, shall ensure the coordinated design of the European Route Network that corresponds with the performance and functionality as defined in Regulation (EU) 716/2014.

response *Not accepted.*

Please note that the text of the proposed rule has been simplified. With respect to the required applicable navigation specification, see the response to the major concerns identified section of the Opinion.

comment *684* comment by: *UK CAA*

Page No: 6 and 24

Paragraph No: 2.1 and AUR/PBN.1005

Comment: The UK CAA is of the view that the requirements of the proposed regulation are disproportionate, and that the NPA does not fully consider the validity (and value) of options such as RNAV 1 as a means of leading to implementation of the requirements contained in Regulation (EU) 716/ 2014. In addition the proposed regulation does not acknowledge the fact that a number of non-RNP 1 PBN solutions are in the throes of being implemented in several European high density TMAs as precursors to compliance with PCP requirements, and that implementation of these projects will not be completed until after December 2018. The UK CAA considers it unfeasible and economically unjustifiable to cause through lawmaking the redesign of procedures associated with such projects in order to satisfy a proposed law that could be more flexible in approach. It is, however, considered appropriate that the proposed regulation be disapplied to such projects through the application of appropriately worded transition arrangements.

Justification: Proportionate regulation.

Proposed Text: Add either of the texts below as an additional paragraph to AUR.PBN.1005 as follows:

Proposed Text (1):

"AUR.PBN.1005 Scope

3) (a) Air Traffic Service Providers (ANSPs) referred to under Article 1(2) that provide air traffic services (ATS) in the airspace as defined in Article 1(1); and

(b) aerodrome operators referred to under Article 1(2)

that have developed and published local PBN implementation plans prior to the date of entry into law of this regulations shall be exempt from this regulation."

Proposed Text (2):

Alternative text:

"3) Local PBN implementation plans that have been developed and published by:

(a) Air Traffic Service Providers (ANSPs) referred to under Article 1(2) that provide air traffic services (ATS) in the airspace as defined in Article 1(1); and

(b) aerodrome operators referred to under Article 1(2)

and approved by the competent authority prior to the date of entry into law of this regulations shall be exempt from this regulation."

response *Partially accepted.*

Acknowledging that the regulation should not put undue burden on those RNAV 1 implementations already in progress and recognising that RNAV 1 may be sufficient for some TMA operations, the required PBN specifications have been amended. Please see the response to the major concerns identified section of the Opinion. However, it should be noted that the goal is for the harmonised use of specific PBN specifications and functionalities.

comment *716* comment by: *Julian Scarfe, PPL/IR Europe*

2.1 PPL/IR Europe agrees with the approach that an appropriate obligation on operators to equip is already addressed in the existing regulations. Equipage should be driven by the benefits delivered by PBN, not by mandates that have typically in the past resulted in airborne capabilities that remain largely unused in practice.

This section, however, offers the impression that aircraft are either fully PBN capable or are entirely incapable and need to resort to procedures based on conventional navaids. This is not the case. In particular as regards GA aircraft used for IFR operations in 2015:

1. RNAV 5 is almost universally supported.
2. RNP APCH non-precision (LNAV) is very widely supported, and the revisions proposed by NPA 2013-25 will ensure almost universal equipage before the effective date of this regulation.
3. RNAV 1 and RNP 1 are widely supported, typically with the same equipment. However, doubt exists over the ability of these aircraft to demonstrate compliance via a statement in the AFM, in part because most of the equipment installations predate regulatory convergence on the nomenclature and PBN specification detail. Operators should not be penalized for this.
4. RNP APCH APV (SBAS-based, to LNAV/VNAV and LPV minima) are increasingly supported, but remain available to a relatively small proportion of the fleet. However, since almost all such approaches are offered in conjunction with a non-precision (LNAV) approach to higher minima, the increase in availability of GNSS approaches, as envisaged by this regulation, are of benefit to all.

5. RNP AR APCH is impractical for almost all GA operators, and it is important that RNP AR APCH is deployed as an alternative to RNP APCH (to improve minima and track distances), not as a substitute for it.
6. RF-leg capability is **not** available in most GA aircraft, even those capable of RNP 1. The current regulatory requirements for RF-leg capability require levels of automation available only in sophisticated aircraft. The GA community sees these requirements as unreasonably conservative, and manufacturers have demonstrated perfectly adequate compliance with the PBN specification in typical GA installations.
7. Baro-VNAV capability is almost unknown in GA aircraft, and appears to be prohibitively expensive to develop. This does not present a problem for RNP APCH APV, provided SBAS-based alternatives are available. However, the capabilities set out in the ICAO PBN manual Attachment A — BAROMETRIC VNAV (BARO-VNAV) are not available to GA as part of a flight management system or navigation system. Despite that, pilots have, throughout the history of instrument flight, been perfectly capable of meeting 'at', 'at or above', 'at or below' and 'window' constraints manually. While the integration of these capabilities with navigation systems offer efficiency advantages, and the constraints should be published for aircraft that support them, alternatives must always be available for Baro-VNAV .

It would be senseless to encourage, by mandate or otherwise, the adoption of procedures unsupported by a significant fraction of the fleet, when less demanding procedures that deliver 90% or more of the incremental benefit are supported by almost the entire fleet.

As an example, to develop RNP 1 procedures including RF-legs to regional airports would exclude most of the GA fleet, and conventional procedures would be required as alternatives. However, if it were possible to use the procedure tracks with RNAV 1 or even RNAV 5 equipment with radar supervision, particularly for the turns, it would make the procedures available to almost the entire GA fleet, vastly reducing the impact of mixed mode operations. This is a model used in many current ATM environments. Moreover, if RF-legs could be avoided entirely, the need to use alternatives would be much reduced.

Airworthiness regulation of GA equipment and operations may mature to the extent that RF leg capability is widely available and cost-effective (for example through the acceptance of manually flown RF legs). Until then, wherever RF procedures are implemented, an alternative non RF procedure, which still uses the full PBN capabilities of GA GPS receivers, should also be provided.

response *Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion in relation to the proposed navigation specifications to be used.

comment *732* comment by: *AOPA Sweden*

Attachment #3

AOPA-Sweden is happy that EASA is taking the step to standardize the use of modern avionics in the European airspace. This is an important step forward! However the cost situation and has to be further adressed. See further comments.

In the USA there are now almost 6000 GPS based approaches but only appx 1300 ILS approaches.(Ref: FAA SatNavNews Winter spring 2015, page 7). Europe has long to go and the process should be accelerated and kept as efficient as possible in order to achieve the same results as in the USA.

As per 2012, as one measure of context, the United States contained 558 public-use airports with both charted instrument approach procedures and control towers that operate at least part-time. Another 2,312 public-use airports had charted approach procedures but **no control towers** (Source: Air Safety Institute, USA).

We propose that EASA makes it possible for IFR approaches including RNAV also to non towered airports. In respect of NPA 2015-01 there should be no requirements laid on a control tower on an airport with RNAV approach. We do propose that the RIA takes the US operation into account. By applying the FAA approach to IFR into non-towered airports, the utilisation of smaller airports in Europe could be increased thus improving the infrastructure.

response *Noted*

The subject matter and scope of the proposed rule is not to be extended for this specific issue. EASA will investigate further the appropriate regulatory provisions to cater for such an implementation.

comment *735* comment by: *AOPA Sweden*

We agree with the agency that no direct obligation should been proposed to aircraft operators. The obligation to equip and qualify flight crew is already addressed in the existing regulations.

response *Noted.*

A number of rulemaking tasks are in progress to facilitate the implementation of PBN in Europe.

2.2. Selection of PBN requirements - 2.2.1. Alignment issues p. 8

comment *113* comment by: *Finavia*

In practice, it is not correct to state that without the regulatory measures, aerodromes or

	Member States are at liberty to implement or adapt any of the applicable PBN specifications. The existing implementation status of RNAV 5 for ATS routes and RNAV 1 (P-RNAV) for TMA operations, should have been recognized in this context. Also ICAO Doc 7030 requires that ATS route network shall apply requirements of RNAV 5 in the European area for the time being. The PBN implementation objective of the Pilot Common Project is focused on high density TMAs, where the performance of advanced PBN applications is needed. Even though the objective of this NPA is to define PBN requirements consistent with the requirements of the Pilot Common Project, it is unclear how to justify exactly the same requirements of the performance level enablers for TMAs having less demanding capacity need. However, it must not be considered as a divider whether or not to implement PBN at all. PBN can provide great benefits also for low traffic airspaces. Too demanding regulation based requirements to provide a service level exceeding the operational needs shall not be the obstructing factor.
response	*Noted.*
	The Agency is of the view that the harmonised use of the PBN specifications and functionalities is critical. This proposal aims to ensure a common application of specific PBN requirements. The proposed rule has been revised to require implementation of RNAV 1 operations within TMA as a baseline and RNP 1 plus additional functionalities only where more stringent performance requirements are to be met.

comment	*145* comment by: *European Helicopter Association (EHA)* Para 2.2.1: Among the 565 aerodromes that are considered, those serving exclusively helicopters are not clearly defined. It is assumed that in the frame of this NPA those aerodromes are heliports. Currently, public heliports with instrument approach or departure procedures do not exist. Instrument approaches or departures at heliports can only be based on PBN procedures, the implementation of which is the goal of this NPA. We would like to recommend to mention that aerodromes serving exclusively helicopters are public heliports. Also, consider public heliports not currently fitted with instrument procedures in the list of aerodromes where PBN approach and departures procedures shall be implemented. Those PBN procedures shall be of Point-in-Space (PinS) for public heliports that are VFR only installations.
response	*Partially accepted.*
	Please, note that the operations of helicopters are included under its subject matter and scope. On the other hand, the proposed rule has been revised and now it incorporates routes to be implemented in accordance with RNP 0.3 specification.

comment	*315* comment by: *Airbus Helicopters* Airbus Helicopters fully shares comment n° 145 posted by EHA

response | *Partially accepted.*

Please, refer to response to comment 145.

comment | *366* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Explanatory Note Section 2.2.1	In the last line of page 8 of 70, where it says '*(…) in the Pilot Commom Project.*' it should say '*(…) in the Pilot Commo**n** Project.*' instead.	Typographical error

response | *Noted.*

comment | *408* comment by: *LFV*

TERMINAL - item 2.2.1 and item 2.4:

LFV finds no explanation to why the PBN IR should have the same plan for implementation as the PCP. There's no logical reason to have 565 airports/TMA, widely different in terms of size, traffic, operators, airspace, RWYs etc, to follow the same plan as 24-25 high density area airports picked-out specifically for their strategic positions.

LFV proposes - The PCP and the PBN IR have different stakeholders and foci, and that should be reflected in the regulation. The focus should be on how to effectively enhance and optimize each airspace depending on local requirements and conditions.

response | *Accepted.*

The proposed rule has been revised to require implementation of RNAV 1 operations within TMA as a baseline and RNP 1 plus additional functionalities only where more stringent performance requirements are to be met. Also, the proposed new dates take into account the present scenario and its changing evolution.

comment	*436* comment by: *EUROPEAN COMMISSION GNSS Programmes* The Regulation 716/2014 PCP IR establishes requirements only for 24 European aerodromes (high density TMAs) while for the rest of them it will be at their discretion to implement any of the applicable PBN specifications. The deadline for APV approaches proposed by the NPA would then create a no-PBN requirements time span of 8 years for 528 European Airports that will allow further proliferation of procedure designs based on different PBN specifications. The rationale behind the alignment is not understood and the drafted NPA seems to fail in complementing the PCP IR.
response	*Noted.*
	New dates have been proposed to take account of the present scenario and its changing evolution. The proposed rule has been revised to require implementation of APV as 30 January 2020.

comment	*619* comment by: *GSA* **EASA NPA 2015-01 alignment to the PCP regulation.** The Regulation 716/2014 PCP IR establishes requirements only for 24 European aerodromes (high density TMAs) while for the rest of them it will be at their discretion to implement any of the applicable PBN specifications. The deadline for APV approaches proposed in the EASA NPA would then create a no-PBN requirements time span of 8 years for 528 European Airports that will allows further proliferation of procedure designs based on different PBN specifications. The rationale behind this alignment is not understood and the drafted NPA seems to fail in complementing the PCP IR.
response	*Noted.*
	New dates have been proposed to take account of the present scenario and its changing evolution. The proposed rule has been revised to require implementation of APV as 30 January 2020.

comment	*638* comment by: *DFS Deutsche Flugsicherung GmbH* ***Alignment issues: "The remaining 565 aerodromes within Europe …."*** According to our information and based on ICAO Annex 10, ICAO Doc 8168 Volume 2, Annex 14 and ICAO Annex 6, it must be assumed that the number of relevant aerodromes will be even higher since the establishment of IFR approach procedures is also possible at VFR aerodromes. DFS requires further information as to how EASA intends to mandate the implementation at the relevant aerodromes.

response | *Noted.*

Article 1 establishes the scope of the proposed regulation making a reference to the Basic Regulation. This reduces the applicability of the proposed provisions to aerodromes where operations are supported by instrument approach or departure procedures and also:

(a) have a paved runway of 800 metres or above; or

(b) exclusively serve helicopters;

unless Member States decide to exempt from the provisions of this Regulation an aerodrome which:

— handles no more than 10 000 passengers per year, and

— handles no more than 850 movements related to cargo operations per year.

comment | *685* comment by: *UK CAA*

Page No: 8

Paragraph No: 2.2.1

Comment: Alignment of the requirement for RNP APCH at airports by January 2024, whilst compatible with the PCP, is inconsistent with obligations that States have given to ICAO in meeting General Assembly Resolution A37-11 by end of 2016. Having a 2024 date may have a negative business effect in "switching-off" investment and funding (e.g., from the European GNSS Agency (GSA)). An extension of the NPA's proposed compliance date for RNP APCH at runway ends where only a non-precision approach exists to the end of 2020 is recommended.

It is recommended to either remove the extension of the PCP requirements to non-PCP aerodromes or (as a minimum) extend the NPA's proposed compliance date for RNP APCH at runway ends where only a non-precision approach exists to at least the end of 2020.

Justification: This suggestion stems from the fact that there is a European paucity of IFP design resource (and at competent authority level the appropriate oversight and approvals resource).

The NPA's 'invitation' to non-PCP aerodromes to implement PBN to the proposed specifications will place an unacceptable burden upon this limited resource that will only lead to delay (or failure) to achieve the NPA's stated objective of 'safe, efficient and harmonised PBN implementation in the EATMN that support an improved operation of the network and are consistent with the requirements as specified in the Pilot Common Project'. Such damage is avoidable through proportionate and flexible regulation.

response | *Partially accepted.*

Please note that the deadline to implement APV at all instrument runway ends not served by

a precision approach procedure has been brought forward in time until 30 January 2020.

comment *686* comment by: *UK CAA*

Page No: 8

Paragraph No: 2.2.1

Comment: The UK CAA strongly disagrees with the statement:

"Such a possible fragmented application of PBN would result in a complex airspace structure and operational procedures as a consequence of numerous transitions between the various possible PBN Navigation Specifications areas".

Justification: The UK experience is that having a homogeneous fleet capability is essential when selecting a navigation specification and that accommodating both "PBN" and "non-PBN" capabilities can lead to inefficiency in airspace design and operations with potential safety issues linked to operating an environment with a mixed capability. However, having different PBN capabilities e.g., RNAV 1 and RNP 1 within an airspace concept can work quite efficiently and indeed, the UK CAA sees the use of RNAV 1 as a transitional state that can offer short term benefits ahead of the fleet equipping to an RNP 1 standard. Having transitional requirements is essential given the diverse local requirements that exist across the UK and Europe from small regional airports with low complexity airspace and large fleet variance to that of the major airports with high density traffic and a higher fleet capability. It is for this reason that Schiphol has mandated RNAV 1 equipment carriage, London has done similarly with November 2017 for aircraft and winter 2019 for airspace changes and Paris plans to do so also.

EASA is requested to provide evidence of a possible negative impact on the overall efficiency of the European network due to the possible transitional requirements, as this does not reflect European experience.

response *Noted.*

The sentence refers to a possible development via the application of different PBN specifications in the en-route airspace. If such an application would occur, the transition between the airspaces would be complex and lead to inefficiency.

2.2.2. Selection of PBN requirements p. 9-12

comment *5* comment by: *Prof. Filippo Tomasello*

NPA 2013-25 proposed to delete operational approval (alias SPA) for all PBN types listed in table 1. Therefore plese delete the expression "operational approval" from the heading of

	said table
response	*Noted.*
	In accordance with NPA 2013-25, operational approvals are required only for RNP AR APCH operations, RNP 0.3 helicopter operations and the advanced RNP function time of arrival control. However, *SPA.PBN.100 PBN operations* is still in force and requires operational approvals for PBN operations, except for RNAV 5 operations. Opinion 03/2015 is pending for evaluation at the time of this CRD preparation. Please see EASA Opinion 03/2015 http://easa.europa.eu/document-library/opinions/opinion-032015 Furthermore, this table was included to show the basis for the choice of the PBN specifications. It was not intended to define how the regulations would evolve.

comment	*6* comment by: *Prof. Filippo Tomasello* Should table 1 not be republished, since part of the EN and not of the proposed rules, please clarify in the Explanatory Note of the future Opinion, that the number of cases in which the infamous "operational approval" is required for pBN is being drastically reduced. The Agency may want to refer to RMT.0256, NPA 2013-25, the related CRD (publication expected bfore summer 2015) and te related Opinion (publication expected simulatenously with CRD 2013-15). This information would be useful to operators to avoid one of their major fears on PBN .... one more administrative process for each PBN type :-(
response	*Noted.*
	In accordance with NPA 2013-25, operational approvals are required only for RNP AR APCH operations, RNP 0.3 helicopter operations and the advanced RNP function time of arrival control. However, *SPA.PBN.100 PBN operations* is still in force and requires operational approvals for PBN operations, except for RNAV 5 operations. Opinion 03/2015 is pending of evaluation at the time of this CRD preparation. Please see EASA Opinion 03/2015 http://easa.europa.eu/document-library/opinions/opinion-032015

comment	*105* comment by: *Heathrow Airport Limited* Table - shows timescale - so see previous comment
response	*Noted.*
	Please see the response in the response to the major concerns identified section of the Opinion.

comment	*114* comment by: *Finavia* Contents of the Table 1 are presented as a basis for the selection of the proposed PBN requirements, which are then stated as having been accepted by relevant stakeholders and Member States. It is important to note that the relevant stakeholders have accepted the whole package as proposed. The effective implementation process requires consistent progress of both the aircraft capabilities and the procedures/routes. The selected approach taken in this NPA of not proposing any direct obligation for aircraft operators to comply with the relevant PBN capability, with the requirement to maintain non-PBN procedures and the supporting navigation infrastructure for an undefined time period in the future, is not in line with the objective of the RMT to ensure an efficient and harmonized PBN implementation in Europe. Thus, regulatory measures shall also oblige aircraft operators to obtain the PBN capability consistent with the requirements set for the routes and procedures. The PBN implementation objective of the Pilot Common Project is focused on high density TMAs, where the performance of advanced PBN applications is needed. Even though the objective of this NPA is to define PBN requirements consistent with the requirements of the Pilot Common Project, it is unclear how to justify exactly the same requirements of the performance level enablers for TMAs having less demanding capacity need. However, it must not be considered as a divider whether or not to implement PBN at all. PBN can provide great benefits also for low traffic airspaces. Too demanding regulation based requirements to provide a service level exceeding the operational needs shall not be the obstructing factor.
response	*Noted.*
	Please see the response in the response to the major concerns identified section of the Opinion.

comment	*172* comment by: *EUROCONTROL* **Page 9 - Selection of PBN requirements - 2nd paragraph** EUROCONTROL raises the same issue through two questions: 1. The decision to select beginning 2019 for RNP1 was not clear. Following the consultation period, Option 2A identified end 2020. The decision therefore does not appear to be building on the EUROCONTROL stakeholder consultation work. Furthermore, whilst the RNP APCH is clearly aligned with the PCP, the 2019 date is not. EUROCONTROL therefore questions the 2019 decision. 2. "The agency took due account of the European concept for PBN operation". Given that the suggested rule is different in every points from the suggested requirement built after EUROCONTROL consultation (Table 1 on page 10), EUROCONTROL questions which document providing the European Concept forms the basis for the dates given?

response | *Noted.*

It should be noted, as already indicated in the comment that the proposal differs significantly from that proposed as option 2A of Eurocontrol RAD. Given that, with the exception of RNP APCH, there is no mandate, the date of December 2018, after which PBN applications corresponding to the rule are to be compliant, is considered to be of sufficient lead-time to enable implementation. Furthermore this table was included to show the basis for the choice of the PBN specifications. It was not intended to define how the regulations would evolve. The European concept for navigation can be derived from the SESAR Concept of Operations.

comment | *285* comment by: *AvinorANSP*

As a result of this prior consultation, the identification of the specific navigation specifications to be
implemented is not included in this rulemaking task.

Comment:

It would be better if this rulemaking task include PBN specifications as they are defined in ICAO DOC 9316.

Table 1: Proposed PBN Requirements

Comment:
The title of "Table 1: Proposed PBN Requirements" should include a reference to the origination of this table in the title, even if it`s explained on page 9. Just to avoid any misunderstandings, since the content of the table differs considerably with the new requirements in this rulemaking task.

response | *Noted.*

The Agency can confirm that the navigation specification are those referenced in ICAO's Doc 9613. Furthermore this table was included to show the basis for the choice of the PBN specifications. It was not intended to define how the regulations would evolve.

comment | *316* comment by: *Airbus Helicopters*

"*As a result of this prior consultation, the identification of the specific navigation specifications to be implemented is not included in this rulemaking task*": This sentence is not very clear and not consistent with NPA proposal for AMC1 AUR.PBN.2015 where navigation specifications to be implemented are identified.

We suggest to reword the sentence for better clarity and consistency with NPA proposal for AMC1 AUR.PBN.2015

response *Not accepted.*

The explanatory note of the NPA is not subject to amendment.

comment *337* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
In line with the comments already made to the ToRs of **RMT.0639**, AESA fully supports that the Agency has taken due account of previous work, in particular of the EUROCONTROL consultation and the resulting RAD.	It is important to take stock of all the hard work already done by the European PBN community and bring it forward to a result that satisfies the most part of that community.

response *Noted.*

comment *427* comment by: *Rockwell Collins, Inc.*

Page 11
Table 1

Comment: “Advanced RNP” is mentioned only twice (pages 11 and 32), but the application is unclear. Everywhere else, the NPA only discusses ±1NM and ±0.3NM. Are Scaleable RNP values not needed?

Suggested Resolution: Clarify aircraft and airspace requirements for using database RNP values, especially where and when RNP values other than 2NM, 1NM, and 0.3NM may be implemented.

Comment is Suggestion

response *Noted.*

AMC/GM will be expanded to give further clarification on performance requirements (like accuracy).

comment	*444* comment by: *CAA-N* P 9: ... This proposal, as shown in Table 1 for reference... It is not clear for CAA-N how to refer to this Eurocontrol RAD Table, as the timeframes in this NPA deviates significantly from those given in the Table. The presumtions has been abandoned.
response	*Noted.*
	This table was included to show the basis for the choice of the PBN specifications. It was not intended to define how the regulations would evolve.

comment	*591* comment by: *IACA International Air Carrier Association* **P10- Table 1: Proposed PBN Requirements** In conformity with ICAO Annex 11, it is strongly advised that new RNP1 procedures shall be consulted with 'lead carriers' (often home-based airlines) as early as possible in the design process to take benefit of local, operational and aircraft performance knowledge.
response	*Noted.*
	In order to provide a more precise answer, the provision of the ICAO Annex 11 reference should be specified. However, your suggestion will be evaluated in order to develop the corresponding AMC/GM.

comment	*596* comment by: *Baranes* Although the NPA mentions that this proposal has been elaborated in accordance with the PBN RAD consultation process previously held by Eurocontrol, , the detailed reading of the proposals shows there are some strong discrepancies. Indeed, many very significant different changes have been observed from Eurocontrol RAD, in term of PBN functions required, in term of implementation dates, and in term of balance of requirements versus ANSPs and airspace users. The PCP document which also has been a source of reference for this PBN 2015 NPA shows significant different dates for some requirements than those retained here. One alignment date retained by EASA from the PCP seems to be 2024 for implementing APV operations for all airports, but on those airports, there are complete sets of precision approach procedures, APV will be used to maintain accessibility in case of unavailability of a precision approach mean. All the other airports in the scope of the NPA will benefit from APV procedures for accessibility, but mostly for improvement of the safety. Therefore, it is a priority to equip them, as stated in Eurocontrol recommendations, and ICAO recommendations toward APV implementation by 2016, as again highlighted during the recent High Level Safety

	Conference. DSNA recommendation to EASA is thus to align back the different requirements with the Eurocontrol PBN RAD submitted to consultation, which in the understanding of DSNA was also quite aligned with the PCP requirements, or to organize a new consultation and rewrite accordingly the NPA. The users mandate is of tremendous importance to obtain an optimized navigation in Europe.
response	*Not accepted.*
	Please see the Agency's view in the response to the major concerns identified section of the Opinion.

comment	*641* comment by: *Virgin Atlantic Airways - Flight Technical Support* Regarding the requirement for FRT, we do not believe that the need for this functionality is proven from either an efficiency perspective or as capacity enhancment tool. An FMS hardware retrofit would be required on a large number of airframes to meet this requirement - even some that have only recently entered service. A more robust CBA should be provided to enable further assessment by operators. Additionally, this functionality would not be required to deliver the stated service provision of Free Routes/user-preferred trajectories as it would be inconsistent with the concept; the value in high density airspace is undetermined at this point.
response	*Accepted.*
	FRT functionalities have been deleted from the revised draft rule. Please see also the response to the major concerns identified section of the Opinion regarding the proposal of navigation specifications to be adopted.

comment	*687* comment by: *UK CAA* **Page No:** 9 **Paragraph No:** 2.2.2 **Comment:** The regulatory approach material that was developed by EUROCONTROL had only been subject to *informal* consultation and therefore was not necessarily accepted by the relevant stakeholders and member States as suggested in paragraph 2.2.2. **Justification:** The earlier EUROCONTROL work, including the informal consultation and the resulting Regulatory Approach Document (RAD) and the need for accurate reportage within the Explanatory Note **Proposed Text:** Paragraph 2.2.2 should be amended to better reflect the status of the earlier

EUROCONTROL work as follows:

'… This Regulatory Approach Document defined the proposed navigation specifications and functionalities that should be implemented in the European airspace. This proposal, as shown in Table 1 for reference, has been informally presented to the relevant stakeholders and Member States..'

response *Noted.*

The selection of the navigation specification as proposed in the NPA was based on the results of the prior consultation previously undertaken by EUROCONTROL and that specified in the Pilot Common Project Regulation.

comment *688* comment by: *UK CAA*

Page No: 10

Paragraph No: Table 1

Comment: Table 1 from the EUROCONTROL Regulatory Approach Document reflects RNP 1 in Terminal airspace by end of 2020 and Advanced RNP with FRT by end of 2023. These dates are informed from the ANNEX E Preliminary Economic Impact Assessment. It is not understood therefore, how the date of December 2018 for the application of these navigation specifications in the respective airspace can be justified when the EUROCONTROL work clearly suggested fleet equipage issues, the need for a later compliance date and an exemption for aircraft greater than 20 years of age.

The UK CAA requests clarification of how the dates proposed by EASA were determined.

response *Noted.*

Given that with the exception of RNP APCH there is no mandate, the date of December 2018, after which PBN applications corresponding to the rule are to be compliant, is deemed to provide sufficient lead-time for the start of implementation. Implementation decisions are to be made based on local performance objectives that should include the capability of aircraft operating to the aerodrome. Furthermore, this table was included to show the basis for the choice of the PBN specifications. It was not intended to define how the regulations would evolve.

comment *717* comment by: *Julian Scarfe, PPL/IR Europe*

2.2.2 We remind the Agency that the Regulatory Approach Document stated:
Consideration will be given to subjecting General aviation aircraft to RNP-1 Specification requirements with RF leg in TMA only, plus RNP APCH capabilities. The intention would be that small GA airplanes are excluded from the requirements of the PBN IR which apply outside the approach environment. The capabilities provided by ETSO-146(C) compliant

equipage could be considered sufficient for the objectives of the PBN IR, where appropriate. This will be subject to further detailed analysis during the extended regulatory impact assessment.

The capabilities provided by ETSO-146(C) compliant equipage potentially include RNP1, but not RF-legs, nor BaroVNAV. While the NPA proposes that Mixed Operations must accommodate non-compliant aircraft, it would seem advantageous and consistent with the spirit of the Regulatory Approach Document to ensure that the vast majority of procedures can be flown using ETSO-146(C) compliant equipment.

We are unaware of any further detailed analysis of the impact on GA, and would welcome the publication of such material by the Agency.

response *Noted.*

Please refer to response to the major concerns identified section of the Opinion.

comment *727* comment by: *AOPA Sweden*

1. Consideration should be made if there is really a need for operational approval for GA operations. Flying an RNP approach or the use of RNP enroute is esentially simpler than using conventional navigation.

2. To accomplish the above comment, consider a revision to the Learning objectives for the instrument rating and ATPL courses, so that RNAV and RNP covered to an extent that additional approvals can be avoided. In this way unnessecary administration can be avoided.

Already now, GNSS is the primary navaid for most IFR pilots enroute.

response *Noted.*

The subjects mentioned are out of the scope of the rulemaking task. The Agency is processing a number of rulemaking tasks to facilitate the implementation of PBN, including operational approval criteria.

Please see EASA Opinion 03/2015 http://easa.europa.eu/document-library/opinions/opinion-032015

2.3. Overview of the issues to be addressed p. 13

comment *12* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:

	PBN offers a number of advantages over the conventional sensor-specific methods of developing and operating on routes and approach procedures. For instance, PBN...[points a) to d)] **COMMENT:** Safety benefits present in other sections of the NPA (e.g. 4.5.1) should be added to the list [points a) to d)]
response	*Not accepted.*
	The explanatory note is not subject to amendment.

comment	*57* comment by: *ENAC ATM* Talking about "harmonised use of the PBN" means that pilot and ATC training must be prepared accordingly. What is suggested in that way?
response	*Noted.*
	The suggestion will be taken in duly account when finalising the AMC/GM material.

comment	*106* comment by: *Heathrow Airport Limited* No information on the negative impacts of PBN as possibly perceived by local communities
response	*Noted.*
	Please refer to the Regulatory Impact Assessment.

comment	*115* comment by: *Finavia* In practice, it is not correct to state that without regulatory measures, aerodromes, ATM/ANS providers or Member States could implement or adapt any of the applicable PBN specifications leading to a fragmented, non-harmonized, inefficient and potentially unsafe PBN implementation. The existing implementation status of RNAV 5 for ATS routes and RNAV 1 (P-RNAV) for TMA operations, should have been recognized in this context. Also ICAO Doc 7030 requires already that ATS route network shall apply requirements of RNAV 5 in the European area for the time being.
response	*Noted.*
	The Agency considers that the harmonised use of specific PBN specifications and functionalities is critical. This proposal aims to ensure a common application of these PBN

	requirements.

comment	*146* comment by: *European Helicopter Association (EHA)* Para 2.3: The efficient and safe access to European aerodromes serving exclusively helicopters (i.e. heliports) is also needed. Although the term "aerodrome" encompasses heliports, there is a need to highlight the importance of PBN procedures for efficient and safe access to heliports. We would recommend to modify the sentence as "….safe access to European aerodromes (including those serving exclusively helicopters) are to be…."
response	*Not accepted.*
	Please note that the proposed rule has been revised and now it incorporates routes to be implemented in accordance with RNP 0.3 specification.

comment	*151* comment by: *skyguide Corporate Regulation Management* **2.3 Equipment requirements for airspace users should be introduced to allow a reduction of conventional navigation aids.** Issues to be addressed: • PBN reduces the need to maintain sensor-specific routes and procedures, and their associated costs. • As long as the proposal requires to keep conventional routes and procedures, conventional facilities cannot be decommissioned and the associated costs cannot be saved. • That contradicts to the ICAO strategy as well as the SESAR goals. **2.3 Equipment requirements for airspace users should be introduced to allow a more efficient use of the airspace.** Issues to be addressed: • Allows for a more efficient use of the airspace. • (see also comment above) As long as we have significant mixed mode operations, an efficient use of the airspace is not feasible.
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion.

comment	*317* comment by: *Airbus Helicopters* Airbus Helicopters fully shares comment n° 146 posted by EHA

response	*Not accepted.*
	The proposed rule has been revised and now it incorporates routes to be implemented i.a.w. RNP 0.3 specification.

comment	*415* comment by: *LFV* **Issues to be adressed** - item 2.3: LFV is concerned about the coordination (or lack therof) with the global aviation community and other related programs including PBN and for example NextGen. Obviously whatever changes made within Europe will affect operators the entire world. If EASA has coordinated the proposed regulation with any other organisation it would be very valuable information for us all to take part of before PBN IR is decided. **LFV proposes -** For EASA to present documentation to show the proposed PBN IRs applicability with global and surrounding states/areas and their PBN plans and programs respectively.
response	*Accepted.*
	The proposed PBN implementation is consistent with that of other regions.

comment	*416* comment by: *LFV* **Issues to be adressed** - item 2.3: Whatever responsibility EASA takes on, the fact is that ICAO is the international UN organisation for states worldwide and member states are to follow ICAO recommendations. For EASA not to respect this puts the stakeholders of the PBN IR in an unnecessary complex and complicated situation. **LFV proposes -** LFV expects that there will be no conflicts between ICAO regulation and EASA/EU PBN IR.
response	*Partially accepted.*
	The Agency take into account any recommendation proposed by ICAO in order to ensure the absence of conflicts. However, its 'recommendations' are not mandatory and different approaches might be necessary at regional level.

comment	*431* comment by: *FNAM* FNAM considers that a modification of current Regulation about the selection of alternate airports could boost the implementation and the use of APV approachs. Namely it seems there is a discrepancy between the willingness to generalize APV operations and the requirement to choose an alternate airport with a conventional approach when a GNSS approach has been choosed for destination airport.
response	*Noted.*
	The criteria to select an alternate aerodrome is not under the scope of this proposed regulation. It has been addressed in EASA Opinion 03/2015.

comment	*450* comment by: *CAA-N* P 13 2.3 ... PBN is, therefore, one of the... How can EASA emphasize the importance of the ICAO GANP, and still issue a NPA with significant deviations from ICAO A37-11 on APV?
response	*Noted.*
	Please see the response to the major concerns identified section of the Opinion with regard to the implementation dates. It should be recognised that when adopting a regulation, sufficient time is needed to enable the regulated parties to comply.

comment	*639* comment by: *DFS Deutsche Flugsicherung GmbH* We do not understand this statement. ICAO Document 9613 contains the standards for worldwide application when implementing PBN (RNAV and RNP) procedures.
response	*Noted.*
	The Agency interprets that the comment refers to the whole section. Certainly, ICAO defines the applicable navigation specifications and the Agency proposes which of them should be chosen in order to promote a harmonised application.

comment	*689* comment by: *UK CAA* **Page No:** 13 **Paragraph No:** 2.3

Comment: See also previous UK CAA comment against 2.2.1 Alignment issues. The UK CAA maintains that an efficient, harmonised and safe implementation of PBN can be achieved within Europe through use of RNAV 1 and RNP 1 in terminal airspace and even RNAV 5 and RNP 1 in en-route airspace.

Subpart PBN in PART-AUR should be amended to reflect actual European experience.

Justification: European experience to date suggests that the benefits are derived from modernising airspace structures from conventional navigation to PBN. Having overly restrictive navigation specifications is counter-productive given the current and projected fleet equipage and may incur unnecessary additional costs for a proportion of airspace users.

response *Accepted.*

Please refer to the response to the major concerns identified section of the Opinion.

2.4. Objectives p. 14

comment *408* ❖ comment by: *LFV*

TERMINAL - item 2.2.1 and item 2.4:

LFV finds no explanation to why the PBN IR should have the same plan for implementation as the PCP. There's no logical reason to have 565 airports/TMA, widely different in terms of size, traffic, operators, airspace, RWYs etc, to follow the same plan as 24-25 high density area airports picked-out specifically for their strategic positions.

LFV proposes - The PCP and the PBN IR have different stakeholders and foci, and that should be reflected in the regulation. The focus should be on how to effectively enhance and optimize each airspace depending on local requirements and conditions.

response *Accepted.*

The proposed rule has been revised to require implementation of RNAV 1 operations within TMA as a baseline and RNP 1 plus additional functionalities only where more stringent performance requirements are to be met. Also, the proposed new dates take into account the present scenario and its changing evolution.

comment *729* comment by: *AOPA Sweden*

AOPA Sweden suggests that the objective should be extended to cover up for the use of PBN to a larger extent to GA operators. This is in line with the objective 1 of the GA road map.

	A large number of GA aircraft in Europe are fully capable of RNAV approaches. Regulatory and or national requirements prohibits or sets out costly extra aircraft approval procedures (in Sweden) to use them despite that the same avionics can be used in the USA for GPS approaches. This is creating a non-level playing field where european GA aircraft owners gets an comparative disadvantage compared to the American or other european countries. The level playing field EU regulation would be a step forward.
response	*Not accepted.*
	Specific operational approval provisions are not under the scope of the proposal. The Agency is processing a number of rulemaking tasks to facilitate the implementation of PBN.

2.5. Regulatory overview p. 14-17

comment	*13* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** *— be applicable to:* *[...]* *operations of aircraft by a third country operator;* **COMMENT:** Since Part-TCO applies only to commercial air transport, please clarify if this NPA applies also to third country, non commercial operators.
response	*Noted.*
	The proposed regulation applies to operations of aircraft by a third country operator regardless of the type of operation, which means registered in a third country, or registered in a Member State which has delegated their regulatory safety oversight to a third country, and used by a third-country operator into, within or out of the Community. Commercial air transport operations only are required to hold an authorisation issued by the Agency.

comment	*173* comment by: *EUROCONTROL* **Page 15 - Regulatory overview - 2nd paragraph** EUROCONTROL asks a question: The requirements are applicable to **all** airspace users. This means that helicopter

	operations cannot benefit from RNP0.3 - Is this a correct interpretation?
response	*Noted.*
	The scope of the proposed rule does not exclude helicopter operations and the proposal has been amended to include the use of the RNP 0.3 specification.

comment	*188* comment by: *ENAV* - "... the creation and proliferation of individual Regulations ...." the statement is not correct. This could be true before the introduction of the PBN manual, but not now. All European ANSPs (based on the data acquired in the various PBN Task Forces) are working unison applying navigation procedure according to the phases of flight in the PBN manual (so RNAV 5 for the en-route, RNAV 1 for arrival and departure);
response	*Noted.*
	The PBN Manual published by ICAO allow Member States to develop their airspace concepts, which means they may implement a number of navigation specifications depending on the performance needed in each particular case. Therefore, a single EU regulation containing the mandated requirements applicable to all airspace users was deemed necessary to promote and ensure harmonisation.

comment	*224* comment by: *ESSP-SAS* This NPA proposes to add a new Subpart (Subpart PBN) within the existing Part AUR which only covered, until now, the ACAS mandate for operators. Since this NPA doesn't intend to finally enforce any obligation on aircraft, it would have been more logical to modify the existing Part ANS and Part ATM/ANS to enforce ANSPs and aerodrome operatos rather than creating a new Subpart under Part AUR.
response	*Not accepted.*
	The use of Part-AUR is to define how the airspace will be used. The Part-ANS, Part-ATM/ANS and other regulation will contain the detail technical requirements.

comment *338* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
AESA fully supports "*single regulation containing the mandated requirements applicable to all*	AESA also supports the full application of the '*Total System Approach*' and the

	airspace users and to the use of the airspace". principles of '*Better regulation*'.
response	*Noted.*

comment	*383* comment by: *NATS National Air Traffic Services Limited* The EASA SERA Part C amendment to EU 923/2012 SERA Parts A & B is amending the format and content of EU 1332/2011 Airspace Usage, both Articles and Annex, and is expected to become law in 2015. This NPA is proposing to repeal 1332/2011 Airspace Usage and make changes to the existing Annex. There appears to be an inconsistency between the two pieces of legislation. Suggested resolution: Co-ordination is needed between these two EASA rulemaking bodies before the Opinion on NPA 2015-01 is published.
response	*Accepted.*
	The intent is to replicate the agreed text as proposed in the SERA C amendment.

comment	*718* comment by: *Julian Scarfe, PPL/IR Europe* This makes no sense. It is indeed desirable that: "The regulatory requirements and means of compliance should be a set of harmonised and complementary provisions, allocated as appropriate within each stakeholder's regulatory domain." The proposal has the opposite effect, mixing requirements on operators in subpart ACAS with requirements on ANSPs in subpart PBN.
response	*Not accepted.*
	The scope of the new regulation has been expanded to include all entities that may be responsible for preparing or responding to changes to airspace usage and conducting operations in the airspace. The structure of the new regulation is easily expandable to include other subject matter in support of the European ATM Master Plan deployment.

2.6. State aircraft p. 17

comment	*58* comment by: *ENAC ATM* What is the real impact for state aircraft ? "Their operation may be limited": who will operate the limitations?
response	*Noted.*
	The proposed provisions cater for maintaining mixed PBN and non-PBN operations based on local or national performance considerations. The revised proposal incorporates the necessity for publishing operational limitations in the AIP.

comment	*116* comment by: *Finavia* The second paragraph gives an impression the proposed regulation requires that procedures and routes based on conventional navigation aids will be maintained subject to identified performance needs. However, AUR.PBN.3005 does not include any reference to the possibility of discretion subject to identified performance needs, as it should. The conventional navigation aids shall be maintained only when local needs exist.
response	*Not accepted.*
	AUR.PBN.3005 already includes that limitations shall be commensurate with the operational performance need (see paragraph 2). The drafting of AUR.PBN.3005 has been revised with respect to the draft rule proposed in the NPA.

comment	*152* comment by: *skyguide Corporate Regulation Management* **2.6 State aircraft ....** With respect to this proposal, no such exemptions or transitions are envisaged as the proposed regulation requires, subject to identified performance needs, that procedures and routes based on conventional navigation aids will be maintained. This will, therefore, permit non-PBN-capable State aircraft to continue to operate; however, their operations may be limited with respect to access times and may not always have the most direct routings. This is not realistic. States decide at FUA Level 1 their priority and can therefore force their requirements.
response	*Partially accepted.*
	Coordination between civil and military authorities performed at strategic, pre-tactical and

tactical levels should contribute to set out these limitations and to ensure its planning and compliance. However, it is not likely to use the FUA concept to limit operations of State aircraft with a TMA.

comment *174* comment by: *EUROCONTROL*

Page 17 - State aircraft - 2nd paragraph

EUROCONTROL asks a question:

"As no exemptions or transitions are envisaged for State aircraft (...) procedures and routes based on conventional navigation aids will be maintained." What are those navigation aids?

EUROCONTROL makes several paramount comments from a military perspective that are followed by a recommendation:

Military air operations and training entail the need for unrestricted access to airspace and aerodromes, including where PBN requirements will apply. Those military operations and training will be conducted by non PBN-equipped State aircraft and shall be facilitated, within safety limits, irrespective of its GAT or OAT status and mixed mode environment.

The appropriate arrangements to accommodate non-PBN State aircraft operating as GAT in final approach, terminal and en-route, where PBN structures and procedures have been introduced, must be explicitly described in the regulatory text of the Draft Regulation (Draft Opinion). ATSPs and aerodrome operators shall not limit military operations on the basis of non-safety related operational performance needs.

As it is written currently, the contents of the NPA Explanatory Note, paragraph 2.6 (State aircraft) are not compatible with the statements above. The same applies to the regulatory text in the Proposed Amendments (SUBPART PBN, Section II, AUR.PBN.3005 Mixed operations) with respect to the absence of exemptions/transition arrangements and conventional navigation support provided to non-PBN-capable State aircraft to be limited with respect to access times and not always having the most direct routings.

Therefore, EUROCONTROL recommends the following:

The text of the Proposed Amendments, namely article 1 of the Draft Regulation (draft EASA Opinion) must include an explicit reference to the caveats related with military operations and training in the Regulations (EU) Nr 549/2004 of 10 March 2004 article 1§2 and Nr 216/2008 of 20 February 2008 (EASA) article 1.2.

These comments are also valid for the “Proportionality analysis from an airspace user perspective” as described in 4.5.6.2.

response *Partially accepted.*

The recitals of the proposed regulation explicitly excludes military operations and training.

Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels should contribute to set out limitations for Non-PBN state aircraft operations and to ensure its planning and compliance.

comment *201* comment by: *French State Aviation Safety Authority (DSAÉ)*

· Military air operations and training entail the need for unrestricted access to airspace and aerodromes, including where PBN requirements will apply. Those military operations and training will be conducted by **non PBN-equipped State aircraft** and shall be facilitated, within safety limits, irrespective of its **GAT** (or OAT) status and mixed mode environment.
· That requirement is not compatible with statements in the NPA Explanatory Note, paragraph 2.6 (State aircraft), in respect to the absence of exemptions/transition arrangements and conventional navigation support provided to non-PBN-capable State aircraft to be limited with respect to access times and not always having the most direct routings.
· The appropriate arrangements to accommodate non-PBN State aircraft operating as GAT in final approach, terminal and en-route where PBN structures and procedures have been introduced, must be explicitly described in the regulatory text of the Draft Regulation (Draft Opinion). This provision must provide the assurance that ATSPs and aerodrome operators will not limit military operations on the basis of non-safety related "operational performance needs".

1. Limitations, restrictions and constraints are not acceptable for military aircraft on operations even for non PBN-equipped aircraft.

2. The requirement to maintain conventional navigation aids should be reflected in the final opinion.

response *Partially accepted.*

The recitals of the proposed regulation explicitly excludes military operations and training.

Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels should contribute to set out limitations for Non-PBN state aircraft operations and to ensure its planning and compliance.

comment *630* comment by: *Spanish Air Force Staff*

Military air operations and training entail the need for unrestricted access to airspace and aerodromes, including where PBN requirements will apply, in order to accomplish with political decisions requiring the use of airspace of sovereignty or by international agreements. Those military operations and training could be conducted by non PBN-equipped State aircraft and shall be facilitated, within civil-military coordination safety limits, irrespective of its GAT or OAT status and mixed mode environment.

That requirement is not compatible with statements in the NPA Explanatory Note, paragraph 2.6 (State aircraft), and in the Proposed Amendments (SUBPART PBN, Section II, AUR.PBN.3005 Mixed operations) in respect to the absence of exemptions/transition arrangements and conventional navigation support provided to non-PBN-capable State aircraft to be limited with respect to access times and not always having the most direct routings. This absence could lead to States not to be able to employ their military means as required by their sovereignty duties and compromises, or, at least, to subordinate their employment to the commercial use of airspace. Costs related to PBN for military, compromise State budgets if no exemptions/transition arrangements are implemented.

The appropriate arrangements to accommodate non-PBN State aircraft operating as GAT in final approach, terminal and en-route where PBN structures and procedures have been introduced, must be explicitly described in the regulatory text of the Draft Regulation (Draft Opinion). This provision must provide the assurance that ATSPs and aerodrome operators will not limit military operations on the basis of non-safety related "operational performance needs". In order to provide air navigation services to state aircraft (with no obligation to be equipped) a mixed environment (PBN and non-PBN routes, corridors and approaches) or alternative routes for non-equipped aircraft shoud be developed, without penalizing the State aircraft. De-confliction during the design of new RNP-RNAV procedures with the traditional procedures based on ground navaids will minimize the impact of new RNP-RNAV procedures with the traditional procedures based on ground navaids will minimize the impact of PBN in State a/c. When deciding the application date for this regulation, the required time for ATCO training should be taken into account.

response | *Partially accepted.*

The recitals of the proposed regulation explicitly excludes military operations and training.

Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels should contribute to set out limitations for Non-PBN state aircraft operations and to ensure its planning and compliance.

comment | *640* comment by: *DFS Deutsche Flugsicherung GmbH*

DFS requests EASA to provide information as to what extent the present NPA has been coordinated with the military partners concerning EUROAT/OATTS. It will not be possible to properly introduce PBN without clarifying its repercussions for military airspace users.

response | *Noted.*

This proposal was prepared as an Agency task, without the use of a rulemaking group. It was consulted via the normal process, requesting comments from all interested parties including the military.

comment | *690* comment by: *UK CAA*

Page No: 17

Paragraph No: 2.6

Comment: The NPA acknowledges that one of the primary concerns of Member States is the continued access to the airspace for State and military aircraft when undertaking operations or training as General Air Traffic (GAT), and the associated cost incurred by governments to modify the military fleets. However, no specific exemption conditions or transitions are envisaged as the proposed regulation requires, subject to identified performance needs, that procedures and routes based on conventional navigation aids will be maintained. This will, therefore, permit non-PBN-capable State aircraft to continue to operate; however, their operations may be limited with respect to access times and may not always have the most direct routings.

Delays and re-routes for routine flights and training will be acceptable but operationally essential flights cannot be delayed. This should be acknowledged within the NPA/CRD, and the Agency is invited to suggest the means by which this obligation may be met by Member States were the regulation to be adopted as proposed and without change.

In addition, citing Annex II to Regulation (EC) No 552/2004 and Article 1.2(a) of the Basic Regulation assumes, by merely requiring Member States to take due account of the objective as far as practicable for aircraft engaged in State activities, that such activities will be accommodated in the anticipated manner. It also anticipates that, where practicable, States will have aircraft and crew qualified for PBN operations.

Such assumptions do not appear to have been reflected in the NPA's supporting RIA, nor is there any recognition that Member States have the financial, technical and personnel capacity and/or capability to ensure these assumptions can be realised. The Agency is invited to consider more widely the impacts the proposed regulation could have on military operations, as the assumptions contained within the NPA suggests that such impacts are the concern of the Member States and not the rulemakers.

Justification: Clarification and justification.

response *Noted.*

The recitals of the proposed regulation explicitly excludes military operations and training.

Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels should contribute to set out limitations for Non-PBN state aircraft operations and to ensure its planning and compliance.

comment *728* comment by: *AOPA Sweden*

We agree to the EASA conclusion.

response *Noted.*

2.7. Overview of regulatory activities currently in progress p. 18

comment *14* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
Overview of regulatory activities 2.7. currently in progress

COMMENT:
This section does not provide assurance that the PBN-enabling regulatory activities will enter into force before this NPA applies (ie. 2018/2024).

response *Noted.*

The Agency is working in coordination to ensure that a harmonised adoption of all PBN-related requirements occurs in a timeframe to support the implementation dates proposed.

comment *59* comment by: *ENAC ATM*

"ATC trained on the operations": what is the situation for EASA states? What is the average level of understanding of ATCO population so far?

response *Noted.*

The basic level of understanding will be defined by Commission Regulation (EU) No 2015/340.

comment *205* comment by: *AIRBUS*

Figure 4: Rulemaking tasks to facilitate PBN operations
Comment

There is no reference to any EASA rulemaking activity to update the airworthiness standards supporting the additional functionalities (A-RNP)

Rationale for Comment

The applicable airworthiness standards need to be identified in a timely manner to allow correct and timely compliance demonstration.

Recommendations

EASA should clarify whether the CS-A-CNS would be updated or whether compliance against the relevant FAA AC would be authorized through AFM entries.

response	*Accepted.*
	The Agency thanks you for your comment. The airworthiness requirements for all ICAO RNP specifications will be incorporate in CS–ACNS, which is subject to another rulemaking task.

comment	*225* comment by: *ESSP-SAS* As not only ATC providers may be involved but also AFIS (or even aerodrome operators), this should have been included in this section. It should state "ATS personnel" instead of "ATC".
response	*Partially accepted.*
	The Agency agrees on the point that AFIS operators should also be trained on PBN when and where applicable. AFIS is also under the scope of the proposed regulation. However, the explanatory note is not subject to amendment.

comment	*384* comment by: *NATS National Air Traffic Services Limited* The Agency has initiated a number of rulemaking tasks to enable a co-ordinated PBN implementation across the EATMN. How is EASA addressing the risk that all the other rulemaking tasks will deliver the necessary supporting activities, in time for the implementation dates set for this NPA? Suggested resolution: Confirmation from EASA that ATSPs may proceed with PBN implementations under this Regulation without risk from non-delivery of other supporting rulemaking tasks.
response	*Noted.*
	The Agency is working in a coordinated manner to ensure a harmonised adoption of all PBN-related requirements.

comment	*730* comment by: *AOPA Sweden* Regarding RMT 0256/0257 and 0445/0446 There should be a discussion what operational approval criteria that is needed for GA operators and their Aircraft. A large part of the IFR equipped GA aircraft in the USA are able to fly RNAV approaches with certified avionics, probably without any special approval, and with no known safety implications. We suggest EASA benchmark the european requirements for RNAV approaches with the

	comparable FAA requirements on GA crew and lighter aircraft. Especially consider also the lower end of RNAV approaches, i.e. approaches with LNAV-minima. If the operational and technical critera can be set so that a large part of the GA fleet can take make use of the RNP infrastructure, the GA fleet can be utilized more safely and to a larger extent. This should lead to an overall better economic and safety outcome, especially since conventional navigation is being decomissioned at a faster and faster pace.
response	*Noted.*
	The subjects mentioned are not under the scope of this task. The requirements for operational approval have been issued in Opinion 03/2015.

2.8. Summary of the RIA p. 19

comment	*117* comment by: *Finavia* As commented to the applicable paragraphs of the RIA, the results of the economic impact assessment are not agreed. Additional costs due to the obligation to maintain and even implement new non-PBN routes and procedures are significant in States having large geographical area and many airports. In the assessment, these additional costs are not considered on the appropriate level of accuracy. It may change the results of the overall impact assessment.
response	*Not accepted.*
	Section 4.5.5.2.3 recognises and takes into account that the continuous availability of non-PBN facilities to accommodate the non-PBN-equipped traffic may represent additional costs. However, this aspect would not change the outcome of the impact assessment.

comment	*175* comment by: *EUROCONTROL* **Page 19 - 2.8.2 Summary of the impact analysis** EUROCONTROL suggests a simplification: "… aircraft operators will only need to qualify (...) in accordance with a limited number of navigation specifications." Why not keep it simple and just indicate either "RNP1 with RF plus RNP APCH" or "A-RNP with FRT"?
response	*Not accepted.*

	The proposed text would be an appropriate suggestion. However, this would only be applicable to those operators that fly within Europe only. Operators operating to other regions will be required to ensure other capability.

comment	*226* comment by: *ESSP-SAS* The description of the Option No1 already includes the definition of the scope (all Instrument RWY ends where there is no PA procedure) before any assessment is made. It would have been desirable to add some more scalable options to run the impact analysis for different feasible scopes, such as comparing the #1 with one containing "all Instrument RWY ends" and another for "requirements on operators" as examples. An option identical to ICAO Assembly resolution 37-11 should have been evaluated as a minimum, as it is the best and only reference available. As summarized in section 2.8.2, this would led to a sound comparison among different feasible options in order to have a clear and sound view on what is the rationale behind the selected scope.
response	*Noted.*

comment	*525* comment by: *IATA* **Comments:** Option 0 means that no regulatory action will be taken, and allows continued fragmentation. Option 1 is the Airspace User Associations preference, although a real quantitative CBA is missing, which makes it difficult for airlines to decide to invest in RNP1 for retrofit purposes.
response	*Noted.*
	The revised proposal has simplified the number of PBN requirements and reduces the retrofit costs for operators to a minimum.

comment	*691* comment by: *UK CAA* **Page No:** 19 **Paragraph No:** 2.8.2 **Comment:** The argument for a benefit from qualifying the aircraft and crews to enable operations in accordance with a limited number of navigation specifications only applies if you can achieve a qualification to the highest standards, i.e., where other specifications are automatically included. **Justification:** Outside of Advanced RNP, RNAV 1/RNAV 2 and RNP 1 are practically identical

and since release of EASA Opinion 03/2015 'Revision of operational approval criteria for Performance-Based Navigation (PBN) the crew qualification criteria has become more generic, thus making PBN in the broadest sense more accessible across all navigation specifications.

Proposed Text: Amend Subpart PBN in PART-AUR to reflect the Opinion 03/2015 and the general nature of PBN crew qualification across multiple navigation specifications.

response *Not accepted.*

Criteria to qualify aircrews or aircrafts are not under the scope of this rulemaking task.

comment *719* comment by: *Julian Scarfe, PPL/IR Europe*

The RIA option set is inadequate. It compares only a lame do-nothing option with the regulatory approach selected (do-what-we-decided). It ignores other options, such as different PBN specs based on different criteria and staged mandates for airborne equipage. It does not respect the commitment made to stakeholders by the Executive Director at the June 2014 SSCC to significantly improve the quality of impact assessment.

response *Noted.*

3. Proposed amendments - 3.1. Draft Regulation Art.1 Subject matter and scope p. 20

comment *91* comment by: *CANSO*

Although it is understood that military and State aircraft face difficulties to become PBN-compliant, those flying IFR/GAT in the affected airspace should be within the scope of the PBN-regulation.
One should realize that the efficiency of any operation in any airspace, is always constrained by the least equipped party. Hence, while it is understood that for certain categories of airspace users, a longer transition period might be desired (or even required), the absence of any obligation to transition to full PBN-compliant operations for all users in a designated airspace, will limit the benefits of any PBN-implementation in Europe.

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion.

comment *176* comment by: *EUROCONTROL*

Page 20 - 3.1 Draft Regulation (Draft EASA Opinion) - (c)(1)

EUROCONTROL proposes to include the following regulatory text:

“The caveats related with military operations and training in the Regulations (EU) Nr 549/2004 of 10 March 2004 article 1§2 and Nr 216/2008 of 20 February 2008 (EASA) article 1.2 are also applicable for the particular case of PBN obligations. Consequently, the application of this Regulation and of the measures contained therein shall be implemented without prejudice to Member States’ sovereignty over their airspace and to the requirements of the Member States relating to public order, public security and defence matters. This Regulation and the abovementioned measures do not cover military operations and training”.

That comment goes without prejudice of clarification on the applicability to military due to any regulatory ambiguity created by the fact that PBN regulatory obligations belong to two different regulatory frameworks (SES and EASA).

Page 20 - 3.1 Draft Regulation (Draft EASA Opinion) - (b)(1)

EUROCONTROL makes a comment that is followed by a question:

"(1) aircraft operations as referred to in Article 4(3) of Regulation (EC) No 216/2008". It means that consulting another rule is required before knowing to which aircraft operations this rule applies.

Is this relevant and appropriate?

response *Partially accepted.*

With respect to the obligations for military and State aircraft and facilities, the text of the regulation has been amended for clarity. Regarding the referencing to other regulation, such referencing avoids possible ambiguity in the applicability.

comment *202* comment by: *French State Aviation Safety Authority (DSAÉ)*

· The text of the Proposed Amendments, namely article 1 of the Draft Regulation (draft EASA Opinion) must include an explicit reference to the caveats related with military operations and training in the Regulations (EU) Nr 549/2004 of 10 March 2004 article 1§2 and Nr 216/2008 of 20 February 2008 (EASA) article 1.2.

1. SES Framework 549/2004 Art 1.2 should be referenced in the Recitals.

2. EASA BR 1108/2009 Art 1.2 (amending 216/2008 Art 1.2) should be referenced in the Recitals.

response | *Partially accepted.*

With regard to the obligations for military and State aircraft and facilities, the text of the regulation has been amended for clarity.

comment | *206* comment by: *AIRBUS*

Article 1 (c)

Comment

Airbus welcomed very positively Article 1 (c) provision that permits aircraft undertaking maintenance, delivery or flight testing to operate in the airspace. However, in line with the rationales formalized by the Agency in Section 2.1 of proposed NPA 2015-01, Airbus would suggest to extend Article 1 (c) provision to aircraft operating under MEL conditions.

Recommendations

Please modify the text as follows:

(c) This Regulation shall not apply to operations of aircraft referred to in Article 4(3) of Regulation (EC) No 216/2008 undertaking operations for the purpose of maintenance, delivery, ~~or~~ flight testing, or aircraft under MEL conditions.

response | *Not Accepted.*

The regulation is intended to permit operations for the purpose of maintenance, delivery or flight-testing which are not standard operations. Operations in accordance with the MEL are intended to permit normal operations with inoperative equipment. Thus, unless otherwise stated, operation in accordance with the MEL are permitted provided that the aircraft still conforms to the minimum requirement to operate along its planned route.

comment | *339* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
Article 1(b)(3) refers to ATM/ANS provisions, i.e. ATM/ANS providers. However, the regulation itself later applies specifically to **ATSPs** (e.g. **AUR.PBN.1005**), which is a subset of the ATM/ANS	For the avoidance of doubt and to adjust the scope to its strict addressees in order to avoid future

providers. Is this done on purpose for a future broader application of the **Part-AUR**?	misunderstandings.

response *Noted.*

ATM/ANS providers Is a generic term to cover multiple providers of services regulated under the ATM/ANS regulation and ATS providers are therefore covered. For consistency, the same terms need to apply to all regulations, independently of the subject be regulated. The referred article 1(b)(3) in the cover regulation provides for the high-level requirements applicable to ATM/ANS providers while in the annex, the specific ATM/ANS provider is identified (in this case ANS providers).

comment *367* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments **Section 3.1.1** **Article 1 '*Subject matter and scope*'**	In **Article 1(b)(2)**, where it says "*aerodrome Operations*" it should say "*aerodrome **o**perations*" instead.	Typographical error

response *Accepted.*

The new proposal has been revised accordingly.

comment *473* comment by: *Belgocontrol*

Although it is understood that military and State aircraft face difficulties to become PBN-compliant, those flying IFR/GAT in the affected airspace should be within the scope of the PBN-regulation.

	One should realize that the efficiency of any operation in any airspace, is always constrained by the least equipped party. Hence, while it is understood that for certain categories of airspace users, a longer transition period might be desired (or even required), the absence of any obligation to transition to full PBN-compliant operations for all users in a designated airspace, will limit the benefits of any PBN-implementation in Europe.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion.

comment	*544* comment by: *HungaroControl*
	Although it is understood that military and State aircraft face difficulties to become PBN-compliant, those flying IFR/GAT in the affected airspace should be within the scope of the PBN-regulation. One should realize that the efficiency of any operation in any airspace, is always constrained by the least equipped party. Hence, while it is understood that for certain categories of airspace users, a longer transition period might be desired (or even required), the absence of any obligation to transition to full PBN-compliant operations for all users in a designated airspace, will limit the benefits of any PBN-implementation in Europe.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion.

comment	*631* comment by: *Spanish Air Force Staff*
	The text of the Proposed Amendments, namely article 1 of the Draft Regulation (draft EASA Opinion) must include an explicit reference to the caveats related with military operations and training in the Regulations (EU) Nr 549/2004 of 10 March 2004[1] article 1§2 and Nr 216/2008 of 20 February 2008 (EASA)[2] article 1.2.[3]. [1] "*The application of this Regulation and of the measures referred to in Article 3 shall be without prejudice to Member States' sovereignty over their airspace and to the requirements of the Member States relating to public order, public security and defence matters, as set out in Article 13. This Regulation and the abovementioned measures do not cover military operations and training"* [2] "*This Regulation shall not apply when products, parts, appliances, personnel and organisations referred to in paragraph 1 are engaged in military, customs, police, or similar services. The Member States shall undertake to ensure that such services have due regard as far as practicable to the objectives of this Regulation."* [3] Without prejudice of clarification on the applicability to military due to any regulatory ambiguity created by the fact that PBN regulatory obligations belong to two different regulatory frameworks (SES and EASA)

response | *Noted.*

With regard to the obligations for military and state aircraft and facilities, the text of the regulation has been amended for clarity.

comment | *632* comment by: *CAA-NL*

It is proposed to change the text of 1(d) as follows:

(d) Member States shall ~~undertake to~~ ensure that operations of aircraft referred to in Article 1(2)(a) and the facilities and services referred to in Articles 1(2)(b) and 1(2)(c) of Regulation (EC) No 216/2008 when used by or made available to the public as far as practicable have due regard to the provisions of this Regulation.

Although we know that the same wording is used in the Basic Regulation we wonder whether 'shall undertake to ensure' is the proper language, shall undertake what? Further we suggest to include 'as far as practicable' as is in the Basic Regulation.

Secondly we wonder whether it is necessary to repeat this here as for this implementing rule under the EASA BR this should be obvious. May be to include a reference to the non applicability and the MS's obligation into a whereas is another option to refer to these legal principles. Then also a reference to article 1.2 of 549/2004 could be included in this wheras.

When the Air Traffic Service Providers (ATSPs) pursue with the implementation of PBN ATS routes, in coordination with the Network Manager, the Draft Opinion shall take into account that airspace design and management remain a full national prerogative of the member States. A reference to 549/2004 article 1.2 in a whereas ensures that, at national level, military authorities can work closely with national airspace design authorities prior to determining PBN routes. This coordination is essential to avoid any adverse impact on State aircraft non PBN-equipped.

response | *Partially accepted.*

With regard to the obligations for military and state aircraft and facilities, the text of the regulation has been amended for clarity.

It is acknowledged that coordination between civil and military authorities in relation to airspace design is advisable at national level, as well as coordination with the Network Manager in order to ensure a suitable integration of local ATS routes with the EATMN.

comment | *642* comment by: *DFS Deutsche Flugsicherung GmbH*

Article 1 Subject matter and scope:

The contents of the regulation must also be directed at the Member States because they have the sovereign rights over airspace usage. The States are the ones that can decide on the (economic) use of airspace and (technical) functionalities in consultation with the relevant stakeholders (e.g.: ATSPs, airspace users, aerodromes, public authorities, etc).

Text proposal / supplement:

(b) This Regulation shall apply to:
……..
(4) Member States;

The elements/specifications and airports included in Regulation (EU) 716/2014 "PCP" (target date: 1 JAN 2024) should be exempted from the application of the new Regulation. Application of this Regulation must not be mandatory for the airports of Frankfurt, München, Düsseldorf and Berlin. This is to avoid additional expenses for the ATSP in RP2.

Text proposal / supplement insert after (c):
(ca)
The high-density TMAs and associated en-route sectors already mentioned under 1.2.1 "Geographical scope" in the Annex of Regulation (EU) 716/2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan shall be excluded from the application of this Regulation.

response *Not accepted.*

The proposed regulatory provisions are complementary to those stipulated in the PCP, whose scope and deadlines have been duly taken into account. The Agency is of the view that the proposed requirements can be imposed directly on aerodromes and ANSP, since these organisations promote the design of PBN procedures.

Art. 2 Definitions p. 21

comment *15* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
Article 2
Definitions
For the purposes of this Regulation, in addition to the definitions established by Regulations (EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012 and 139/2014

COMMENT:
Suggest to add Regulation (EU) 800/2013 as it updates a PBN definition in 965/2012.

	New suggested text: *For the purposes of this Regulation, in addition to the definitions established by Regulations (EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012, **800/2013 and 139/2014**.*
response	*Not accepted.*
	The sole reference to Regulation (EU) No 965/2012 includes all the amendments affected by means of later regulations, such as Regulation (EU) No 800/2013.

comment	*71* comment by: *CANSO* Article 2, definition Standard Instrument Arrival (STAR) is slightly different from the one used in the Doc 4444 and 8168 without any particular reason: · (9) 'Standard Instrument Arrival (STAR)' route means a designated instrument flight rule (IFR) arrival route linking a specified significant point, normally on an ATS route, with a point at which a published instrument approach procedure can be commenced; · Doc 4444 e 8168 **Standard instrument arrival (STAR). A designated instrument flight rule (IFR) arrival route linking a significant point, normally on an ATS route, with a point from which a published instrument approach procedure can be commenced.**
response	*Accepted.*
	The new proposal has been revised accordingly.

comment	*72* comment by: *CANSO* - Article 2, it's proposed the definition of "area navigation" in addition to the others established by Regulations (EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012 and 139/2014, but "area navigation" definition is already present in the Regulation (EU) 923/2012, so it should not be replicated;
response	*Not Accepted.*
	The Agency recognises that the basic definition of area navigation is included in Regulation (EU) No 923/2012. However, following some comments received on this regulation, amendments were made to define the accuracy requirements.

comment	*73* comment by: *CANSO* Article 2, definition of TSE(difference between true position and intended position), there is no alignment with the terminology used in the PBN Manual (difference between true position and Desired path);
response	*Noted.*
	Reference to a TSE requirement has been deleted form the proposal.

comment	*177* comment by: *EUROCONTROL* **Page 21 - Article 2 - Definitions** EUROCONTROL suggests an addition: "instrument runway ends" is not defined in the Definitions section although it is used in AUR.PBN.2005 and in later sections.
response	*Not accepted.*
	The Agency is of the view that “instrument runway end” is not subject to misinterpretation, since the aviation community is familiar with associated concepts, like “instrument runway” or “runway end”.

comment	*189* comment by: *ENAV* - Article 2, it’s proposed the definition of “area navigation” in addition to the others established by Regulations (EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012 and 139/2014, but “area navigation” definition is already present in the Regulation (EU) 923/2012, so it should not be replicated; - Article 2, definition Standard Instrument Arrival (STAR) is slightly different from the one used in the Doc 4444 and 8168 without any particular reason: • (9) ‘Standard Instrument Arrival (STAR)’ route means a designated instrument flight rule (IFR) arrival route linking a specified significant point, normally on an ATS route, with a point at which a published instrument approach procedure can be commenced; • Doc 4444 and 8168 ***Standard instrument arrival (STAR).*** A designated instrument flight rule (IFR) arrival route linking a significant point, normally on an ATS route, with a point from which a published instrument approach procedure can be commenced. - Article 2, definition of TSE(difference between true position and intended position),

there is no alignment with the terminology used in the PBN Manual (difference between true position and Desired path);

response *Partially Accepted.*

The Agency recognises that the basic definition of area navigation is included in Regulation (EU) No 923/2012. However, following some comments received, amendments were made to define the accuracy requirements with the definitions for RNAV and RNP specifications.

Regarding the definition of SIDs/STARS the text has been amended as proposed.

comment *229* comment by: *ESSP-SAS*

To be fully alligned with recent modifications in ICAO Annex 6, the following definitions should be included in Article 2:

- Non-precision approach (NPA) procedure. An instrument approach procedure designed for 2D instrument approach operations Type A.
- Approach procedure with vertical guidance (APV). A performance-based navigation (PBN) instrument approach procedure designed for 3D instrument approach operations Type A.
- Precision approach (PA) procedure. An instrument approach procedure based on navigation systems (ILS, MLS, GLS and SBAS CAT I) designed for 3D instrument approach operations Type A or B.

response *Not accepted.*

The rule proposal does not include these definitions as they are already included in Regulation (EU) No 923/2012.

comment *286* comment by: *AvinorANSP*

Comment
The document is not consistent concerning use and definition of the term ATS routes

PBN routes
PBN ATS routes
ATS Routes using PBN

As it is important to have a clear understanding of what is meant by an ATS route in this regulation it is proposed to include the definition of an ATS route, even if it is included in the e.g.
COMMISSION IMPLEMENTING REGULATION (EU) No 923/2012 has the following definition

"ATS route" means a specified route designed for channeling the flow of traffic as necessary for the provision of air traffic services;

Note: An ATS-route encompass ATS route en-route and SID/STAR. The continuation of a STAR is an instrument approach procedure (IAP)

Comment:
Instrument Runway ends (IRE) is used in the document. Consider it important to have a definition of IRE!

This is linked to the requirement of APV to all IRE where only non-precision exists (AUR.PBN.2005 point 1, page 24 of 70). There are many IRE where APV is impossible to implement due to lack of EGNOS coverage and/or current PANS-OPS design criteria. The lack of a definition that qualify an IRE to be or not to be within the scope of APV-implementation (APV candidate), makes the number of IRE and APV-implementation status in chapter 4: Regulatory Impact Assessment (RIA) page 37, 38 and 43 of 70 not as representative as it could be. I seem like the statistics used in this document have a goal of 100% implementation of APV, which is unrealistic considering EGNOS coverage and PANS-OPS design criteria. E.g in Norway consider 80 of 108 IRE as APV candidates based on what is possible with current EGNOS coverage and PANS-OPS design criteria.

response *Not accepted.*

The number of terms defined in the proposal is limited to those strictly necessary meaning to those not reflected in other applicable references.

The Agency is of the view that “instrument runway end” is not subject to misinterpretation, since the aviation community is familiar with associated concepts, like “instrument runway” or “runway end”.

comment *329* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland*

Some of the definitions slightly differ from the ones used in the ICAO Documents (e.g. the definition of 'Total System Error [TSE]'). Unless there are good reasons for those differences, the ICAO definitions should be used.

response *Accepted.*

The new proposal has been revised accordingly.

comment *340* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**

The reference to **regulation (EU) No 1035/2011** in **Article 2** should be revised once the regulation stemming from **EASA Opinion No 03/2014** is issued in the OJEU.	This regulation will be repealed by the regulation stemming from **EASA Opinion No 03/2014**. The draft of this regulation is at this moment going through the comitology process in the SSC, with an intended vote in **SSC/58** (21-22.10.2015).

response *Noted.*

The new proposal takes into account the approval process of the said EASA Opinion and will be dependent upon the adoption and publication timescales.

comment *341* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 Article 2(7) '*resolution advisory (RA) indication*'	The definition is not correct as it is. It should be completed as follows: "*(...) an indication given to the flight crew recommending a manoeuvre intended to provide separation from all threats known by ACAS and/or SSR transponder or a manoeuvre restriction intended to maintain existing separation*".	In line with the definition of ACAS ("*(…) are equipped with SSR transponders*"), as this system will only "*see*" those aircraft equipped with ACAS and/or SSR transponders. The definition as it is implies that any other aircraft can be detected by the ACAS.

response *Not accepted.*

The definition of ACAS II describes the type of advisories provided, so no misinterpretation should take place.

comment *342* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 Article 2(11) '*traffic advisory (TA) indication*'	The definition is not correct as it is. It should be completed as follows: "*(...) an indication given to the flight crew that the proximity of another aircraft equipped with ACAS and/or SSR transponder is a potential threat*".	In line with the definition of ACAS ("*(…) are equipped with SSR transponders*"), as this system will only "*see*" those aircraft equipped with ACAS and/or SSR transponders. The definition as it is implies that any other aircraft can be detected by the ACAS.

response *Not accepted.*

The definition of ACAS II describes the type of advisories provided, so no misinterpretation should take place.

comment *452* comment by: *CAA-N*

CAA Norway would like to state that we need a more a clear definition of Instrument Runway End related to APV. In our State there are some Instrument Runway ends equipped, but APV is not possible because terrain and obstacle contraints does not meet the design criteria. These Runway ends are not included in the national target number for APV implementation.

response *Noted.*

The Agency considers that the concept “instrument runway end” in relation to APV is not subject to misinterpretation. APV stands for an instrument approach procedure associated to a runway end, which makes use of lateral and vertical guidance but does not meet the requirements established for precision approach.

comment *539* comment by: *HungaroControl*

Article 2 Definitions
For the purposes of this Regulation, in addition to the definitions established by Regulations

	(EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012 and 139/201413, the following definitions shall apply. ~~(1) 'airborne collision avoidance system (ACAS)' means an aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders; „~~ Justification: Airborne collision avoidance system (ACAS) is already defined in Regulation (EU) 923/2012 Art. 2. no. 17., it should not be replicated.
response	*Accepted.*
	The new proposal has been revised accordingly.

comment	*545* comment by: *HungaroControl* Article 2, definition Standard Instrument Arrival (STAR) is slightly different from the one used in the Doc 4444 and 8168 without any particular reason: · (9) 'Standard Instrument Arrival (STAR)' route means a designated instrument flight rule (IFR) arrival route linking a specified significant point, normally on an ATS route, with a point at which a published instrument approach procedure can be commenced; · Doc 4444 e 8168 **Standard instrument arrival (STAR). A designated instrument flight rule (IFR) arrival route linking a significant point, normally on an ATS route, with a point from which a published instrument approach procedure can be commenced.**
response	*Accepted.*
	The new proposal has been revised accordingly.

comment	*546* comment by: *HungaroControl* - Article 2, it's proposed the definition of "area navigation" in addition to the others established by Regulations (EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012 and 139/2014, but "area navigation" definition is already present in the Regulation (EU) 923/2012, so it should not be replicated;
response	*Not Accepted.*
	The Agency recognises that the basic definition of area navigation is included in Regulation (EU) No 923/2012. However, following comments received, amendments were made to define the accuracy requirements with the definitions for RNAV and RNP specifications.

comment	*547* comment by: *HungaroControl* Article 2, definition of TSE(difference between true position and intended position), there is no alignment with the terminology used in the PBN Manual (difference between true position and Desired path);
response	*Accepted.*
	Reference to a TSE requirement has been deleted form the proposal.

comment	*580* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* **COMMENT:** Total system error definition should be consistent with EASA documents AMC 20-27 (Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BAROVNAV Operations) and AMC 20-28 (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). **REASONS(S) FOR COMMENT:** In order to avoid eventual misunderstandings and maintain technical consistency with EASA documents AMC 20-27 (Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BAROVNAV Operations) and AMC 20-28 (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), the Total System Error (TSE) should be defined in accordance with the aforementioned documents. Furthermore, the definitions of "flight technical error (FTE)", "navigation system error (NSE)" and "path definition error (PDE)" should also be included, as proposed below. **PROPOSED CHANGE:** Embraer suggests that the text passage: *"Article 2* ***Definitions*** *For the purposes of this Regulation, in addition to the definitions established by Regulations (EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012 and 139/201413, the following definitions shall apply.* *(…)* *(4) 'fix radius transition (FRT)' is defined as a fixed radius turn between two route segments;* *(5) 'performance-based navigation' (PBN) means area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument procedure or in a designated airspace;* *(6) 'radius to Fix (RF)' is defined as a constant radius circular path about a defined turn centre*

that terminates at a fix;
(7) 'resolution advisory (RA) indication' means an indication given to the flight crew recommending a manoeuvre intended to provide separation from all threats or a manoeuvre restriction intended to maintain existing separation;
(8) 'satellite-based augmentation system (SBAS)' means a wide coverage GNSS augmentation system through which the user receives augmentation information from a satellite-based transmitter;
(9) 'Standard Instrument Arrival (STAR)' route means a designated instrument flight rule (IFR) arrival route linking a specified significant point, normally on an ATS route, with a point at which a published instrument approach procedure can be commenced;
(10) 'Standard Instrument Departure (SID)' route means a designated instrument flight rule (IFR) departure route linking the aerodrome or a specified runway of the aerodrome with a specified significant point, normally on a designated ATS route, at which the en route phase of a flight commences;
(11) 'Total System Error (TSE)' means the difference between true position and intended position;
(12) 'traffic advisory (TA) indication' means an indication given to the flight crew that the proximity of another aircraft is a potential threat."

should be replaced by:

"Article 2

Definitions

For the purposes of this Regulation, in addition to the definitions established by Regulations (EC) Nos 216/2008 and 1035/2011, and Regulations (EU) Nos 923/2012, 965/2012 and 139/201413, the following definitions shall apply.

(…)

(4) 'fix radius transition (FRT)' is defined as a fixed radius turn between two route segments;
(5) 'flight technical error' (FTE) is the accuracy with which the aircraft is controlled as measured by the indicated aircraft position with respect to the indicated command or desired position. It does not include blunder errors.
(6) 'navigation system error' (NSE) is the difference between true position and estimated position.
(7) 'path definition error' (PDE) is the difference between the defined path and the desired path.
*(~~5~~**8**) 'performance-based navigation' (PBN) means area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument procedure or in a designated airspace;*
*(~~6~~**9**) 'radius to Fix (RF)' is defined as a constant radius circular path about a defined turn centre that terminates at a fix;*
*(~~7~~**10**) 'resolution advisory (RA) indication' means an indication given to the flight crew recommending a manoeuvre intended to provide separation from all threats or a manoeuvre restriction intended to maintain existing separation;*
*(~~8~~**11**) 'satellite-based augmentation system (SBAS)' means a wide coverage GNSS augmentation system through which the user receives augmentation information from a satellite-based transmitter;*

*(~~9~~**12**) 'Standard Instrument Arrival (STAR)' route means a designated instrument flight rule (IFR) arrival route linking a specified significant point, normally on an ATS route, with a point at which a published instrument approach procedure can be commenced;*
*(~~10~~**13**) 'Standard Instrument Departure (SID)' route means a designated instrument flight rule (IFR) departure route linking the aerodrome or a specified runway of the aerodrome with a specified significant point, normally on a designated ATS route, at which the en route phase of a flight commences;*
*(~~11~~**14**) 'Total System Error (TSE)' means the difference between true position and ~~intended~~**desired** position~~;~~.* ***This error is equal to the root sum square (RSS) of the Flight Technical Error (FTE), Path Definition (PDE), and Navigation System Error (NSE).***

*(~~12~~**15**) 'traffic advisory (TA) indication' means an indication given to the flight crew that the proximity of another aircraft is a potential threat."*

response

Not Accepted.

Reference to a TSE requirement has been deleted form the proposal.

comment

633 comment by: *CAA-NL*

Article 2(3) states as follows:
'area navigation' means a method of navigation which permits aircraft operation on any desired
flight path within the coverage of ground or space-based navigation aids or within the limits of
the capability of self-contained aids, or a combination of these;

It is proposed to use the ICAO definition (from ICAO PBN Manual):
A navigation method that allows aircraft to operate on any desired flight path within the coverage of ground- or space-based navigation aids, or within the limits of the capability of self-contained aids, or a combination of both methods.

response

Not accepted.

The definition for area navigation (RNAV) is already included in Regulation (EU) No 923/2012, and has therefore been deleted from this proposed regulation.

Art. 3 Airborne collision avoidance system (ACAS) Airspace usage p. 22

comment

92 comment by: *CANSO*

	The term “Air Traffic Service Providers (ATSPs) and aerodrome operators” is often used in the text in the context of service provision and procedure development. This definition should be widened to all entities responsible for the deployment of the related items, including the aviation oversight bodies of each Member State. This is especially true in countries where the ANSP and/or individual aerodrome operators have little or no authority to impose/publish instrument flight procedures. Note that ICAO usually refers to ‘States’ rather than referring to individual stakeholders within that State.
response	*Partially accepted.*
	The reference to ATSPs has been replaced with ANSPs to increase the clarity. The Agency fully recognises that many entities are involved with PBN implementation, however they should be a responsible party.

comment	*440* comment by: *DGAC/DTA* **Article 3** The “aircraft operators” are not equipped, the aircraft are. **Proposal:** “Aircraft operators as defined in AUR.ACAS.1005 shall ~~be~~ ensure that their aircraft are equipped as specified in Subpart ACAS of the Annex to this Regulation.” Or,delete “operators” to become: “The aircraft ~~operators~~ as defined in AUR.ACAS.1005 shall be equipped as specified in Subpart ACAS of the Annex to this Regulation.”
response	*Partially Accepted.*
	The text of the proposal has been amended to take into account the suggested amendment.

comment	*474* comment by: *Belgocontrol* The term “Air Traffic Service Providers (ATSPs) and aerodrome operators” is often used in the text in the context of service provision and procedure development. This definition should be widened to all entities responsible for the deployment of the related items, including the aviation oversight bodies of each Member State. This is especially true in countries where the ANSP and/or individual aerodrome operators have little or no authority to impose/publish instrument flight procedures. Note that ICAO usually refers to ‘States’ rather than referring to individual stakeholders within that State.

response	*Partially accepted.*
	The reference to ATSPs has been replaced with ANSPs to increase the clarity. The Agency fully recognises that many entities are involved with PBN implementation, however there should be a responsible party.

comment	*548* comment by: *HungaroControl* The term "Air Traffic Service Providers (ATSPs) and aerodrome operators" is often used in the text in the context of service provision and procedure development. This definition should be widened to all entities responsible for the deployment of the related items, including the aviation oversight bodies of each Member State. This is especially true in countries where the ANSP and/or individual aerodrome operators have little or no authority to impose/publish instrument flight procedures. Note that ICAO usually refers to 'States' rather than referring to individual stakeholders within that State.
response	*Partially accepted.*
	The reference to ATSPs has been replaced with ANSPs to increase the clarity. The Agency fully recognises that many entities are involved with PBN implementation, however there should be a responsible party.

comment	*720* comment by: *Julian Scarfe, PPL/IR Europe* (editorial) *Aircraft* are equipped, not operators.
response	*Accepted.*
	The new proposal has been revised in order to take into account the comment.

Art. 4 - Special provisions applying to operators subject to Regulation (EU) No 965/2012 p. 22

comment	*333* comment by: *DGAC France* <u>Comment 1</u> Reference to SPO.OP.205 is missing in article 4 §1 <u>Justification/proposition</u> SPO.OP.205 Airborne collision avoidance system (ACAS) states : *« The operator shall*

establish operational procedures and training programmes when ACAS is installed and serviceable. When ACAS II is used, such procedures and training shall be in accordance with Commission Regulation (EU) No 1332/2011. »
This paragraph
- is written exactly as NCC.OP.220
- contains a reference to regulation (EU) n° 1332/2011
and as such, should be referred to in article 4 §1 :

Comment 2
Article 4 1 indicates: *« By derogation from provisions CAT.IDE.A.155 and CAT.OP.MPA.295… »*
The wording « by derogation » is not understood

Justification/proposition
Why does the fact that article 3(1) and subpart ACAS apply constitute a « derogation » to provisions of CAT.IDE.A.155 , CAT.OP.MPA.295…?
Would not *« Notwithstanding provisions CAT.IDE.A.155 and CAT.OP.MPA.295… »* be a more appropriate wording?

Alternatively, it even seems that the simplest solution would be to :
- Delete equipment rules CAT.IDE.A.155, NCC.IDE.A.140 and SPO.IDE.A.131 from the AIR OPS regulation as the same requirements lie within subpart ACAS (this would unnecessary, possibly obsolete, cross references)
- Simplify operational rules CAT.OP.MPA.295, NCO.OP.200, NCC.OP.220 and SPO.OP.205 a) by simply stating:
*« The operator shall establish operational procedures and training programmes when ACAS is installed and serviceable. » (*or for part NCO *: « operational procedures and training programmes shall be established when ACAS II is used »)*

This proposition, with no reference to regulation AUR, would be more consistent with the fact that PART-AUR does not contain any reference to « procedures » nor « operations » anymore (PART-AUR proposition is purely equipment related)

response *Partially accepted.*

The text has been aligned with the recently published Regulation (EU) No 2016/583 and, as a result, this article has been deleted...As it is proposed to repeal Regulation (EU) No 1332/2011 and replace it by this proposal. Therefore the related references in Regulation (EU) No 965/2012 to Regulation (EU) No 1332/2011 have to be amended.

comment *343* comment by: *AESA / DSANA*

PART	**COMMENT**	**JUSTIFICATION**
Proposed amendments Section 3.1.1 Article 4(1) '*Special*	This paragraph states that provisions **CAT.IDE.A.155**, **CAT.OP.MPA.295**, **NCC.IDE.A.140**, **NCO.OP.200**, **NCC.OP.220** and **SPO.IDE.A.131** are	For the avoidance of inconsistencies between regulations and in order to avoid future issues with the

provisions applying to operators subject to Regulation (EU) No 965/2012'	derogated. However, **Section 3.1.2** of this NPA introduces an amendment to **Regulation (EU) No 965/2012** that affects provisions **CAT.IDE.A.155**, **NCC.IDE.A.140**, **NCO.OP.200** and **SPO.IDE.A.131**. **Article 4(1)** and **Section 3.1.2** should be revisited to clarify this inconsistency.	implementation of the regulations.

response *Partially accepted.*

Regulation (EU) No 1332/2011 is proposed to be repealed and replaced by this proposal. Therefore the related references in Regulation (EU) No 965/2012 to Regulation (EU) No 1332/2011 have to be amended. The text has been aligned with the recently published Regulation (EU) No 2016/583 and, as a result, this article has been deleted.

comment *470* comment by: *EUROPEAN COMMISSION GNSS Programmes*

The Eurocontrol's Regulatory Approach Document requested aircraft operators to get equipped for APV by 2020. The NPA changes slightly the approach since no mandate or requirement is imposed to aircraft operators. In EASA's opinion, current Regulation (Reg.965/2012 and Reg.923/2012 SERA) already establishes requirements for the operators to ensure that their aircraft are equipped and aircrew qualified as required for the area and type of operation (in particular PBN routes and procedures). However, this is lax enough for operators to put the pressure on the ANSPs to keep non-PBN applications to a satisfactory level for operators and still comply with the applicable Regulation.
The rationale behind this change is unclear and negative impact on EGNOS use is expected. Moreover, this lack of mandate would not be coherent with the launched EC/GSA actions to promote EGNOS use and actually targeting both aircraft operators and ANSPs.
It is important to note that when a lack of an obligation to be equipped exists, the rhythm of upgrade and/or certification varies very significantly between different airlines and ANSPs. In Europe, this has provoked non coordinated implementation programmes at each European State.

response *Noted.*

Please, refer to the response to the major concerns identified section of the Opinion in

relation to aircraft equipage.

Art. 6 - Entry into force p. 22

comment *74* comment by: *CANSO*

Article 6 The derogation to 2024 for the implementation of RNP procedures with vertical guidance is not appropriate, primarily because it goes against (more than 8 years) the deadline set in the ICAO resolution A37/11 and secondarily it's not even in line with original Eurocontrol proposal (end of 2018). The postponement of this date, in addition to delaying the benefits in terms of safety and performance, risks to compromise the future use of EGNOS infrastructure, on which the EU has invested billions of euro;

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion.

comment *85* comment by: *CANSO*

Implementation dates shall be set according to experience and also with regard to their regulatory context. This means, alignment of implementing target dates for airports subject to PCP IR as well as alignment with RP. Airspace planning projects need 5 years in average. A lot of other technical implementation projects do impact resources and cost efficiency targets within an IR. Adherence with the target dates of the ICAO resolution, i.e. Dec 2016 for APV, would be another argument.

response *Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to implementation dates.

comment *93* comment by: *CANSO*

- RNP APCH APV procedures will be mandated by 2024 for all runway ends that have published Non Precision Approach(es) only. This is much too late: ICAO asks 2016 for ALL instrument runway ends. The late date (2024) risks to flatten down the momentum which exists today in many countries.
- RNP1 for new SIDS/STARS (and even en-route airspace) from December 2018 onwards. This is much too early and not in compliancy with the ICAO-vision on PBN.

CANSO recommends to realign the implementation timetable with ICAO recommendations and EU Reg. 716/2014 PCP IR:

- 2018: APV in all instrument runway ends
- 2024: RNP 1 required in those European TMAs where it has been proven that RNAV1 does not meet the performance requirements

response *Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions on navigation specifications. Also, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this revised proposal.

comment *118* comment by: *Finavia*

Applicability date of 26 January 2024 for AUR.PBN.2005(1) shall be earlier, if the objective is to expedite APV implementation from the current rate of implementation. It is also not in line with the objective set by ICAO resolution to implement APV procedures at all applicable runway ends by 2016.

response *Partially accepted.*

Please refer to the response in the major concerns identified section of the Opinion related to implementation dates.

comment *178* comment by: *EUROCONTROL*

Page 22 - Article 6 - Entry into force - 2.

EUROCONTROL points out a possible inconsistency by asking two questions:

Why will AUR.PBN.2005(1) - APVs apply from 26 Jan 2024 when the PCP requires them to be in place for the 24 airports by 1 Jan 2024?

Furthermore we understand that the applicability date is the next AIRAC publication date after 1st January 2024, viz. 27.01.2024. Is the date given in the NPA a date to meet this AIRAC cycle or will States have to publish in the previous cycle (which is over the Christmas/New Year holiday period)?

January 2024 is very much later (8 years) than the recommendation in ICAO Assembly Resolution 37-11 that urges States to implement approach procedure with vertical guidance for all instrument runway ends by 2016. Why envisaging such a long delay? Was ICAO so far out in their estimate of when this could be achieved?

In Article 6 - Entry into force, EUROCONTROL suggests to adapt the applicability date of Subpart PBN, AUR.PBN.2005(1) as follows: from 6/12/2018, or as soon as reasonably feasible, so that safety benefits can be generated much earlier than 2024. It should be noted that from the extrapolation of RNP APCH implementations on the basis of the current rate of implementation, it can be deduced that the full implementation will not be complete by early 2024.

response *Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to implementation dates. The dates for the revised proposal to enter into force have been revised and are aligned with the AIRAC effective dates. To meet these dates, the procedures are required to be published and to be effective.

comment *190* comment by: *ENAV*

- The derogation to 2024 for the implementation of RNP procedures with vertical guidance is not appropriate, primarily because it goes against (more than 8 years) the deadline set in the ICAO Assembly Resolution A37 / 11 and secondarily it's not even in line with original Eurocontrol proposal (end of 2018). The postponement of this date, in addition to delaying the benefits in terms of safety and performance, risks to compromise the future use of EGNOS infrastructure, on which the EU has invested billions of euro, and which safety benefits are widely demonstrated;

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion.

comment *207* comment by: *AIRBUS*

Article 6

Comment

There is misalignment between EASA and ICAO regarding the implementation date for RNP APCH.

Rationale for Comment

Implementing PBN Approaches is of utmost importance to reduce the number of runway excursions.

Recommendations

Timeline for the Implementation of RNP APCH (AUR.PBN. 2005(1) should be December 2018.

response *Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion.

comment *267* comment by: *Boeing*

Page: 22
Section: Article 6, Entry into force
AND
Page: 10-11
Section: Table 1, Proposed PBN Requirements
AND
Page: 30-31
Section: AMC1 AUR.PBN.2015 Performance and functionality
Paragraph: 4.(g)

The proposed text of Article 6 states:

"1. This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union and shall apply as from 6 December 2018."

The proposed text of Section AMC1 AUR.PBN.2015, paragraph 4.(g) states:

"4. Approach procedures, SIDs/STARs and ATS routes should be such that aircraft qualified in accordance with the applicable certification requirements corresponding with the performance and functionality specified in ICAO Document 9613 AN/937 — 'Performance-based Navigation (PBN) Manual', 2013, 4th Edition, as follows, are capable of the desired operations.
…
(g) VOLUME II — IMPLEMENTING RNAV AND RNP OPERATIONS, PART C — IMPLEMENTING RNP OPERATIONS, Appendix 2 to Part C — FIXED RADIUS TRANSITION (FRT), 3. AIRCRAFT REQUIREMENTS."

CONCERN:
The wording in Article 6 and the date indicated, when read with Section AMC1 AUR.PBN.2015, could be inappropriately interpreted to mean that airplanes are required to have fixed radius transition (FRT) capability in advance of the dates indicated in Table 1 *(i.e., "By end 2023")."*

RECOMMENDATION:
We recommend that, as an alternative, Table 1 should be inserted into Article 6 to clarify that the implementation timing is intended to be in accordance with Table 1.

JUSTIFICATION:
We consider this revision appropriate to avoid possible confusion with the intended

	implementation dates and requirements.
response	*Not accepted.*
	Please refer to the response in the major concerns identified section of the Opinion related to implementation dates and provisions regarding navigation specifications.

comment	*287* comment by: *AvinorANSP* Comment: We don`t understand why, and find it unfortunate that the applicability dates of this rulemaking task concerning the implementation of APV-procedures choose to follow the implementation dates of the PCP Regulation instead of the ICAO Assembly Resolution 37-11 and/or the RAD Draft Interoperability Implementing Rule on Performance Based Navigation (SES/Eurocontrol). We don`t agree with the change of focus in this rulemaking task. We find it more important to implement APV first and secondly implement RNP 1 ATS routes. SID/STAR is already RNAV 1 many places and en-route is based on RNAV 5. We doubt that RNP 1 ATS routes (en-route and SID/STAR) by DEC 2018 is usefull/realistic based on lack of certification among the aircraft operators. We suggest to reconsider and keep 2018 for APV implementation and 2020 for RNP 1 + RF ATS routes (ref RAD Draft Interoperability Implementing Rule on Performance Based Navigation).
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion related to implementation dates and provisions regarding navigation specifications.

comment	*304* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* The Sweden Transport Agency recommends that ICAO Resolution 37-11 shall be followed. Realign the implementation timetable with ICAO recommendation and EU Reg. 716/2014 (PCP IR): • 2018: APV in all instrument runway ends. • 2024: RNP 1 required in those European TMAs where it has been proven that RNAV 1 does not meet the performance requirements.
response	*Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications. Also, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal.

comment

305 comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

The date for implementation of APV and RNP is 1 January 2024 in EU Reg. 716/2014 (PCP IR) and 26 January 2024 and 6 December respectively in the NPA. Why are these dates not harmonised?

response

Noted.

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications. Also, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal. The dates for entry into force have been revised and respect AIRAC effective dates.

comment

344 comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
The date established in paragraph 2 of **Article 6** [26.01.2024] is not consistent with the date set in **section 1.3** of the Annex to **regulation (EU) No 176/2014** (PCP IR) [01.01.2024] for the 24+1 aerodromes listed in **section 1.2** of that same Annex. A single date should be set and that date should be the one already published in the PCP IR: **01.01.2024**.	For the avoidance of inconsistencies between regulations and in order to avoid future issues with the implementation of the regulations.

response

Not accepted.

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications. Also, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal.

comment

378 comment by: *CAA-NL*

Article 6 - Entry into force
Article 6 states as follows:
1. This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union and shall apply as from 6 December 2018.
2. By way of derogation from paragraph 1 the provisions as defined in the Annex , Subpart PBN, AUR.PBN. 2005(1) shall apply as from 26 January 2024.

Although The Netherlands understands the relation with Commission implementing regulation (EU) No 716/2014, we are not in favor of the derogation from paragraph 1 until 2024, and would like EASA/EC to stay more in line with ICAO resolution A37-11, especially as AUR.PBN.2005(1) does not require approach procedures with vertical guidance for all instrument runway ends.

response

Accepted.

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications.

comment

441 comment by: *DGAC/DTA*

Article 6, paragraph 1

This means that all SID and STAR published after the entry into force of the regulation shall be flown RNP 1 by the 7th of December 2018. It is not consistent with the aircraft equipage at this date and will conduct to a loss of capacity in the high density TMAs due to the lack of the on board equipment. Moreover, there is a mismatch with the PCP IR which is applicable by the 1st January 2024.

response

Noted.

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications. Also, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high

	density TMAs have been duly taken into account and do not come into conflict with this new proposal. The dates for entry into force have been revised and respect AIRAC effective dates.

comment	*442* comment by: *DGAC/DTA* Article 6, paragraph 2: Same comment as in page 6 §2.1 concerning the need to anticipate the implementation of APV approaches, or RNP AR APCH where limiting obstacles or terrain exist. Deadline to complete implementation should be set in 2020 at the latest with an intermediate step in 2018 (e.g. 50% completion). DGAC France proposes that APV implementation will stick to 2018 implementation deadline, SID and STAR requirement become applicable in 2024: "By way of derogation from paragraph 1 the provision as defined in the Annex subpart BPN, AUR.PBN 2005~~(1)~~ (3) shall apply as from 26 January 2024."
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications.

comment	*467* comment by: *DGAC/DTA* **Article 6, paragraph 2** Same comment as in page 6 §2.1 concerning the need to anticipate the implementation of APV approaches, or RNP AR APCH where limiting obstacles or terrain exist. Deadline to complete implementation should be set in 2020 at the latest with an intermediate step in 2018 (e.g. 50% completion).
response	*Partially accepted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications. The Agency does not consider necessary to propose intermediate implementation targets in the proposed rules.

comment	*468* comment by: *EUROPEAN COMMISSION GNSS Programmes* The present NPA, through Article 6 "Entry into force" of the Draft Regulation, establishes **2024 as deadline for ATSPs or aerodrome operators to implement**

	approach procedures with vertical guidance. This requirement does not follow the resolutions of the **ICAO Assembly 36-23** and **37-11** establishing performance-based navigation goals. These resolutions are recommending *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*** Though it is commonly understood that some of the primary ICAO target dates would be hardly feasible due to current progress in the implementation process, the proposed 2024 deadline establishes a 6 years delay in the target date which will mean also 6 years delay in the use of EGNOS for RNP APCH. Several ANSPs having done already significant effort to comply with ICAO recommendation and EC/GSA tools to promote EGNOS adoption having been already launched, the newly proposed deadline looks deeply incoherent at both international and european levels.
response	*Noted.*
	Please refer to the response in the major concerns identified section of the Opinion related to implementation dates.

comment	*475* comment by: *Belgocontrol* - RNP APCH APV procedures will be mandated by 2024 for all runway ends that have published Non Precision Approach(es) only. This is much too late: ICAO asks 2016 for ALL instrument runway ends. The late date (2024) risks to flatten down the momentum which exists today in many countries. RNP1 for new SIDS/STARS (and even en-route airspace) from December 2018 onwards. This is much too early and not in compliancy with the ICAO-vision on PBN.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications.

comment	*488* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland* The end date for implementing RNP APCH APV procedures at all instruments runway ends, which are currently not served by precision approach procedures, should be better aligned with the ICAO resolution A37-11.
response	*Accepted.*

	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates.

comment	*494* comment by: *CAA-N* P 22: Article 6 Entry into force No 2. CAA-N suggest that the APV requirements in Subpart PBN, AUR.PBN.2005(1) shall apply from the end of 2018. This will be aligned with the original proposals from Eurocontrol in the Regulatory Approach Document. After being in contact with Operators in Norway, they strongly urge the CAA-N not to pace down the implementation requirements for APV. Present National regulation says APV from the end of 2016. Given the nature of the surroundings of norwegian Airports, the Safety aspect of APV vs CFIT is evidently.
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates.

comment	*499* comment by: *AEA* **Article 6 (1) : Entry into Force:** ***The Regulation shall come into force as from 6 Dec 2018*** **Comments:** Clarification is required what the date of 6 Dec 2018 means. Q. Is our understanding right that any new SIDs and STARs and any new route (en-route) shall be based on RNP1 as from Dec 2018 where and when performance can be improved ? Considering the fact that already many aircraft of the our member airlines have RNP1 capabilities, IATA is of the opinion that the ground infrastructure and procedures supporting these capabilities must be put in place as from Dec 2018, for which a harmonized airborne/ground development plan shall be made available as soon as possible. It is of utmost importance that with immediate effect a **dedicated PBN Program Manager will be** installed with a clear mandate to smoothly prepare implementation from now until 6 Dec 2018. We also understand that a phased implementation approach is foreseen with an unlimited time after 6 Dec 2016. However, the Pilot Common Project (PCP) which is actually in force and related to ATM Functionality #1 (XMAN + RNP1 + RF leg) has an end date of 2024. Q.: Could it be confirmed that our understanding is correct? If our understanding is right, the time span of 10 years to implement RNP1 in the 25 TMAs is

too long and is not acceptable due to the fact that the most of the aircraft are PBN capable for already at least 10 years and airlines have lost their patience to wait for another 10 years to finally gain benefits of their investments. The Airspace User Associations therefore request to shorten this period to achieve RNP1 design completeness of the 25 TMAs much earlier whilst taking into account the BCBS principle.

response *Noted.*

AEA's understanding with respect to the deployment of new PBN routes is correct. However, a phased implementation plan or PBN Program manager are not stipulated. For further clarification, please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and new provisions regarding navigation specifications.

The specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been taken into account and this proposal intends to broaden its scope.

comment *500* comment by: *AEA*

Art. 6 (2) : Entry into force:
RNP APCH APV procedures will be mandated by end date of 26 Jan 2024 <u>for all runway ends that only have an NPA</u>

<u>Comments</u>
We understand that a phased implementation approach is foreseen until 26 Jan 2024.
From a safety point of view IATA and the airlines do not accept a delay in implementing APV BaroVNAV procedures. The ICAO date of 2016 must be kept, in conformity with ICAO globally set timelines which were agreed back in 2007 by all DGs of CAA. Delaying the implementation with 8 years will send a wrong message especially when the delay is proposed by EASA as <u>the</u> Agency responsible for Aviation Safety in Europe. Airlines want vertical guidance to approaches to runway ends by means of BaroVNAV for safety reasons thereby avoiding to execute an Non Precision Approach.
As an acceleration measure it is strongly advices to assist slow moving States by means of creating a temporarily European Centre of Excellence in PBN.
From a technical APV design point of view it is requested not to deviate from the ICAO recommended 3 degree glide slope during descent to the runway.

response *Not accepted.*

The Agency may explore the possibility of creating a European Centre of Excellence in PBN.

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates.

comment *527* comment by: *IATA*

Comments:
Clarification is required what the date of 6 Dec 2018 means.

Q. Is our understanding right that any new SIDs and STARs and any new route (en-route) shall be based on RNP1 as from Dec 2018 where and when performance can be improved ?

Considering the fact that already many aircraft of the our member airlines have RNP1 capabilities, the Airspace User Associations is of the opinion that the ground infrastructure and procedures supporting these capabilities must be put in place as from Dec 2018, for which a harmonized airborne/ground development plan shall be made available as soon as possible.

It is of utmost importance that with immediate effect a **dedicated PBN Program Manager will be** installed with a clear mandate to smoothly prepare implementation from now until 6 Dec 2018.

We also understand that a phased implementation approach is foreseen with an unlimited time after 6 Dec 2016. However, the Pilot Common Project (PCP) which is actually in force and related to ATM Functionality #1 (XMAN + RNP1 + RF leg) has an end date of 2024.

Q.: Could it be confirmed that our understanding is correct?

If our understanding is right, the time span of 10 years to implement RNP1 in the 25 TMAs is too long and is not acceptable due to the fact that the most of the aircraft are PBN capable for already at least 10 years and airlines have lost their patience to wait for another 10 years to finally gain benefits of their investments. The Airspace User Associations therefore request to shorten this period to achieve RNP1 design completeness of the 25 TMAs much earlier whilst taking into account the BCBS principle.

response *Noted.*

IATA's understanding with respect to the deployment of new PBN routes is correct. However a phased implementation plan or PBN Program manager are not stipulated. For further clarification, please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and new provisions regarding navigation specifications.

The specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been taken into account and this proposal intends to broaden its scope.

comment *528* comment by: *IATA*

Art. 6 (2) : Entry into force:
RNP APCH APV procedures will be mandated by end date of 26 Jan 2024 for all runway ends that only have an NPA

Comments
We understand that a phased implementation approach is foreseen until 26 Jan 2024.
From a safety point of view the Airspace User Associations do not accept a delay in implementing APV BaroVNAV procedures. The ICAO date of 2016 must be kept, in conformity with ICAO globally set timelines which were agreed back in 2007 by all DGs of CAA. Delaying the implementation with 8 years will send a wrong message especially when the delay is proposed by EASA as the Agency responsible for Aviation Safety in Europe. Airlines want vertical guidance to approaches to runway ends by means of BaroVNAV for safety reasons thereby avoiding to execute an Non Precision Approach.
As an acceleration measure it is strongly advices to assist slow moving States by means of creating a temporarily European Centre of Excellence in PBN.
From a technical APV design point of view it is requested not to deviate from the ICAO recommended 3 degree glide slope during descent to the runway.

response *Not accepted.*

The Agency may explore the possibility of creating a European Centre of Excellence in PBN.

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates.

comment *549* comment by: *HungaroControl*

Article 6 The derogation to 2024 for the implementation of RNP procedures with vertical guidance is not appropriate, primarily because it goes against (more than 8 years) the deadline set in the ICAO resolution A37 / 11 and secondarily it's not even in line with original Eurocontrol proposal (end of 2018). The postponement of this date, in addition to delaying the benefits in terms of safety and performance, risks to compromise the future use of EGNOS infrastructure, on which the EU has invested billions of euro;

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion.

comment *550* comment by: *HungaroControl*

Implementation dates shall be set according to experience and also with regard to their regulatory context. This means, alignment of implementing target dates for airports subject to PCP IR as well as alignment with RP. Airspace planning projects need 5 years in average. A lot of other technical implementation projects do impact resources and cost efficiency targets within an IR. Adherence with the target dates of the ICAO resolution, i.e. Dec 2016 for APV, would be another argument.

response *Not accepted.*

	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates.

comment	*551* comment by: *HungaroControl* - RNP APCH APV procedures will be mandated by 2024 for all runway ends that have published Non Precision Approach(es) only. This is much too late: ICAO asks 2016 for ALL instrument runway ends. The late date (2024) risks to flatten down the momentum which exists today in many countries. - RNP1 for new SIDS/STARS (and even en-route airspace) from December 2018 onwards. This is much too early and not in compliancy with the ICAO-vision on PBN. CANSO recommends to realign the implementation timetable with ICAO recommendations and EU Reg. 716/2014 PCP IR: • 2018: APV in all instrument runway ends • 2024: RNP 1 required in those European TMAs where it has been proven that RNAV1 does not meet the performance requirements
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications. Also, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal.

comment	*593* comment by: *IACA International Air Carrier Association* **P22 – Article 6 – Entry into force** Much needs to be done to achieve the 6 December 2018 entry into force deadline: · implementation of pilot / controller procedures · ATC gaining experience to cope with RNP1 and its 'alert and monitoring' function · last but not least, to safely cope with a mixed aircraft environment. It is of utmost importance to have a dedicated PBN Program Manager with a clear mandate to smoothly prepare implementation.
response	*Noted.*
	The proposed requirements and their dates to enter into force together with the corresponding AMC/GM have been developed to take account of those essential aspects that facilitate and ensure an appropriate implementation. The appointment of PBN Program manager for implementation is outside the scope of this task.

comment	*594* comment by: *IACA International Air Carrier Association* **P22 – Article 6 – Entry into force** We note that the ATM Functionality #1 of the SESAR Pilot Common Project includes RNP1 and has an end date of 2024. Considering that most of the aircraft are PBN capable for already more than 10 years, waiting another 10 years to implement RNP1 in the 25 TMAs is too long and not acceptable. The Airspace User Associations therefore request to shorten this period to achieve RNP1 design completeness of the 25 TMAs much earlier whilst taking into account the 'Best-Capable-Best-Served' principle.
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates and provisions regarding navigation specifications. Also, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal, but the implementation schedule of the PCP is beyond the scope of this rulemaking task.

comment	*597* comment by: *Baranes* The dates of entry into force of the regulation are not consistent with the dates proposed in the RAD Eurocontrol, and in the ICAO resolution A37-11.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates.

comment	*598* comment by: *Baranes* The dates of entry into force of the regulation are not consistent with the dates proposed in the RAD Eurocontrol and in the IR PCP. Proposal for a new text : "By way of derogation from paragraph 1 the provisions as defined in the Annex, Subpart PBN, AUR.PBN. 2005(3) and (4) shall apply as from 26 January 2024, when those performance and functionality are needed."
response	*Not accepted.*
	The specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal.

comment	*644* comment by: *DFS Deutsche Flugsicherung GmbH* The dates mentioned in the DFS comment below only apply in conjunction with the request of DFS for the mandatory carriage of on-board RNP equipment (see comment on Explanatory Note 2.1). The implementation date has to be based on previous experience and on the overall context of the SES Regulations that are already applicable in the EU. None of the dates mentioned in Article 6 seem to take these interdependencies into account. This is why DFS cannot support any implementation dates prior to 2020. The planned introduction of RNP is performance driven (KPA of capacity and environment). It must not be forgotten that meeting the KPA of cost efficiency by 2019 is associated with an efficiency factor of -2.5%, which means that DFS must lower charges. Implementation dates for new operational procedures will inevitably lead to expenses and possibly to an increase in uncontrollable costs in accordance with Article 14 of Regulation (EU) 390/2013. The existing time requirements will lead to additional expenses in RP2 without promising any financial relief. Before RP3 (in 2020), it will not be possible to identify and budget these expenses. A target date will give the ATSPs sufficient lead time for new airspace projects, which may take up to five years depending on their complexity (FABEC), and sufficient time to properly conclude ongoing airspace projects. At the same time, it will be possible to include in the planning for subsequent reference periods the necessary resources and costs to be provided by ATSPs for the implementation of this Regulation. This would be a realistic timeframe for the implementation of this performance-driven requirement. Implementation of the ADQ Regulation should also be completed by then. The ADQ functionalities are a major supporting factor in the PBN data chain and the States will be in a position to establish their own national PBN implementation plan. Bearing in mind the above-mentioned conditions as well as our assessments, mandatory application of the requirements should **not begin prior to 2024**.
response	*Not accepted.*
	Key performance areas of safety, environment, capacity and cost-efficiency can be remarkably improved by means of a gradual PBN implementation strategy. The scope of the proposed regulation has been simplified and requires implementation of APV approaches at instrument runways where there is no precision approach procedure in place. The rest of the PBN requirements proposed only apply where and when needed to meet performance criteria. On the other hand, the specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal. They must enter into force as stipulated in the PCP.

comment | *668* comment by: *Virgin Atlantic Airways - Flight Technical Support*

Regarding 6(1) Entry into force, we would request clarification as to what the date of 6 Dec 2018 actually means in this context.

Regarding 6(2), the phased entry into force by 26 January 2024 is inconsistent with ICAO resolution A37-11 which set a 2016 date. We believe that the gap in these two dates is too wide and needs to be reconsidered on safety grounds.

response | *Noted.*

Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates. The proposed date of entry into force (6 December 2018) has been respected, although the date to implement APV has been brought forward in time.

ANNEX PART-AUR SUBPART ACAS — Airborne Collision Avoidance Systems (ACAS) II p. 23

comment | *345* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 AUR.ACAS.1005 'Scope'	The whole requirement is not consistent. In particular, the airspace referred is not made clear as it is designed by reference to **regulation (EC) No 216/2008** which, in turn, references **regulation (EC) No 551/2004**. We would suggest the following wording: "*This Subpart establishes the specific requirements for the carriage of ACAS II equipment when undertaking flights within the airspace above the territory to which the Treaty applies* ***as well as in any other airspace defined in Article 1*** *by :* ~~*(a)*~~ *operators of aircraft referred to under Article 4(1)(b)* ***thru (d)*** ~~*and (c)*~~ *of Regulation (EC) No 216/2008* ~~*undertaking flights into, within or out of the Union; and*~~	The general requirement establishes the applicability to "*flights within the airspace above the territory to which the Treaty applies*". This is then redefined in **paragraphs (a)** and **(b)**. The wording proposed tries to establish a clearer requirement that takes into account all possible situations.

	~~*(b) operators of aircraft referred to under Article 4(1)(d) of said Regulation undertaking flights within the airspace above the territory to which the Treaty applies as well as in any other airspace defined in Article 1.*~~".	

response *Partially accepted.*

Text amended accordingly to reflect the intent of the comment.

comment *368* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 AUR.ACAS.2005 '*Performance requirements*'	In **AUR.ACAS.2005 2)**, where it says "*aircraft not referred to in (1) but equipped with ACAS II (…)*" it should say "*aircraft not referred to in **paragraph** (1) but equipped with ACAS II (…)*" instead.	Typographical error

response *Accepted.*

Text has been amended accordingly.

comment *634* comment by: *CAA-NL*

AUR.ACAS.2005 – Performance Requirements
Although the text in Annex Part-AUR is existing regulations, it is observed that the term "unmanned aircraft systems" used in Paragraph (3) is outdated.
Therefore it is proposed change the text into

"..shall not apply to Remotely Piloted Aerial Systems."

response *Partially accepted.*

The text has been amended to refer to remotely piloted aircraft systems.

SUBPART PBN — Performance-Based Navigation - AUR.PBN.1005 Scope p. 24

comment *94* comment by: *CANSO*

The assumption/expectation that an ATSP and/or aerodrome operator is accountable for the implementation of the requirements of this NPA should be revised in order to include the responsibility of the State authorities.

AUR.PBN.2005 (3)
- What is the meaning of 'to meet the airspace performance needs'?
- Where is this performance defined?
- Who has the authority to define this?

The requirement AUR.PBN.2015(3) is not compliant with ICAO Doc. 9613 which offers several possibilities. One may expect to have the choice to opt for an ICAO proposed solution which matches the specific 'airspace performance needs' without being forced to implement RNP1.

AUR.PBN.2005 (4)
- What is the meaning of 'to meet the network performance needs'?
- AUR.PBN.2015(4) refers to a non-existing performance level: RNP1 en-route…
- It is understood that the statement refers to 'new' routes developed after 6 December 2018.

response *Not accepted.*

The text has been developed to characterise the role played by public or private entities that are the responsible for providing airspace or procedure design services.

PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme. Mandatory requirements have been proposed to implement APV due to their significant safety achievements.

Please, refer to response to the major concerns identified section of the Opinion related to

	the navigation specifications proposed. SUBPART PBN has been significantly simplified, but the performance requirements and functionalities will be incorporated as AMC/GM.

comment	*181* comment by: *EUROCONTROL* **Page 24 - AUR.PBN.1005 Scope - (2)(a)** EUROCONTROL makes an observation that should probably give rise to a correction: Reference is made to Article 1(1) and Article 1(2) but these articles cannot be found elsewhere in the document. In Article 1, the lower order numbering starts with a, b, c.
response	*Accepted.*
	The text of the new proposal has been revised.

comment	*203* comment by: *French State Aviation Safety Authority (DSAÉ)* · When the Air Traffic Service Providers (ATSPs) pursue with the implementation of PBN ATS routes, in coordination with the Network Manager, the Draft Opinion shall take into account that airspace design and management remain a full national prerogative of the member States. The regulatory text must ensure that, at national level, military authorities can work closely with national airspace design authorities prior to determining PBN routes. This coordination is essential to avoid any adverse impact on State aircraft non PBN-equipped. **Network Functions 677/2011 Art 11, should be referenced in the Recitals.**
response	*Accepted.*
	Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels together with local operational procedures should contribute to avoid any adverse impact on State aircraft non-PBN equipped.

comment	*227* comment by: *ESSP-SAS* Proposal: to include a reference to the definition of the EATMN included in Article 2.17 of Regulation No 549/2004 (amended by Reg. No 1070/2009).

response | *Not accepted.*

The revised draft regulation does not refer to the EATMN and therefore no definition is required.

comment | *228* comment by: *ESSP-SAS*

It is unclear why this Regulation will apply to aerodrome operators.
Aerodrome Operators are not within ATM/ANS definitions in Reg. No 549/2004, and according to SES Regulation, in relation with PBN there should always be a ATS provider, which would lead the eventual PBN implementation.

response | *Noted.*

Aerodromes operators are under the scope of the Basic Regulation and its essential requirements. They can promote the implementation of PBN Approach Procedures with Vertical guidance (APV) in order to ensure access to their instrument runways, as well as facilitate any necessary facility or investment, enabling any work or project related to the APV implementation.

comment | *346* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
This requirement implies that in any Member State either the ATSPs or the aerodrome operators are the owners of the process for establishing the IAPs, SID/STARs and ATS routes. This might not be the case in all instances.	There might be cases (e.g. a fully liberalised ATS provision or a strategic unit within the Government responsible for airspace management) where this responsibility would fall in other organizations within the State. Although requirement **AUR.PBN.3010** partially caters for this, if this is not properly addressed, there might be future issues with the actual implementation of this regulation.

response | *Noted.*

The text has been developed to characterise the role played by public or private entities that

are the responsible for providing airspace or procedure design services.

comment *347* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
Irrespective of the previous comment **[#346]**, **paragraph 2)** should be amended as follows: "*This Subpart shall apply to:* *(a) Air Traffic Service Providers (ATSPs)* ***included in*** ~~*referred to under*~~ *Article 1*~~*(2)*~~***b(3)*** *that provide air traffic services (ATS) in the airspace as defined in Article 1(*~~*1*~~***a****); and* *(b) aerodrome operators referred to under Article 1(*~~***2****b(2))*. "	**Article 1(b)(3)** refers to ATM/ANS provisions, i.e. ATM/ANS providers. However, this requirement applies specifically to ATSPs. Further to this, the references to **Article 1** are not correct.

response *Partially accepted.*

The Agency has revised the text to incorporate the intent of the comment and to ensure the correct references.

comment *385* comment by: *NATS National Air Traffic Services Limited*

SUBPART PBN AUR.PBN.1005 2)(a)&(b)

Where it states:
This Subpart shall apply to:
(a) Air Traffic Service Providers (ATSPs) referred to under Article 1(2) that provide air traffic services (ATS) in the airspace as defined in Article 1(1); and
(b) aerodrome operators referred to under Article 1(2).

Articles 1(1) & 1(2) are not in the NPA hence clarification is requested.

response	*Accepted.*
	The Agency has revised the text to ensure the references are correct.

comment	*476* comment by: *Belgocontrol* The assumption/expectation that an ATSP and/or aerodrome operator is accountable for the implementation of the requirements of this NPA should be revised in order to include the responsibility of the State authorities!
response	*Not accepted.*
	The text has been developed to characterise the role played by public or private entities that are the responsible for providing airspace or procedure design services.

comment	*552* comment by: *HungaroControl* The assumption/expectation that an ATSP and/or aerodrome operator is accountable for the implementation of the requirements of this NPA should be revised in order to include the responsibility of the State authorities. AUR.PBN.2005 (3) - What is the meaning of 'to meet the airspace performance needs'? - Where is this performance defined? - Who has the authority to define this? The requirement AUR.PBN.2015(3) is not compliant with ICAO Doc. 9613 which offers several possibilities. One may expect to have the choice to opt for an ICAO proposed solution which matches the specific 'airspace performance needs' without being forced to implement RNP1. AUR.PBN.2005 (4) - What is the meaning of 'to meet the network performance needs'? - AUR.PBN.2015(4) refers to a non-existing performance level: RNP1 en-route… - It is understood that the statement refers to 'new' routes developed after 6 December 2018.
response	*Not accepted.*
	The text has been developed to characterise the role played by public or private entities that are the responsible for providing airspace or procedure design services. PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme. Mandatory requirements have been proposed to implement APV due to their significant safety achievements.

	Please, refer to response to the major concerns identified section of the Opinion related to navigation specifications proposed and note that SUBPART PBN has been significantly simplified, but the performance requirements and functionalities will be incorporated as AMC/GM.

comment	*635* comment by: *CAA-NL* We beleave that the references in this article are not correct, the correct references are as follows: This Subpart shall apply to: (a) Air Traffic Service Providers (ATSPs) referred to under **Article 1(b)(3)** that provide air traffic services (ATS) in the airspace as defined in **Article 1(a)**; and (b) aerodrome operators referred to under **Article 1(b)(2)**.
response	*Accepted.*
	The Agency has revised the text to ensure the references are correct.

comment	*645* comment by: *DFS Deutsche Flugsicherung GmbH* This subpart must also be directed at the Member States because they have the sovereign rights over airspace usage. The States are the ones deciding on the (economic) use of airspace and (technical) functionalities in consultation with ATSPs, airspace users and the EU. This is all the more true the less the EU contributes to the regulation of the PBN elements of navigation specification (aircraft equipment) and NAVAID infrastructure and leaves the design of mixed operations (AUR.PBN.3005), for example, up to the national system. *Text proposal / supplement:* *…….* (c) Member States
response	*Not accepted.*
	The text has been developed to characterise the role played by public or private entities that are the responsible for providing airspace or procedure design services.

comment	*646* comment by: *DFS Deutsche Flugsicherung GmbH* In keeping with the supplements made to Article 1 and AUR.PBN.1005, requirements for the States and the national PBN implementation plans should be defined in a new section of AUR.PBN and the related AMC/GM: Text proposal / supplement:

AUR.PBN.NEW National PBN Implementation Plan
The Member State shall prepare a binding national PBN implementation plan with a time horizon of at least 10 years.
This PBN implementation plan shall be subject to annual consultation with the airspace users, airport operators and ATSPs. It shall be updated annually on a rolling basis and shall be coordinated/agreed annually with the Network Manager with respect to the cross-border interfaces.

AMC1 AUR.PBN.NEW National PBN Implementation Plan
This PBN implementation plan shall contain binding requirements for ATS and CNS providers taking into account the requirements contained in Regulation (EU) 390/2013, the reference periods in accordance with the EU performance plan, the ATM master plan as well as the ESSIP/LSSIP documents.
Taking into account the requirements and contents of this Regulation, this plan shall contain detailed national requirements/contents at least on the following subjects:

1. the use of the Global Navigation Satellite Systems (GNSS);
2. the navigation infrastructure to be provided;
3. the handling of mixed traffic (PBN / non-PBN) on routes and in terminal control areas;
4. the establishment and application of contingency procedures on routes and in terminal control areas;
5. the aircraft equipment - with respect to the equipment to be carried in general within the national territory as well as to the equipment required to serve the international airports that are of special importance to the State.

response | *Partially accepted.*

Implementation plans should only be developed where and when performance needs arise. The proposed requirements and their dates of entry into force, together with the corresponding AMC/GM, will take account of essential aspects that could facilitate and ensure an appropriate implementation.

Section I — Airspace AUR.PBN.2005 Routes and procedures p. 24

comment | *16* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AUR.PBN.2005 Routes and procedures
(1) to (4)

COMMENT:
ICAO doc. 9613 RNP1 chapter only provides guidance for implementation in arrival and departure procedures. On the other hand, RNP2 specification is the PBN application intended for en-route applications.

It is important to notice that beyond 30 NM from the airport, it is recommended that the

horizontal alert limit must be considered 2 NM instead of 1 NM in any RNP1 procedure, making equal the lateral spacing required for RNP2 and RNP1 routes out of the terminal airspace.

The RNP2 specification can be associated with the FRT function and the RNP1 with RF and Baro-VNAV functions.

Proposal: to reformulate the NPA to consider:
a) RNP2 specification for en-route application, instead of RNP1;
b) An issuance to airspace users of a single A-RNP operational approval to cover all specifications mandated in this NPA. This approval should go beyond basic A-RNP capabilities, covering the following functions:

- RNP2 + FRT (en-route)
- RNP1 + RF + Baro-VNAV (SID & STAR), and
- RNP APCH (approach).

response

Noted.

Please refer to the response to the major concerns identified section of the Opinion related to applicable navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements as a minimum. Therefore, RNP 1 should be implemented for those areas where higher performance is required.

RNAV 5 will remain applicable in en-route airspace.

The text has been reformulated and simplified.

comment

17 comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AUR.PBN.2005 Routes and procedures
(1)
ATSPs or aerodrome operators, responsible for the provision of instrument approach procedures, shall implement approach procedures with vertical guidance, that correspond to the performance and functionality as defined in AUR.PBN.2015(1) at all instrument runway ends which are not served by a precision approach procedure.

COMMENT:
Actual RNP APCH implementations have proved that runway ends “not served by a precision approach procedure” usually feature very significant difficulties and blocking points, compared with those already served by precision approaches. These blocking points are not addressed by the NPA with an appropriate level of detail – neither in the NPA’s AMC and GM. In particular:

- Visual Segment Surfaces penetration. On these situations each European NSA has different solution criteria -or no criteria at all. Some of these scenarios prevent RNP APCH or even RNP AR implementation. Ad-hoc procedure design adjustements are

not desirable nor acceptable as a general rule – they either make difficult the stabilization of the aircraft or decrease the airport accessibility.
- Runway end without runway facilities (according to ICAO Annex 14) for implementing APV approaches, because of the type or the amount of traffic and a not very demanding local meteorology, or all together. Some NSAs assume that there is a need to observe the requirements for precision approaches when implementing APV procedures.
- Minimum ATS infrastructure required. Some states require a minimum of ATS - AFIS or ATC- when RNP APCH instrument procedures are implemented. Instrument procedures should not necessarily be accompanied by ATS services.

Proposal: To address in the NPA the previously mentioned implementing blocking issues, providing a minimum common basis for an European homogeneous solution.

These specific issues can be solved via Guidance Material or Acceptable Means of Compliance, since they have not been considered under para. 2.7 (p. 18) activities.

response *Accepted.*

The contents of the proposed rule have been simplified. The AMC/GM will be further developed in order to facilitate and ensure an appropriate implementation.

comment *18* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AUR.PBN.2005 Routes and procedures
(3) and (4)

COMMENT:
RNP 1 implementation for en-route and SID/STAR applications is left subject to "airspace/network performance needs". This seems to suggest that the possibility of ATSPs implementing different, not mentioned PBN applications, if no performance gain is foreseen, is still open.
As this is in contradiction with the intent of Option 1 (section 4.3; RNP 1 is the only valid PBN specification in case some PBN SID/STAR/route implementation is decided), a more precise wording is suggested in all the document for this content.

As an example, new suggested text:

(3) When implementing Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs) using PBN, ATSPs or aerodrome operators, responsible for the provision of the routes, shall ensure that the routes correspond to the performance and fuctionality as defined in AUR.PBN.2015(3).

(4) When implementing ATS routes using PBN, the Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011(14), shall ensure the coordinated design of the European Route Network that corresponds with the performance and functionality as defined in AUR.PBN.2015(4).

response	*Not accepted.*
	The initial proposal required that all new and redesigned SIDs/STARs and ATS routes were developed to conform to RNP 1 specification when using PBN to gain performance benefits. This principle will be maintained. However, please refer to the response to the major concerns identified section of the Opinion related to navigation specifications, where a simplified approach is presented.

comment	*75* comment by: *CANSO* Regarding to Section I "Airspace" it would be more useful an explicit mapping between phases of flight and their specific RNP navigation, rather than focusing on the total system error(TSE);
response	*Accepted.*
	The text has been amend to describe those navigation specifications that can be used to implement a certain navigation application (SID, STAR, ATS route, approach procedure) with reference to specific PBN specifications. It clarifies and simplifies the text.

comment	*76* comment by: *CANSO* AUR.PBN.2005.1: To be reframed the criterion of the APV procedures introduction modulating it on the ICAO resolution A37/11 (missing the option for the implementation of PBN procedures with vertical guidance as an ILS backup)and on the priority criteria shared throughout EANPG55
response	*Not accepted.*
	The implementation of APV as back-up for precision approach (Type A or Type B) is left voluntary on the basis of local performance objectives.

comment	*77* comment by: *CANSO* AUR.PBN.2005.2: To be rewritten. In case of penalizing obstacles is not necessarily true that the RNP AR specification should be introduced, but may be sufficient the A-RNP. The requirement, as described, puts too stringent and onerous constraints for airliners and airport operators;
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion. The

	implementation of A-RNP has not been considered in the revised proposal.
comment	*88* comment by: *CANSO* AUR.PBN.2005 points (3) and (4) furthermore only make sense if the rule addresses a state responsibility as proposed above and to clarify about who determines the airspace needs and whether to introduce PBN. Without such a provision requirement AUR.PBN.2015 is not clear whether and who has the freedom to choose PBN or not.
response	*Not accepted.*
	The text has been developed to characterise the role played by public or private entities providing airspace or procedure design services.
comment	*95* comment by: *CANSO* What is the meaning of 'to meet the airspace performance needs'? - Where is this performance defined? - Who has the authority to define this? The requirement AUR.PBN.2015(3) is not compliant with ICAO Doc. 9613 which offers several possibilities. One may expect to have the choice to opt for an ICAO proposed solution which matches the specific 'airspace performance needs' without being forced to implement RNP1.
response	*Partially accepted.*
	PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme. In those cases, the harmonised use of the PBN specifications and functionalities is critical. SUBPART PBN has been significantly simplified, but the performance requirements and functionalities will be incorporated as AMC/GM.
comment	*96* comment by: *CANSO* AUR.PBN.2015 (3) - Requirements (a) and (d) imply RNP1 for terminal procedures (SID/STAR). - RNP1 currently implies "GNSS", as any alternative is currently not available… and "GNSS", currently, and also for the foreseeable future, means "GPS L1" only. - Requirement (c): RF legs are an optional capability for use with RNP 1, RNP 0.3 and RNP APCH rather than a minimum requirement. How many RNP1-capable aircraft today,

support the RF-functionality?
- The due date (6 December 2018) appears to be overly optimistic. According to a recent survey (March 2015), based on the submitted flight plans, only 38% of the departures out of Brussels Airport report to have a Basic RNP1-capability. Not less than 90% are RNAV1 compliant.
- CONCLUSION: RNP1 appears to be the wrong baseline for SID/STAR implementation starting in 2018.
- Note: a 'WINDOW' constraint is a common function for a modern FMS, but not foreseen in 'legacy' systems. How many aircraft do currently have that function available?

response *Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements as a minimum. RNP 1 should be implemented for those areas where superior performance is required.

comment *119* comment by: *Finavia*

In paragraphs (3) and (4), the text shall be modified so that the requirements were applicable when implementing PBN SIDs, STARs and ATS routes in the context of airspace changes using PBN to meet the airspace performance needs. The proposed change of the requirement would help in avoidance of the situations where:

- the regulation would prevent the application of the navigation specification other than RNP 1 already in use within an airspace, in the context of individual route implementations as part of the existing airspace structure,
- the regulation would lead to a mix of RNAV 5 and RNP 1 routes (or RNAV 1 and RNP 1 routes) within the same airspace, leading to problems with safety and efficiency.

Proposed new text:
AUR.PBN.2005
(3) When implementing Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs), in the context of airspace changes using PBN to meet the airspace performance needs, ATSPs or aerodrome operators, responsible for the provision of the routes, shall ensure that the routes correspond to the performance and functionality as defined in AUR.PBN.2015(3).
(4) When implementing ATS routes in the context of airspace changes using PBN to meet the network performance needs, the Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011 (14) , shall ensure the coordinated design of the European Route Network that corresponds with the performance and functionality as defined in AUR.PBN.2015(4).

The proposed modification is justified by the current PBN implementation status in Europe. The ATS route network is already relying on PBN, based on the navigation specification RNAV 5. At many airports (for example in Finland, 75% of the airports), there are SIDs or STARs in

operations based on the navigation specification RNAV 1. Instead of the fixed date applicable for each individual route implementation, the regulation should focus on airspace changes where all the routes of an airspace are subject to change. In the context of individual route implementations, the regulation should not prevent the application of the navigation specification already in use within the airspace.
In case it turns out that not all aircraft are capable for RNP 1 requirements, RNAV 5 and RNAV 1 shall be the alternative in support of PBN implementation, instead of the reliance on conventional navigation. Recent assessment of the fleet navigation capabilities in Finland, for example, indicated that less than 1 % of the civil IFR traffic was not capable for RNAV 5.

response *Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements as a minimum. Therefore, RNP 1 should be implemented for those areas where superior performance is required. RNAV 5 will remain applicable in en-route airspace. The implementation of SID/STARs should not be only associated with major airspace modification programmes.

comment *154* comment by: *skyguide Corporate Regulation Management*

AUR.PBN.2005

1. It is our understanding that existing RNAV1, RNAV5 and conventional routes / SID /STARS can still be changed without converting them to RNP1. Can EASA confirm this understanding? We suggest to specify the ICAO A-RNP navigation specification instead of RNP1.
   Comment: As of 2018, only RNP1 procedures and ATS routes are allowed
2. It is our understanding that RNP0.3 helicopter operations are still possible to implement. Can EASA confirm this understanding?
   Comemnt: ICAO identified RNP0.3 routes for advanced helicopter operations for an efficient use of the airspace. According AUR.PBN.2005, the implementation must be based on RNP1.

   AUR.PBN.2005 (1)
   ICAO resolution A37-11 does explicitly allow to develop RNP APCH to LNAV minima in case APV is not feasible. This option should also be included here.

response *Partially accepted.*

The set of applicable navigation specifications has been simplified in the new proposal to simplify the transition to PBN operations based on a performance need. Please see the response to the major concerns identified section of the Opinion. Also, RNP 0.3 specification has been included for rotorcraft operations.

It should be recognised that any amendments to an existing route, to improve performance, will require the convergence of the route either to an RNAV1 or RNP 1 standards as required

	by the revised proposal.

comment	*168* comment by: *skyguide Corporate Regulation Management* **AUR.PBN (4)** Equipment requirements for airspace users should be introduced or the PBN specification reduced to RNAV 5. Comment: Introducing anything more precise of stringent than current RNAV5 in the en-route environment makes only sense at a time when the carriage of appropriate equipment will be mandatory for all traffic (except OAT) in a certain airspace
response	*Accepted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications.

comment	*179* comment by: *EUROCONTROL* **Page 24 - Section I - Airspace** EUROCONTROL makes a comment requiring action at the text level: This section deliberately avoids the naming of PBN Navigation Specifications. This makes it confusing, thus requiring a text review and adaptation. **Page 24 - AUR.PBN.2005 Routes and procedures (1) and (2)** EUROCONTROL makes a comment followed by a question and an assumption, both requiring action at the text level: Understanding (2) is difficult as (1) says basically "implement RNP APCH with vertical guidance" whereas (2) seems to say that "an RNP AR procedure may be implemented". Therefore, what does the "without prejudice to paragraph 1" mean? Could this mean that the RNP APCH with vertical guidance is needed even if AR is implemented? **Page 24 - AUR.PBN.2005 Routes and procedures (3)** EUROCONTROL raises a point through the form of a series of questions showing that this part of the rule-making proposal needs clarification:

	Is the rule applicable to SIDs/STARs and ATS routes already using PBN (e.g. SID/STAR using RNAV1)? This part of the NPA states "when implementing … using PBN …". Is the requirement intended only for new implementations or does it relate also to existing PBN implementations? Taking into account AUR.PBN.3010 (2) (page 26) it seems that the requirement applies only to new implementations. A clarification, however, would be beneficial. In addition the difference between maintaining airspace design and designing new airspace needs to be clarified, e.g. is modifying an element in a SID/STAR considered as a new implementation?
response	*Partially accepted.*
	The initial proposal required that all new or redesigned SIDs/STARs and ATS routes were developed to conform to RNP 1 specification. However, please refer to response to the major concerns identified section of the Opinion related to navigation specifications, where a simplified approach is presented. The proposed rule has been revised accordingly to clarify that the requirement is applicable if implementing or modifying PBN ATS routes. Furthermore the text has been clarified with respect to "Notwithstanding paragraph…"

comment	*191* comment by: *ENAV* - Regarding to Section I "Airspace" it would be more useful an explicit mapping between phases of flight and their specific RNP navigation, rather than focusing on the total system error(TSE);
response	*Accepted.*
	The text describes those navigation specifications that can be employed in order to implement a certain navigation application (SID, STAR, ATS route, approach procedure).

comment	*192* comment by: *ENAV* - AUR.PBN.2005.1: To be reframed the criterion of the APV procedures introduction modulating it on the ICAO resolution A37/11 (missing the option for the implementation of PBN procedures with vertical guidance as an ILS backup)and on the priority criteria shared throughout EANPG55; - AUR.PBN.2005.2: To be rewritten. In case of penalizing obstacles is not necessarily true that the RNP AR specification should be introduced, but may be sufficient the A-RNP. The requirement, as described, puts too stringent and onerous constraints for airliners and airport operators;

response | *Not accepted.*

The implementation of APV as back-up for precision approach (Type A or Type B) is left voluntary on the basis of local performance objectives.

Please refer to the response to the major concerns identified section of the Opinion. The implementation of A-RNP has not been considered in the present proposal.

comment | *230* comment by: *ESSP-SAS*

If ICAO Annex 6 definitions are to be included and the scope of the Regulation changed to "all instrument runway ends" some modification should be made to the AUR.PBN.2005 section, as it would bring no real benefit to have Precision Approaches based on SBAS with another APV at the same runway end, as the navigation sensor would be the same (no benefit in safety).

response | *Not accepted.*

The scope of the regulation is not proposed to be changed. APV implementation will only be applicable at those runway ends that are not served by a precision approach.

comment | *288* comment by: *AvinorANSP*

Comment:
According to the above rational (ref. our comments to add definition of ATS routes in Article 2) ***Routes and Procedures*** is proposed changed to ***ATS Routes and Instrument Approach Procedures***

(1) ATSPs or aerodrome operators, responsible for the provision of instrument approach procedures, shall implement approach procedures with vertical guidance, that correspond to the performance and functionality as defined in AUR.PBN.2015(1) at all instrument runway ends, ***where possible****, which are not served by a precision approach procedure*.

Comment:
As it is not possible to implement APV procedures to all instrument runway ends due limitations in EGNOS coverage and/or current Pans-Ops criteria, the disclaimer **where possible** should be a part of the text

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(4) When implementing ATS routes using PBN to meet the network performance needs, the Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011(14), shall ensurethe coordinated design of the European Route Network that corresponds with the performanceand functionality as defined in AUR.PBN.2015(4).

Comment:
Propose new text:
(4) When implementing ATS routes (en-route) using PBN to meet the network performance needs, the
Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011(14), shall ensurethe coordinated design of the European Route Network that corresponds with the performanceand functionality as defined in AUR.PBN.2015(4).

response *Not accepted.*

The term "where possible" cannot be defined and, as such, conditions for its application would need to be defined. APV can also be implemented based on BARO –VNAV, reliance on full EGNOS coverage is not required. Furthermore to ensure safe operation only APV approach procedures shall be implemented.

comment *307* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

Is there a need to specify the vertical performance in AUR.PBN.2005 (1) and (2)? In RIA page 40 the vertical performance is stated as 99.7 %, 150 ft at and below 5 000 ft.

response *Not accepted.*

The regulation has been simplified for clarity and no reference to vertical performance is included in the proposed draft regulation.

comment *308* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

Review the NPA in the sense of setting A-RNP specification for approach, SID/STAR and en-route phase (as provided in the ICAO PBN Manual).

response *Not accepted.*

Please, refer to the response to the major concerns identified section of the Opinion in relation to applicable navigation specifications.

comment *309* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

The necessary infrasturcture that is needed to support RNP navigation requirements for departure, en-route and arrival phase of the flight needs to be clarified.

response | *Noted.*

If the comment refers to NAVAID infrastructure, different sensors could be employed to estimate the position depending on the navigation specification concerned, such as DME/DME or GNSS. If the comment (also) refers to communications or surveillance services and facilities, these elements are part of the airspace concept adopted locally.

The AMC/GM associated to the proposed regulation will facilitate and ensure the implementation of the proposed navigation applications.

comment | *310* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

When does EASA expect to have an aircraft specification ready for A-RNP?

response | *Noted.*

The certification specification that will support A-RNP should be available in 2017.

comment | *313* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

The Swedish Transport Agency recommends that there be a requirement in the regulation of LNAV-minima also when implementing APV procedures.

response | *Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion. In order to ensure safe operation, only APV approach procedures shall be implemented.

comment | *348* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
Requirement **AUR.PBN.2005 (4)** implies that the Network Manager (NM) is the responsible for establishing the ATS routes in the European airspace. This is actually not so as the NM	**Regulation (EU) No 677/2011** (NMF IR) establishes the way that the NM interacts with the Member States, in particular through its **Articles 7** and **9** and **Annex I Part A 3**.. Further to this, **whereas (3)** of the NMF IR states that "*The design of the European route network and the coordination of scarce resources according to Regulation*

shall "*support the execution of the functions listed in Article 3*" of **regulation (EU) No 677/2011** (NMF IR).	*(EC) No 551/2004 should be without prejudice to Member States' sovereignty over their airspace and to the requirements of the Member States relating to public order, public security and defence matters according to Regulation (EC) No 549/2004*" whilst **whereas (8)** states that "*The obligations of the Member States towards the ICAO regarding route design, frequency and SSR transponder code management should be respected and should be implemented more effectively for the network with coordination by and support from the Network Manager*".

response *Noted.*

Article 3 of Regulation (EU) No 677/2011 stipulates that the Network Manager (NM) performs the design of the European Route Network (ERN) in order develop an integrated European Route Network Design. However, this should be achieved via cooperative decision-making process. For that purpose, the NM is required to put in place an ERN Improvement Plan. Member States shall remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility. For that reason, the proposed rule mentioned "the coordinated design" of the ERND function.

comment *369* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 AUR.PBN.2005 '*Routes and procedures*'	In **AUR.PBN.2005 (2)**, where it says "*Without prejudice to paragraph 1, where limiting obstacles conditions exist (…)*" it should say "*Without prejudice to paragraph **(1)**, where limiting obstacles conditions exist (…)*" instead.	Typographical error

response *Accepted.*

The text has been revised and corrections made.

comment *370* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 AUR.PBN.2005 '*Routes and procedures*'	In **AUR.PBN.2005 (3)**, where it says "*When implementing Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs), using PBN to meet the airspace performance needs (…)*" it should say "*When implementing Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs)~~,~~ using PBN to meet the airspace performance needs (…)*" instead (i.e. the comma should be removed).	Typographical error

response *Accepted.*

Corrections have been made when necessary. In this particular case, the commas are used to clarify the message: using PBN to meet the identified performance objectives.

comment *386* comment by: *NATS National Air Traffic Services Limited*

SUBPART PBN, AUR.PBN.2005(4) + RIA 4.3 Page 41

Where it states:
(4) When implementing ATS routes using PBN to meet the network performance needs, the Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011(14), shall ensure the coordinated design of the European Route Network that corresponds with the performance and functionality as defined in AUR.PBN.2015(4).

1. 1. The role of the Network Manager (NM) in “co-ordinating implementations” is not

clear. Will that function have a role in determining where the PBN ATS routes are implemented, in accordance with the ERNIP, or will it be left to the ATS provider.

2. 2. Where the NM "harmonises implementations', this suggests that the function would take on a greater leadership role in implementations.

EASA is asked to more fully define and scope the role of the NM in co-ordinating ATS routes

response *Noted.*

Article 3 of Regulation (EU) No 677/2011 establishes that the Network Manager (NM) performs the design of the European Route Network (ERN) in order develop an integrated ERN Design. However, this should be achieved via cooperative decision-making process. For that purpose, the NM is required to put in place an ERN Improvement Plan. Member States shall remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility. For that reason, the proposed rule mentioned "the coordinated design" of the ERND function.

comment *403* comment by: *LFV*

ENROUTE - AUR.PBN.2005 (4) + AUR.PBN 2015 (4a):

In Sweden FRA is implemented between FL 285-660 with a current requirement on operators to be capable of RNAV5. With a reduced route spacing between parallel routes from 10 – 15 NM (ICAO Annex 11, Attachment A) to 7 NM and the reduction of strategical separation between centerline of a route and an adjoining airspace structure it might be possible to enlarge military airspace structures somewhat or to establish routes free of these structures. Above FL285 from an ATCOs perspective it makes no difference whether B-RNAV (RNAV 5) or Advanced RNP (RNP1) is implemented since separation is not provided strategically but is provided by the ATCO based on surveillance. A very limited positive effect might also be the possibility to reduce spacing between the Transition Routes if SID/STAR final/initial waypoints are re-designed.
The requirement to keep the possibility for non-PBN acft wouldn't be applicable because RNAV5 is required enroute in all Europe and RNAV5 is also PBN. We interpret the NPA so that if FRA is already implemented there is no change needed and there will be no action of "any change" to initiate implementation of RNP 1/Adv-RNP.
FRA eliminates the need for vertical functionality and FRT because no explicit routes are followed.
LFV proposes for Enroute – Airspace to be designed to optimise flight efficiency with FRA by 2023. PCP requirements for High density areas to be followed as they are by 2024. Include requirement on operators with capability for Adv-RNP+ FRT above FL195 and RNP 1+ RNAV Holding below FL195.
However, since mixed-mode en-route operations are not deemed to be beneficial until there is a requirement on aircraft equipage, the positive effects will most likely be beyond the date when a mandate on aircraft performance is implemented.

response | *Partially accepted.*

The proposed regulation intends to ensure harmonised PBN implementation in Europe where and when needed to reach performance criteria, so if new or redesigned PBN operations are not necessary, there is no obligation to implement changes.

Please, see also the response to the major concerns identified section of the Opinion related to PBN requirements and also note that RNAV 5 will remain applicable in en-route airspace.

comment | *404* comment by: *LFV*

ENROUTE - AUR.PBN.2005(4) and AUR.PBN.2015(4a,b):

In Sweden all airspace above FL 95 is considered enroute with routes requiring operators' capability of RNAV 5 (B-RNAV) as implemented 1998 in all Europe. Parallel routes are only implemented:

- Stockholm – Copenhagen,
- From Stockholm northbound along the Swedish east-coast,
- Stockholm – Gothenburg,
- Oslo – Copenhagen and
- Stockholm – Oslo.

These routes are more or less straight which reduces the need for Fixed Radius Turns capability although on the boundary between TMA and ACC operations some positive effects could be achieved.
According to the NPA "any change" in that airspace would activate the requirement RNP 1/Adv-RNP capability but in what sense?
- If only one ATS route is changed, will the requirement only apply to that particular ATS route or would all ATS routes be directly affected?
- When a change is required, according to NPA that would also activate the "upgrade" to require RNP1/Adv-RNP capability for acft using that route. At the same time we are obliged to keep the possibility for non-PBN operators to navigate the same routes.
- Firstly – there are currently no non-PBN operators allowed in Europe flying above FL95 because of the requirement of RNAV 5 (which is also a PBN application).
- Second – in Sweden we have no need for closer ATS routes than we already have with RNAV5.
- Third – if in Sweden, we will need to mandate RNP 1/Adv-RNP for the new/changes routes, there would actually be no alternative routes to keep anyway for the non-PBN capable operators.
- Or – Sweden would actually have ATS routes with the exact same configuration, but with two different requirements/possibilities to navigate (RNAV 5 and RNP1/Adv-RNP) for no obvious reason at all.

LFV proposes for Enroute – Airspace to be designed to optimise flight efficiency with FRA by 2023. PCP requirements for High density areas to be followed as they are by 2024. Include requirement on operators with capability for Adv-RNP+ FRT above FL195 and RNP 1+ RNAV Holding below FL195.
However, since mixed-mode en-route operations are not deemed to be beneficial until there is a requirement on aircraft equipage, the positive effects will most likely be beyond the date when a mandate on aircraft performance is implemented.

response

Partially accepted.

The proposed regulation intends to ensure harmonised PBN implementation in Europe where and when needed to reach performance criteria, so if new or redesigned PBN operations are not necessary, there is no obligation to implement changes.

Please, see also the response to the major concerns identified section of the Opinion related to PBN requirements, and also note that RNAV 5 will remain applicable in en-route airspace.

comment

405 comment by: *LFV*

TERMINAL - AUR.PBN 2005(3) and AUR.PBN2015(3):

NPA states that ”when” implementation or when ”any change” of present routes within TMA is initiated, this would activate SID/STAR to be consistent with RNP 1 specification (acft performance and functionality?).

- This proposal could lead to that if no operators request RNP 1 routes for better performance and there is no other driving factor to initiate a change (no new obstacles, no change of WPT coordinates, no environmental needs etc) LFV foresees that the responsible entity would avoid any kind of airspace change for as long as possible. With the result that modernization of TMAs could take forever.

- On the other hand, a simple change of a coordinate could activate the need to redesign the complete SID/STAR system according to RNP 1. That would cause unjustifiable costs for the entity responsible for the SID/STAR system. In the worst case this would be of absolutely no use if no operators have the relevant capability. So there would be totally useless costs without benefit for anyone. And with the need of 36 months prior notice, this is the reality already from today.

- The comments above shows that the date of December 2018 has no positive effect for anyone, not even the SESAR deployment through the PCP.

LFV proposes for TMA – Airspace to be redesigned and optimised, with provision of RNP 1 SID/STAR system where applicable, to provide capacity, efficiency, access, CDO/CCO according to ATM master plan requirements, by 2020. That will be more realistic and also provide the possibility to include requirements on the operators with capability for RNP1 + RF leg + RNAV holding + ALT constraints. It would also be better in line with the date for implementation of PBN according to the PCP, if necessary.

response | *Partially accepted.*

PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme for air navigation services and network functions. If new or redesigned PBN operations are necessary, it is mandatory to implement PBN proposed navigation specifications.

However, the revised proposal has been simplified and the navigation specifications to be applied has been amended.

Please, see also the response to the major concerns identified section of the Opinion related to PBN requirements.

comment | *409* comment by: *LFV*

APPROACH - AUR.PBN.2005(1,2) and AUR.PBN.2015(1a-d, 2a-d):

There should be better consistency and coordination between regulations/recommendations from organisations with steering on states and/or responsible bodies. This is what we get from different directions right now:
- **ICAO** – Requires APV to be implemented to all instrument RWY ends (replace non-precision and back up for ILS) by the end of 2016. Requires at least an LNAV procedure to be implemented if APV not possible, or as fall back in case of GNSS failure during approach.
- **EASA/NPA** – Requires APV to all RWY ends not served with a precision approach procedure by January 2024. Fall back procedures during approach are not mentioned. If limiting obstacles conditions, RNP AR may be implemented.
- **PCP** – Requires implementation of APV but doesn't specify to which RWY ends (all, to replace non-precision, to one of your own choice…), by 2024. Fall back procedures during approach are not mentioned. Is RNP AR considered enough?

1. In Sweden already most of the airports are soon to implement APV procedures according to the recommendations from ICAO, further expressed by Swedish Regulator, by 2016 or as soon as possible. As LFV has understood according to the NPA there is no problem with implementing the procedures in advance of 2024, but the date must be questioned anyway. The requirement from ICAO to implement by 2016 is now established as not completely realistic but many states/airport are actually ready or about to implement which means a delay of just a couple of years would be more reasonable than 2024.

2. Again, the states/airports that have already implemented APVs or are about to, have done so according to ICAO recommendations – to ALL RWY ends. To change that requirement is not in line with ATM master plan or the PCP stating reasons like efficiency, access, capacity etc as drivers behind PBN, since an APV as back-up to ILS also has that same purpose.

3. If flight safety (reducing CFIT) is one of the drivers behind SESAR, ATM masterplan and

PCP – there's no excuse not to also require an LNAV procedure as fall-back to all APV and to set the date as soon as possible, therefore 2018.

LFV proposes for Apch – APV to be implemented to all instrument RWY ends, and at least LNAV procedures where APV is not possible or as fall back to APV by 2018.
That will be more realistic and also give the possibility to include requirements on the operators with capability for APV by 2020.

response *Not accepted*.

Please refer to the response to the major concerns identified section of the Opinion related to implementation dates and provisions regarding navigation specifications.

comment *443* comment by: *DGAC/DTA*

AUR.PBN.2005, paragraph (1)
What happens on instrument runway ends where an APV cannot be implemented due to obstruction or terrain, regarding to PANS-OPS criteria limitations (Vertical path angle)?

Suggestion:
"at all instrument runway ends which are not served by a precision approach procedure, where limiting obstacles or terrain don't prevent it"

response *Not accepted.*

For improved safety, APV operations are required.

comment *445* comment by: *DGAC/DTA*

AUR.PBN.2005, paragraph (4)

The Member States are responsible for the airspace design and the coordination does already exist in regulation no 677/2011.

Proposal:

(4) When implementing ATS routes using PBN to meet the network performance needs, ~~the Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011(14)~~, Member States shall ensure that the coordinated design of the European Route Network ~~that~~ corresponds with the performance and functionality as defined in AUR.PBN.2015(4).

response *Not accepted.*

Article 3 of Regulation (EU) No 677/2011 establishes that the Network Manager (NM)

	performs the design of the European Route Network (ERN) in order develop an integrated ERN Design. However, this should be achieved via cooperative decision-making process. For that purpose, the NM is required to put in place an ERN Improvement Plan. Member States shall remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility. For that reason, the proposed rule mentioned "the coordinated design" of the ERND function.

comment	*469* comment by: *EUROPEAN COMMISSION GNSS Programmes* The present NPA, in its SUBPART PBN - Performance-Based Navigation, AUR.PBN.2005 (1) of the Draft Regulation, requests implementation of approach procedures with vertical guidance **only at instrument runway ends not served by a precision approach procedure.** This requirement does not follow the resolution of ICAO Assembly 37-11 recommending 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** Moreover, the proposed NPA **does not consider the use of APV as a backup to ILS**. **The scope of the requirement is then considerably reduced which will mean a strong limitation of SBAS-based procedure implementation.**
response	*Noted.*
	The initial scope of the proposed rules is maintained. However, APV may be implemented at other locations based on a local decisions.

comment	*477* comment by: *Belgocontrol* (3) What is the meaning of 'to meet the airspace performance needs'? - Where is this performance defined? - Who has the authority to define this? The requirement AUR.PBN.2015(3) is not compliant with ICAO Doc. 9613 which offers several possibilities. One may expect to have the choice to opt for an ICAO proposed solution which matches the specific 'airspace performance needs' without being forced to implement RNP1.
response	*Noted.*
	PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme. In those cases, the harmonised use of the PBN specifications and

	functionalities is critical. SUBPART PBN has been significantly simplified, but the performance requirements and functionalities will be incorporated as AMC/GM.

comment	*478* comment by: *Belgocontrol* (4) - What is the meaning of 'to meet the network performance needs'? - AUR.PBN.2015(4) refers to a non-existing performance level: RNP1 en-route… It is understood that the statement refers to 'new' routes developed after 6 December 2018.
response	*Noted.*
	PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme. In those cases, the harmonised use of the PBN specifications and functionalities is critical. SUBPART PBN has been significantly simplified, but the performance requirements and functionalities will be incorporated as AMC/GM. Please see also the response to the major concerns identified section of the Opinion regarding PBN specifications included in the revised proposal.

comment	*491* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland* The ICAO resolution A37-11 does explicitly allow to develop RNP APCH to LNAV minima in case APV is not feasible. This option should also be included here.
response	*Not accepted.*
	For improved safety, APV operations are required.

comment	*495* comment by: *CAA-N* AUR.PBN.2005 (1) It should be added .."to Instrument runway ends where APV is possible according to valid ICAO criteria and SBAS coverage". (4) When implementing ATS routes... It should be specified here that this applies to En-route!
response	*Not accepted.*

	APV does not need to be solely based on SBAS. With respect to en-route operations, the proposed regulation requires no change to the current implementation and, as such, the corresponding requirement has been deleted.

comment	*501* comment by: *AEA*
	AUR.PBN.2005 (4) page 24: " ***The Network Manager shall ensure the coordinated design of the European Route Network"*** **Comments** The role of the NM is not clear as it says: "ensuring the coordinated design" . The term coordination is very vague and does not have any practical meaning based on past experience with the NM. The role of the NM to our opinion shall be broader and shall also look into the development of ICAO recognized ATS procedures between pilots and controllers ready for usage in full support of airborne investments in RNP1. A harmonized PBN implementation across Europe is key. A credible plan is needed to ensure that all new ground systems, new functionalities and associated procedures are timely implemented in a harmonized and synchronized manner. Since some ANSPs have no technical PBN competence, a third party might be needed to ensure progress. In this sense PBN deployment needs strong PBN Program Manager (PM) with a clear mandate to act, dedicated to the PBN "technical" implementation issues. ATCOs must be fully trained and adapt skills to cope with new aircraft functionalities, RNP1, RF leg, RNAV Holding, CCO/CDO etc. to achieve promised benefits through improved efficiencies. A PBN Centre of Excellence shall be created for which could be fulfilled by the NM. The dedicated PBN PM, with its responsibilities, is then able to make use of this Centre for the successful harmonized, synchronized and coordinated implementation of PBN across Europe. (The PM is reporting to the DM).
response	*Noted.*
	Article 3 of Regulation (EU) No 677/2011 establishes that the Network Manager (NM) performs the design of the European Route Network (ERN) in order develop an integrated ERN Design. However, this should be achieved via cooperative decision-making process. For that purpose, the NM is required to put in place an ERN Improvement Plan. Member States shall remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility. Therefore, the proposed rule mentioned "the coordinated design" of the ERND function. The creation of a PBN Programme Manager is out of the scope of this rulemaking task. PBN implementations other than APV will take place where and when a performance need arises.

comment	*507* comment by: *Swedavia* Comment: The NPA states that when implementing SIDs and STARs, aerodrome operators shall ensure that the routes correspond to the performance and functionality of RNP 1. If only a smaller adjustment of the airspace is needed, the effect of this regulation could be that steps to modernize the airspace will be postponed as long as possible. This would be the case if the cost for procedure design and implementation is larger than the benefits, which could be the case if only a small share of the aircraft fleet can fly RNP 1.
response	*Accepted.*
	The revised draft proposal now requires the use of RNAV 1 as a minimum. This should offset the concerns regarding the number of equipped aircraft. PBN SDIs/STARs are to be implemented only when a performance benefit is evident.

comment	*510* comment by: *Swedavia* Comment: ICAO and the Swedish CAA as well urges airports to implement APV procedures to all instrument RWY ends by the end of 2016. Many countries have difficulties to fulfil this requirement, but as far as Swedavia understands, most states are planning for implementation as soon as practicably possible. In this perspective we find it difficult to understand why EASA proposes 2024.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the implementation dates.

comment	*529* comment by: *IATA* **Comments** The role of the NM is not clear as it says: "ensuring the coordinated design" . The term coordination is very vague and does not have any practical meaning based on past experience with the NM. The role of the NM to our opinion shall be broader and shall also look into the development of ICAO recognized ATS procedures between pilots and controllers ready for usage in full support of airborne investments in RNP1. A harmonized PBN implementation across Europe is key. A credible plan is needed to ensure that all new ground systems, new functionalities and associated procedures are timely implemented in a harmonized and synchronized manner. Since some ANSPs have no technical PBN competence, a third party might be needed to ensure progress. In this sense PBN deployment needs strong PBN Program Manager (PM) with a clear mandate to act, dedicated to the PBN "technical" implementation issues. ATCOs must be fully trained and adapt skills to cope with new aircraft functionalities, RNP1,

	RF leg, RNAV Holding, CCO/CDO etc. to achieve promised benefits through improved efficiencies. A PBN Centre of Excellence shall be created for which could be fulfilled by the NM. The dedicated PBN PM, with its responsibilities, is then able to make use of this Centre for the successful harmonized, synchronized and coordinated implementation of PBN across Europe. (The PM is reporting to the DM).
response	*Noted.*
	Article 3 of Regulation (EU) No 677/2011 establishes that the Network Manager (NM) performs the design of the European Route Network (ERN) in order develop an integrated ERN Design. However, this should be achieved via cooperative decision-making process. For that purpose, the NM is required to put in place an ERN Improvement Plan. Member States shall remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility. Therefore, the proposed rule mentioned "the coordinated design" of the ERND function. The creation of a PBN Programme Manager is out of the scope of this rulemaking task. PBN implementations other than APV will take place where and when a performance need arises.

comment	*553* comment by: *HungaroControl* Regarding to Section I "Airspace" it would be more useful an explicit mapping between phases of flight and their specific RNP navigation, rather than focusing on the total system error(TSE);
response	*Accepted.*
	The text has been revised to describe those navigation specifications that can be used in order to implement a certain navigation application (SID, STAR, ATS route, approach procedure).

comment	*554* comment by: *HungaroControl* AUR.PBN.2005.1: To be reframed the criterion of the APV procedures introduction modulating it on the ICAO resolution A37/11 (missing the option for the implementation of PBN procedures with vertical guidance as an ILS backup)and on the priority criteria shared throughout EANPG55
response	*Not accepted.*
	The implementation of APV as back-up for precision approach (Type A or Type B) is left voluntary on the basis of local performance objectives.

comment	*555* comment by: *HungaroControl* AUR.PBN.2005.2: To be rewritten. In case of penalizing obstacles is not necessarily true that the RNP AR specification should be introduced, but may be sufficient the A-RNP. The requirement, as described, puts too stringent and onerous constraints for airliners and airport operators;
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion. The implementation of A-RNP has not been considered in this proposal.

comment	*556* comment by: *HungaroControl* AUR.PBN.2005 points (3) and (4) furthermore only make sense if the rule addresses a state responsibility as proposed above and to clarify about who determines the airspace needs and whether to introduce PBN. Without such a provision requirement AUR.PBN.2015 is not clear whether and who has the freedom to choose PBN or not.
response	*Not accepted.*
	The text has been developed to characterise the role played by public or private entities that are the responsible for providing airspace or procedure design services.

comment	*557* comment by: *HungaroControl* What is the meaning of 'to meet the airspace performance needs'? - Where is this performance defined? - Who has the authority to define this? The requirement AUR.PBN.2015(3) is not compliant with ICAO Doc. 9613 which offers several possibilities. One may expect to have the choice to opt for an ICAO proposed solution which matches the specific 'airspace performance needs' without being forced to implement RNP1.
response	*Noted.*
	PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme. In those cases, the harmonised use of the PBN specifications and functionalities is critical. Mandatory requirements have been proposed to implement APV due to their significant in improving safety.

comment	*558* comment by: *HungaroControl* AUR.PBN.2015 (3) - Requirements (a) and (d) imply RNP1 for terminal procedures (SID/STAR). - RNP1 currently implies "GNSS", as any alternative is currently not available… and "GNSS", currently, and also for the foreseeable future, means "GPS L1" only. - Requirement (c): RF legs are an optional capability for use with RNP 1, RNP 0.3 and RNP APCH rather than a minimum requirement. How many RNP1-capable aircraft today, support the RF-functionality? - The due date (6 December 2018) appears to be overly optimistic. According to a recent survey (March 2015), based on the submitted flight plans, only 38% of the departures out of Brussels Airport report to have a Basic RNP1-capability. Not less than 90% are RNAV1 compliant. - CONCLUSION: RNP1 appears to be the wrong baseline for SID/STAR implementation starting in 2018. - Note: a 'WINDOW' constraint is a common function for a modern FMS, but not foreseen in 'legacy' systems. How many aircraft do currently have that function available?
response	*Partially accepted.*
	Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) to meet local performance objectives, have to conform to RNAV 1 performance requirements as a minimum. RNP 1 should be implemented for those areas where higher performance is required.

comment	*600* comment by: *Baranes* To (3) 1) - Typo : fuctionaliity 2) - RNAV1 specification is widely used in European TMAs, which combined with a satisfactory rate of users equipment, allows meeting the needs in capacity and safety. This paragraph will require using RNP1 only as of 6/12/2018, for no benefits in a number of TMAs. DSNA proposal is to modify the text by making the on-board monitoring optional : "(3) When implementing Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs), using PBN to meet the airspace performance needs, ATSPs or aerodrome operators, responsible for the provision of the routes, shall ensure that the routes correspond to the (1) performance and functionality as defined in AUR.PBN.2015(3) (a), (b), and (c). **AUR.PBN.2015(3) (d) can be used when needed**."
response	*Accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable navigation specifications.

comment	*601* comment by: *Baranes* To (4) The Member States are responsible for the airspace design, not the Network manager. Considering the rate of equipment and the problem of mixed fleet that prevents benefits for the users, this performance and functionality requirement should be limited on a case by case basis. Proposed text : "(4) When implementing ATS routes using PBN to meet the network performance needs, the ATSP responsible for the provision of the routes, shall ensure that the routes correspond to the Performance and functionality as defined in AUR.PBN.2015(4), or RNAV5, on a case by case basis."
response	*Noted.*
	Article 3 of Regulation (EU) No 677/2011 establishes that the Network Manager (NM) performs the design of the European Route Network (ERN) in order develop an integrated ERN Design. However, this should be achieved via cooperative decision-making process. For that purpose, the NM is required to put in place an ERN Improvement Plan. Member States shall remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility. For that reason, the proposed rule mentioned "the coordinated design" of the ERND function. Please note that RNAV 5 will remain applicable in en-route airspace.

comment	*647* comment by: *DFS Deutsche Flugsicherung GmbH* The text should contain a clear designation and description of the procedures to be introduced. Introduction of APV Baro VNAV and/or APV SBAS. *This is relevant for AUR.PBN.2005 (1) and AUR.PBN.2015 (1)-(4) with related procedures.*
response	*Not accepted.*
	The proposal has been amended to simplify the regulation. The use of the specific APV down to LPV or LNAV/VNAV minima will be a local decision based on the operations.

comment	*649* comment by: *DFS Deutsche Flugsicherung GmbH* Para (3) The requirement *"to meet the airspace performance needs*" is not specific enough. The current formulation of this requirement is not suited to adequately support the introduction of PBN. DFS requests EASA to specify this requirement in detail.

SIDs/STARs and APCH are the flight phases where the greatest added value can be achieved by means of RNP-based procedures. For example: less CO2, less noise, more efficient procedures and the associated cost savings for aircraft operators. It must, however, be remembered that ATSPs may be subject to externally imposed statutory noise abatement rules which can make it necessary to plan significantly longer and more inefficient routes.

response *Noted.*

PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme.

The contents of the proposed rule have been simplified, although the AMC/GM will be further developed in order to facilitate and ensure an appropriate implementation.

comment *650* comment by: *DFS Deutsche Flugsicherung GmbH*

Para (4)
The requirement *"to meet the airspace performance needs*" is not specific enough. The current formulation of this requirement is not suited to adequately support the introduction of PBN. DFS requests EASA to specify this requirement in detail.

response *Noted.*

PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme.

The contents of the proposed rule have been simplified, although the AMC/GM will be further developed in order to facilitate and ensure an appropriate implementation.

comment *652* comment by: *Spanish Air Force Staff*

When the Air Traffic Service Providers (ATSPs) pursue with the implementation of PBN ATS routes, in coordination with the Network Manager, the Draft Opinion shall take into account that airspace design and management remain a full national prerogative of the member States. The regulatory text must ensure that, at national level, military authorities can work closely with national airspace design authorities prior to determining PBN routes. This coordination is essential to avoid any adverse impact on State aircraft non PBN-equipped. The need to detect and identify any aircraft separating from expected flight plans is a main concern for the exclusive role of States in the control of their sovereignty airspaces. New PBN procedures and ATCO training shall allow maintaining this Air Defence requirement.

response | *Noted.*

Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels together with local operational procedures should contribute to avoid any adverse impact on military operations and concerns.

comment | *692* comment by: *UK CAA*

Page No: 24

Paragraph No: AUR.PBN.2005 (3)

Comment: Mention is made of Standard Arrival Routes (STARs) but not of Transitions which typically across Europe provide connectivity between the Hold or sequencing Merge Point and the runway.

The UK CAA proposes that provision be made within the NPA to provide connectivity with Linear Holding procedures by including Open and Closed Transition procedures within AUR.PBN.2005 (3)

Justification: As part of the UK Airspace Management Plan, the UK CAA has plans to implement Linear Holding Procedures (Point Merge) to a number of major UK Airports by 2020. It would therefore be practicable to include such arrival procedures within the scope of AUR.PBN.2005 (3).

response | *Accepted.*

The draft rule does not explicitly mention transitions, even though navigation computers can only process one STAR per flight. Those 'Transitions' that connect the STAR with the instrument approach segments are by definition part of the STAR.

comment | *721* comment by: *Julian Scarfe, PPL/IR Europe*

AUR.PBN.2005 (1) Does this not incentivize ATSPs to degrade instrument runways to visual ops to meet the letter of the mandate? If so, the safety effect is undermined.

AUR.PBN.2005 (2) should be rephrased as "Without prejudice to paragraph 1, where limiting obstacles **render compliance with paragraph 1 impossible**, ATSPs or aerodrome operators, responsible for the provision of instrument approach procedures, may implement approach procedure with vertical guidance to aerodromes that correspond to the performance and functionality as defined in AUR.PBN.2015(2) **as an alternative to AUR.PBN.2015(1)**. Where **expedient to achieve operational objectives**, ATSPs or aerodrome operators, responsible for the provision of instrument approach procedures, may implement approach procedure with vertical guidance to aerodromes that correspond to the performance and functionality as defined in AUR.PBN.2015(2) **in addition to procedures as defined in AUR.PBN.2015(1)**"

This allows RNP AR APCH to be used by capable aircraft for e.g noise abatement or track length reduction, but requires RNP APCH to be available unless obstacles prevent it.

response *Not accepted.*

The implementation of RNP AR APCH should be kept to a minimum and only used were obstacles or terrain require its use. The use of RNP 1 with the associated RF leg should enable improved TMA operations to be implemented and support improvements as noise abatement or track length reduction.

AUR.PBN.2010 Surveillance and communications p. 24

comment *19* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AUR.PBN.2010 Surveillance and communications
ATSPs shall ensure that the surveillance and communications infrastructure has the capabilities needed to support the intended PBN operation.

COMMENT:
NPA 2015-1 seems to assume that PBN will only be implemented in environments where surveillance information is available to ATSPs.
However, this does not seem consistent with the intent of RNP implementation in the ICAO PBN Manual. In fact, this document states that:

"RNP 1 has been developed primarily for application in non-radar, low-density terminal airspace" (page I-A-2-4)

"The RNAV 1 and 2 specification is primarily developed for RNAV operations in a radar environment (for SIDs, radar coverage is expected prior to the first RNAV course change). The RNP 1 specification (Volume II, Part C, Chapter 3) is intended for similar operations outside radar coverage. However, RNAV 1 and RNAV 2 may be used in a non-radar environment or below minimum vectoring altitude if the implementing State ensures appropriate system safety and accounts for lack of on-board performance monitoring and alerting" (II-B-3-1)

Clarification is asked about this point.

No discussion is made either about the different communications performance levels required by each PBN specification, as stated in the PBN manual. It is suggested to fit communications requirements to each PBN specification addressed by the NPA.

response	*Noted.*
	AUR.PBN.2010 does not assume the existence of any specific surveillance infrastructure. Within an airspace concept, communications and ATS surveillance enable the implementation of PBN operations, which means that ATS surveillance might be necessary for certain applications although not always. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated with the proposed regulation.

comment	*78* comment by: *CANSO* AUR.PBN.2010: Too general statement. The PBN Manual already provides the recommended requirements for the implementation of each specification. It is not clear how to implement EASA requirement;
response	*Noted.*
	Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*86* comment by: *CANSO* AUR.PBN.2010 According to latest information from the EU/EASA workshop this requirement is a reminder. That does not make much sense in this IR and should be deleted. In the relevant rule for CNS and the sub-Part PBN thereof is a better location to place PBN infrastructure requirements, if so required for particular equipage and infrastructure.
response	*Not accepted.*
	The relevant rules pertaining to the CNS infrastructure have not been developed yet on a EU basis. The Agency is proposing to retain the requirement for a suitable surveillance and communications infrastructure and will further develop the AMC/GM material in support of this requirement.

comment	*193* comment by: *ENAV* - AUR.PBN.2010: Too general statement. The PBN Manual already provides the recommended requirements for the implementation of each specification. It is not clear how

	to implement EASA requirement;
response	*Noted.*
	Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated with the proposed regulation.

comment *349* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
AESA fully supports this requirement.	It is most important that the risks posed by the use of GPS be mitigated by CNS/ATM services provided by certified ANSPs.

response *Noted.*

comment *446* comment by: *DGAC/DTA*

AUR.PBN.2010

For the surveillance concerns, what about AFIS aerodromes and aerodromes without any ATS?
This NPA considers only ATSPs providing ATC. Within EU there are many aerodromes where ATS consists in providing information and alert services only without control service.

response *Noted.*

The Agency recognises the possible understanding with respect to the regulation being applicable to ATSPs. However, it should be noted that the term ATSP includes the provision of ATC service, alerting service, air traffic advisory service and flight information service. It should be noted that the proposed regulation is now applicable to ANSPs, which include ATSPs and therefore, AFIS providers are also included.

comment *447* comment by: *DGAC/DTA*

AUR.PBN.2010

The combination of AUR PBN 2010 and its AMC/GM makes surveillance mandatory for whole PBN operations. This is not adequate for certain operation (eg RNP APCH).
This requirement should be supplemented or it should deleted and placed in another regulation (ATM/ANS) where it will apply to both PBN and non PBN operations.

response *Not accepted.*

AUR.PBN.2010 does not assume the existence of any specific surveillance infrastructure. Within an airspace concept, communications and ATS surveillance enable the implementation of PBN operations, which means that ATS surveillance might be necessary for certain applications, but not always.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation, which will be adapted to the navigation specifications proposed

comment *559* comment by: *HungaroControl*

AUR.PBN.2010: Too general statement. The PBN Manual already provides the recommended requirements for the implementation of each specification. It is not clear how to implement EASA requirement;

response *Noted.*

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment *560* comment by: *HungaroControl*

AUR.PBN.2010
According to latest information from the EU/EASA workshop this requirement is a reminder. That does not make much sense in this IR and should be deleted. In the relevant rule for CNS and the sub-Part PBN thereof is a better location to place PBN infrastructure requirements, if so required for particular equipage and infrastructure.

response *Not accepted.*

The relevant rules pertaining to the CNS infrastructure have not been developed yet. The Agency is proposing to retain the requirement for a suitable surveillance and communications infrastructure and will further develop the AMC/GM material in support of this requirement.

comment	*651* comment by: *DFS Deutsche Flugsicherung GmbH* According to the information from the EU/EASA workshop of 9 MAR 2015, this is a requirement of informal nature. In our opinion, this requirement is not specific enough and cannot adequately support the introduction of PBN. This passage should be deleted or placed at a different position (e.g. as AMC/GM).
response	*Not accepted.*
	The relevant rules pertaining to the CNS infrastructure have not been developed yet. The Agency is proposing to retain the requirement for a suitable surveillance and communications infrastructure and will further develop the AMC/GM material in support of this requirement.

AUR.PBN.2015 Performance and functionality p. 24-26

comment	*20* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AUR.PBN.2015 Performance and functionality*** *General comment* **COMMENT:** The present definition of RNP performance and navigation functionalities can potentially allow a mostly DME/DME-based PBN implementation to be requested by local Authorities- only the final segments of RNP APCH would be free from this risk. This would be in contradiction with this NPA's objective of achieving an homogeneous PBN implementation in Europe, as the role of DME/DME in RNP is marginal according to the following paragraphs of the PBN manual: *- (II-C-3-1) The RNP 1 specification is based upon GNSS. While DME/DME-based RNAV systems are capable of RNP 1 accuracy, this navigation specification is primarily intended for environments where the DME infrastructure cannot support DME/DME area navigation to the required performance. The increased complexity in the DME infrastructure requirements and assessment means it is not practical or cost-effective for widespread application.* *- (II-C-5-2)Where authorized by the State, the multi-sensor systems may use other sensor combinations such as DME/DME or DME/DME/IRU that provide the navigation performance acceptable for RNP APCH. However, such cases are limited due to the increased complexity in the NAVAID infrastructure requirements and assessment, and are not practical or cost-effective for widespread application.* On the other hand, it does not seem that the most recent A-PNT developments (e.g. SESAR 15.3.1) have been considered.

It is suggested that:

a) The primary role of GNSS systems in the proposed PBN implementation be explicitly mentioned in this or any other binding NPA section.
b) Consideration is given to the role of A-PNT systems, in particular that of the upgrade of existing DME/DME networks.

response *Noted.*

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation.

The Agency agrees on the importance of GNSS to support PBN operations and also on initiatives to develop alternative position, navigation, and timing services (A-PNT), which are extremely important in order to make available alternatives for providing higher precision back-up for GNSS.

comment *21* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AUR.PBN.2015 Performance and functionality
(1) The instrument approach procedures required by AUR.PBN.2005(1) shall be consistent with the
following aircraft performance and functionality:
(b) for the Final Approach Segment when supported by BARO–VNAV:
(ii) the operations are along a vertical path
COMMENT:

Point ii) is considered insufficient, as some avionics can produce a "virtual" onboard vertical path, which is used in non-precision approaches flown with CDFA technique.

It is suggested to correct point ii) as follows:

(ii) the operations are along a vertical path ***defined in the procedure***

Note that this is consistent with NPA 2015-1 section 4.5.1.1 - Final Approach Operations.

response *Accepted.*

The text proposal is more accurate. Please note that the "Performance and functionality"

	requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*22* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AUR.PBN.2015 Performance and functionality*** *(c) for the Final Approach Segment when supported by SBAS, the angular lateral performance shall be equivalent to (b)(i) and (b)(ii) respectively; and* **COMMENT:** (b)(ii) makes reference to vertical navigation. Suggested correction: *(c) for the Final Approach Segment when supported by SBAS, the angular lateral **and vertical** performance shall be equivalent to (b)(i) and (b)(ii) respectively; and*
response	*Accepted.*
	The text proposal is more accurate. Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*23* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AUR.PBN.2015 Performance and functionality*** *(3) The routes required by AUR.PBN.2005(3) shall be consistent with the following aircraft performance and functionality:* *(b) the operations along a vertical path and between two fixes and able to comply with:* **COMMENT:** Editorial comment- in point b) should read: *(b) the operations along a vertical path and between two fixes **are** able to comply with:*
response	*Accepted.*

	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*60* comment by: *ENAC ATM* (1) (b) add sub-part (iii) on-board performance monitoring and alerting (1) (c) add b(iii) Delete (1) (d) Delete (3) (d) Delete (4) (a) (iv) and (b) (ii)
response	*Not accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*79* comment by: *CANSO* AUR.PBN.2015: The specifications for the en-route and SID / STAR phases are not standard and they are reported incorrectly. The statement referring to the performance is misleading, it could be modified simply rewriting the requirement as A-RNP specification. The same specification should be introduced for the approach phase where necessary;
response	*Partially Accepted.*
	It would be more appropriated to refer to the applicable PBN specifications. As a result, the "Performance and functionality" requirements have been deleted from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*87* comment by: *CANSO*

AUR.PBN.2015
This requirement can lead to wrong assumptions, thus to disharmonized implementation.
Reference to one complete specific ICAO conform Navigation Specification would bring a clear picture of what is applicable in Europe – e.g. A-RNP Doc 9613.
The values given here are insufficient and/or wrongly extracted, e.g. some ENR specifics are not current, for some possibilities industry standards are not available (e.g. point (4) (a) (ii) A-D).
The Navigation Specification should be either referenced or transposed in a whole only, not in parts or single sentences

response *Accepted.*

It would be more appropriated to refer to the applicable PBN specifications. As a result, the "Performance and functionality" requirements have been deleted from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment *97* comment by: *CANSO*

AUR.PBN.2015 (3)
- Requirements (a) and (d) imply RNP1 for terminal procedures (SID/STAR).
- RNP1 currently implies "GNSS", as any alternative is currently not available… and "GNSS", currently, and also for the foreseeable future, means "GPS L1" only.
- Requirement (c): RF legs are an optional capability for use with RNP 1, RNP 0.3 and RNP APCH rather than a minimum requirement. How many RNP1-capable aircraft today, support the RF-functionality?
- The due date (6 December 2018) appears to be overly optimistic. According to a recent survey (March 2015), based on the submitted flight plans, only 38% of the departures out of Brussels Airport report to have a Basic RNP1-capability. Not less than 90% are RNAV1 compliant.
- CONCLUSION: RNP1 appears to be the wrong baseline for SID/STAR implementation starting in 2018.
- Note: a 'WINDOW' constraint is a common function for a modern FMS, but not foreseen in 'legacy' systems. How many aircraft do currently have that function available?

AUR.PBN.2015 (4)
- The combination of the requirements "±1 NM for at least 95 % of the total flight time" and "on-board performance monitoring and alerting" practically mean RNP1.
- However ICAO (Doc 9613) does not intend to use RNP1 for en-route application: "The RNP 1 specification is limited to use on STARs, SIDs, the initial and intermediate segments of IAPs and the missed approach after the initial climb phase. Beyond 30 NM from the ARP, the accuracy value for alerting becomes 2 NM."
- It is not clear to which extent this requirement fits with the future structure and

	utilization (vectoring?) of the airspace, which will provide increasingly direct routings instead of closely separated ATS routes, especially in dense airspace.
response	*Partially accepted.*
	Please refer to the response to the major concerns identified section of the Opinion regarding navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements as a minimum. RNP 1 should be implemented for those areas where superior performance is required.

comment	*120* comment by: *Finavia* The PBN concept, as defined in ICAO Doc 9613, includes a set of well-defined navigation specifications. They are the basis of both the operational approvals and the published requirements applicable for each route or a procedure. It would be more unambiguous to also use those as a reference in the regulation or in the associated AMC, instead of just picking up a few attributes of the navigation specifications.
response	*Accepted.*
	It would be more appropriated to refer to the applicable PBN specifications. As a result, the "Performance and functionality" requirements have been deleted from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation. ICAO's PBN Manual provides implementation guidance for States and operators, but its guidelines do not themselves constitute regulatory provisions against which either the aircraft or the operator can be assessed and approved. On the other hand, the Agency recognises that AMC/GM proposed in the NPA needed further definition and is working to improve their contents.

comment	*121* comment by: *Finavia* The accuracy requirement of AUR.PBN.2015 (4)(a)(i) and AUR.PBN.2015 (4)(b)(i) are imprecise. Perhaps the words: "the applicable accuracy ranging from" should be removed. Then the requirement would be in line with, for example, AUR.PBN.2015 (3)(a).
response	*Accepted.*
	The text proposal is more accurate. However, please note that the "Performance and

functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment *155* comment by: *skyguide Corporate Regulation Management*

AUR.PBN.2015

1. As of 2018, RNAV 1 should be the main navigation specification for SID/STARS. The requirements should be open to choose the navigation specification (within the A-RNP family) which best matches the need of airspace users allowing an efficient use of the airspace.
    - Without equipage requirements to airspace users, the requirement to only implement RNP1 as of 2018 will generate a significantly higher complexity for ATC and making most PBN benefits impossible.
    - ICAO identifies A-RNP as the navigation specification to be used in the future. This allows ANSP to design procedures and routes according to the current needs with the required performance.
    - It is understood that the RNP1 navigation specification is chosen by EASA based on the Eurocontrol RAD. However, the Eurocontrol RAD proposes a balanced implementation between service provisioning and airspace user equipage. If the airspace user requirements are not chosen according the Eurocontrol RAD, the RNP1 navigation specification cannot be seen as an adequate solution for the service provisioning.

2. It is suggested to consider using the globally harmonised navigation specifications as defined by ICAO (Doc9613).

- It is understood that EASA doesn't want to make reference to ICAO documents. However, the use of a description of the navigation specifications does generate a lot of confusion and can only be incomplete

AUR.PBN.2015 (4) (b) (ii) and (iii)

The requirements for the holding pattern should be clearly described.
Comment: It is understood that the holding pattern should be based on RNP1, no such requirements exist in ICAO

response *Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications to be used. Also note that the "Performance and functionality" requirements have been withdrawn from the revised proposal via the use of the ICAO navigation specification references.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

Although holding patterns are specified as a navigational system functionality permitted for RNAV/RNP operations, this functionality has been excluded from the revised proposal.

comment *180* comment by: *EUROCONTROL*

Page 24-26 - AUR.PBN.2015

EUROCONTROL makes a comment applicable from (1) to (4) that is followed by a question:

Clearly stating which navigation specification is required would help in reading the document. Why is it not the case?

Page 24-25 - AUR.PBN.2015 - (1)

and suggestions that are followed by a question:

Part (1) of AUR.PBN.2015 should be describing the requirements from the RNP APCH Nav Spec., including vertical guidance (which it really should mention for clarity purpose).

Section (1)(c) for LPV refers back to the Baro/VNAV requirements. If (1)(b) and (1)(c) are the same then there is no need to have two sections.

The LPV and Baro/VNAV requirements are actually rather different - especially laterally. Is it the intention to only request Baro/VNAV procedures but make them flyable by SBAS users? There seems to be no encouragement to seize the opportunity offered by the very improved performance achievable using LPV.

Page 25 - AUR.PBN.2015 - (1)(b)(ii)

EUROCONTROL points out a gap in requirements:

The lateral track requirement is stipulated but the vertical performance is not.

EUROCONTROL asks a question:

"the operations are along a vertical path". Which vertical path? The question is relevant since any path, even one including step down fixes, is a vertical path.

EUROCONTROL proposes that AUR PBN 2015 (1) (b) should be read as “+/- 1 NM outside final approach and +/- 0.3 NM within the final approach” (RNP APCH).

Page 25 - AUR.PBN.2015 - (2)

EUROCONTROL makes an observation that is followed by a suggestion:

Section (2) describes the RNP (AR) APCH aircraft performance (very briefly). The RNP (AR) APCH Nav Spec. should be mentioned.

Page 25 - AUR.PBN.2015 - (2)(a)

EUROCONTROL points out a possible shortcoming and makes a suggestion for change/correction:

Section (2)(a) seems to be referring to RNP (AR) APCH as the TSE is lower than +/-0.3NM but this is only for the Final Approach phase. Since the title of the paragraph describes it as an instrument approach procedure why is it not +/-1NM to +/-0.1NM?

EUROCONTROL proposes that AUR PBN 2015 (2) (a) should be read as ”+/- 0.1...1 NM outside final approach and +/- 0.1…0.3 NM within the final approach” (RNP AR).

Page 25 - AUR.PBN.2015 - (2)(c)

EUROCONTROL asks a question in order to better understand:

What does "….and to maintain a track consistent with an RF leg…." mean? Surely the aircraft must be capable of executing a RF path terminator and the ac/crew appropriately certified and approved for the operation.

Page 25 - AUR.PBN.2015 - (3)

EUROCONTROL makes a suggestion on the relevance and preciseness of text through a question:

The issue with the RF leg is raised again. As the PBN manual spells out the performance and functionality requirements for each navigation specification, why is it not stated clearly which navigation specification is required in each of the paragraphs (1-4)? There are more functionalities which are not included in this list. Again, clearly stating the Nav Spec. would aid in the reading of the document.

Page 24-25 - AUR.PBN.2015 (including references to AUR.PBN.2005)

EUROCONTROL wishes to highlight the essence of the proposed text before making comments:

In essence, for TMAs, the rule comes down to the following:
"When implementing SIDs and STARs, using PBN to meet the airspace performance needs, ATSPs shall ensure that the routes shall be consistent with the following aircraft performance and functionality:
- Lateral TSE +/- 1NM, 95%;
- AT, AT or ABOVE, AT or BELOW, or WINDOW altitude constraints;
- Execution of fly-over, fly-by turns and to maintain a track consistent with an RF leg;
- On-board performance monitoring and alerting."

The comments on "route consistency", under the form of questions applying to both TMAs and en-route, are the following:
- How can a route be “consistent” with performance monitoring and alerting? As an illustration, if a line is drawn on a map, it is clear that any aircraft capable of OPMA will be able to fly it, thus making the route consistent;
- A route “consistent” with altitude constraints? That means that altitude constraints can be put on some waypoints but without obligation, thus no change;
- Maintain a track “consistent” with an RF leg? Does this mean that an RF leg is not required as long as the track looks like an RF leg?

Moreover, AUR PBN 2015 is not a requirement but a definition (cf. AUR PBN 2005 … that corresponds to the performance and functionality as defined in AUR.PBN.2015 (1/2/3/4)). So, there should be no “shall” in AUR PBN 2015 since, as currently worded, it is a rewording of AUR PBN 2005.

EUROCONTROL therefore proposes the following adaptation:

For instrument approach procedure the aircraft performance and functionality are:
(a) the lateral TSE and the along-track error are within ±1 NM for at least 95 % of the total flight time
(b) …
(c) …
(d) …

For SIDs/STARs the aircraft performance and functionality are:
(a) the lateral TSE and the along-track error are within ±1 NM for at least 95 % of the total flight time
(b) …
(c) RF leg
(d) …

For ATS routes (below FL 195) the aircraft performance and functionality are:
(a) the lateral TSE and the along-track error are within ±1 NM for at least 95 % of the total flight time
(b) …
(c) …

For ATS routes (above FL 195) the aircraft performance and functionality are:
(a) the lateral TSE and the along-track error are within ±1 NM for at least 95 % of the total flight time
(b) …
(c) FRT
(d) …

Page 25 - All relevant sections

EUROCONTROL makes an observation:

The *lateral accuracy* requirement is stipulated but the *vertical accuracy* requirement is not.

Page 26 - AUR.PBN.2015 - (4)(b)

EUROCONTROL asks one question:

Concerning route consistency, why, contrary to (4)(a)(ii), is there no altitude constraint below FL195?

response *Partially accepted.*

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

The Agency recognises that AMC/GM proposed in the NPA needed further definition and is working to improve their contents.

comment *194* comment by: *ENAV*

- AUR.PBN.2015: The specifications for the en-route and SID / STAR phases are not standard and they are reported incorrectly. The statement referring to the performance is misleading, it could be modified simply rewriting the requirement as A-RNP specification. The same specification should be introduced for the approach phase where necessary;

response *Partially accepted*.

It would be more appropriated to refer to the applicable PBN specifications. As a result, the "Performance and functionality" requirements have been deleted from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment *208* comment by: *AIRBUS*

AUR.PBN.2015 Performance and functionality (1) b (ii)

Comment

The wording "operations are along a vertical path" does not sufficiently address the VNAV

function.

Recommendations

We propose the following text:
"Operations are along the desired vertical path respectful of the NDB altitude constraints".

response *Partially accepted.*

The text could be more accurate with respect of the vertical path guidance, but NDB navigation is not accurate enough for PBN operations. It is considered to revert to conventional navigation or maybe to design the missed approach.

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment *209* comment by: *AIRBUS*

AUR.PBN.2015 Performance and functionality (2) (b)

Comment

The wording "the operations are along a vertical path" does not sufficiently address the VNAV function

Recommendations

We propose the following text
"Operations are along the desired vertical path respectful of the NDB altitude constraints".

response *Partially accepted.*

The text could be more accurate with respect of the vertical path guidance, but NDB navigation is not accurate enough for PBN operations. It is considered to revert to conventional navigation or maybe to design the missed approach.

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed

	regulation.

comment	*210* comment by: *AIRBUS*
	AUR.PBN.2015 Performance and functionality (1) (c) Comment Equivalent performance between linear and angular design should be required for both the lateral and vertical axis. Rationale for Comment This change should avoid any ambiguity. Recommendations We propose the following text: "For the Final Approach Segment when supported by SBAS, the angular lateral and vertical performance shall be equivalent to (b) (i) and (b) (ii) respectively".
response	*Accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation, whose contents will reflect the intent of the suggested wording.

comment	*211* comment by: *AIRBUS*
	AUR.PBN.2015 Performance and functionality (2) (c) Comment The term Fly-By turn should be replaced by Fly-By transition. Rationale for Comment This change should reflect that for fly-by turns, the navigation system limits the path

transition within theoretical transition as defined in ED-75B/DO-236B.

Recommendations

We propose the following text:
“execution of fly-over and fly-by transitions while maintaining track predictability consistent with an RF Leg;”.

response *Not Accepted.*

The fly-by turn is the term used by ICAO. However, please note that the “Performance and functionality” requirements have been withdrawn from the revised proposal.

comment *212* comment by: *AIRBUS*

AUR.PBN.2015 Performance and functionality (3) (b)

Comment

The wording “operations along a vertical path” does not sufficiently address the VNAV function

Recommendations

We propose the following text
“the operations along the desired vertical path and between two fixes and able to comply with:”

response *Accepted.*

The suggested wording is more accurate to reflect the concept of vertical guidance. However, the “Performance and functionality” requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment *213* comment by: *AIRBUS*

AUR.PBN.2015 Performance and functionality (3) (c)

Comment

The term Fly-By turn should be replaced by Fly-By transition.

Rationale for Comment

This change should reflect that for fly-by turns, the navigation system limits the path transition within theoretical transition as defined in ED-75B/DO-236B.

Recommendations

We propose the following text:
“execution of fly-over and fly-by transitions while maintaining track predictability consistent with an RF Leg;”.

response *Not accepted*

The fly-by turn is the term used by ICAO. However, the “Performance and functionality” requirements have been withdrawn from the revised proposal.

comment *272* comment by: *AIRBUS*

AUR.PBN.2015 Performance and functionality (4) (a) (ii)

Comment

The wording “operations along a vertical path” does not sufficiently address the VNAV function.

Recommendations

We propose the following text:
“the operations along the desired vertical path and between two fixes and able to comply with:”

response *Accepted.*

The suggested wording is more accurate to reflect the concept of vertical guidance. However, the “Performance and functionality” requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*289* comment by: *AvinorANSP* ***AUR.PBN.2015 Performance and functionality*** ***(4)*** *(b) below Flight Level 195……* **Comment:** Why is there no requirement for (A) an 'AT' altitude constraint; or (B) an 'AT OR ABOVE' altitude constraint; or (C) an 'AT or BELOW' altitude constraint ; or (D) a 'WINDOW' constraint; These requirements are in 3b (SID/STAR) and 4a (en-route above FL 195). Should it be in 4b as well?
response	*Noted.*
	The use of altitude constraints were not proposed below FL195 due to the reason that within this volume of airspace, aircraft with less capable area navigation systems are operating and these systems are not capable of such operations. However, the "Performance and functionality" requirements have been withdrawn from the revised proposal.

comment	*318* comment by: *Airbus Helicopters* AUR.PBN.2015 (1)(b)(ii), (2)(b): The description of the operation in vertical plane is rather vague. All types of operations are flown along a vertical path, guided or not. For PBN procedures with vertical guidance, it is more relevant to use the term "vertical profile", instead of "vertical path". It is suggested to modify 1 b(ii) and 2b, as "the operations are along a vertical profile".
response	*Accepted.*
	The suggested wording is more accurate to reflect the concept of vertical guidance. However, the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*319* comment by: *Airbus Helicopters* AUR.PBN.2015 (1)(c): It is not clear how an angular lateral performance can be equivalent to (b)(ii) which deals with the vertical path. Likely, some words are missing in (1)(c) statement.

It is suggested to reword (1)(c) to address clearly lateral and vertical performance, respectively.

response *Accepted.*

In the proposed suggestion, the text should then referred to “angular lateral and vertical performance”. However, the “Performance and functionality” requirements have been withdrawn from the revised proposal.

comment *331* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland*

It is suggested to use the globally harmonized navigation specifications as defined by ICAO (Doc 9613) instead of introducing a new terminology.

response *Accepted.*

comment *350* comment by: *AESA / DSANA*

PART	**COMMENT**	**JUSTIFICATION**
Proposed amendments Section 3.1.1 AUR.PBN.2015 '*Performance and functionality*' **Section 3.1.2 AMC1 '*AUR.PBN.2015 Performance and functionality*'**	We feel that the way that this requirement is structured, passing the formal ICAO PBN specification to **AMC1**, difficults its full understanding and may, in its turn, complicate its applicability.	As already stated, the structure proposed difficults the full understanding of the requirements. In fact, setting the PBN specifications in AMCs would send the message that there are alternative ways to the **ICAO PBN Manual** to fulfil this requirement. This goes directly against the main objective of the rulemaking task and of ICAO when introducing the PBN concept. We propose to state the specifications directly in the requirement **AUR.PBN.2015** itself and delete **AMC1**.

response | *Partially accepted.*

The approach may result in other Navigation specification being used and compliance with relevant ICAO's navigation specifications in the SUBPART PBN has been introduced. As a results of the use of the relevant navigational specification the "Performance and functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

The specifications as defined in ICAO's PBN Manual, which provides implementation guidance for States and stakeholders, do not in themselves constitute regulatory provisions. However, the description of the technical aspects by means of AMC/GM could facilitate their implementation.

comment | *388* comment by: *NATS National Air Traffic Services Limited*

NATS fully supports EASA's intent to establish a harmonised application of PBN, to support the SESAR ATM Master plan to improve the efficiency of the EATMN and to align with the intent of the ICAO Global Air Navigation Plan.The required PBN performance and functionality for the different phases of flight appear to be:

· SIDs/STARs – RNP1+RF
· ATS Routes – Advanced RNP + FRT

For ATSPs that are planning to implement PBN airspace changes in the period immediately after 2018, the performance requirements are very problematic.

The requirement for airspace based on RNP+RF/A-RNP+FRT and the lack of an equipment obligation on operators means that there will be nothing like a homogenous fleet capability in the years immediately post 2018.

1. 1. The NPA does not address the economics of airborne RNP+RF equipage however for ANSPs the key to realising benefits from the airspace design is the level of equipage at the time of implementation. The greatest benefits from an airspace design is not a high level of navigation capability from a proportion of users, but a high level of conformity to a navigation capability, which may be lower. The performance targets set for an airspace with a higher user performance requirement may not be achievable if a very high percentage of users are not equipped and the airspace design has to be compromised to accommodate many users with a lower capability

2. 2. In accordance with the NPA's stated requirement to meet defined performance objectives, where an airspace design or airport or State or FAB has determined that the performance benefits that it seeks can be realised with RNAV1, then this should be acceptable. Where the assumed benefits require the use of RNP+RF and the customer base can support it, then this can be done without legislation.

3. 3. Outside the initial turn after departure and during the latter stages of approach, the benefits in airspace design using RNP for the Network as a whole, compared to RNAV, are not quantified. The Total System Error requirement for both specifications is the same and where an ANSP has extensive surveillance coverage and ground based track conformance monitoring systems, there appears no quantitative airspace benefit from legislating RNP. For those early departure and late arrival stages, the Network dis-benefits from using an RNAV specification for the procedures are considered to be minimal. The NPA does not provide evidence on the airspace performance improvements that RNP provides over other PBN specifications throughout all phases of flight.

4. 4. The Eurocontrol Regulatory Approach Document for the earlier PBN IR activity contained equipage figures that suggested that by 2020, RF capability may only be 80%. This was based on there being a mandate on operators to equip to this standard, which the NPA does not propose.

1. 5. The 2024 date for the SESAR JU PCP AF1 RNP requirements for major airports adopts a realistic approach to what navigation capability is likely to available in the medium term, even for the larger CAT operators at the targeted airports. Cognisant of this, where implementations are planned in 2019 for major TMAs, the potential level of RNP+RF equipage is not expected to be high enough without the need for compromises in the airspace design.

2. 6. In the En-route phase, the level of A-RNP +FRT equipage, certification and approval in the period immediately after 2018 is expected to be even less than for RNP and the compromise in airspace design to accommodate even lower levels of capability will be greater. Unless there is a largely homogenous A-RNP fleet, the airspace design will not be able to exploit the standard's capabilities such as true VNAV, RNAV holding and TPO.
S

response *Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Note that regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 should be implemented for those areas where superior performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.

comment *389* comment by: *NATS National Air Traffic Services Limited*

Suggested resolution to comment 388

In line with the NPA timescales proposed for bringing European navigation capability up to a harmonised level, EASA is asked to consider only mandating the performance requirements that meet the RNAV1 standard, for ground implementation *and* airborne carriage, because:

1. 1. There is already a high percentage of RNAV1 equipage/approval and mandating the standard would not be as great a financial impact to operators as for RNP. An RNAV1 mandate would bring all operators up to the same baseline performance level. For those not yet capable, an equipage mandate in 2019 would be sufficient notice to comply.

2. 2. There are various RNAV 1 ground implementations across Europe but these are fragmented and of varying conformance. An assumed homogenous RNAV 1 airborne capability would enable planners to design an airspace that can be maximised to its full potential, thus delivering the maximum benefit for the Network.

3. 3. Except for the very early stages of departure and late stages of arrival, the RNAV 1 standard can provide a performance based framework which can deliver in effect as much as the RNP standard, without the necessity to compromise the airspace design because of a mix of fleet capability.

4. 4. A mandate for RNAV1 provides a common performance baseline, from which users and ATSPs can progressively migrate to SEASR PCP compliance for the affected airports, in an achievable timeframe. It also allows those airspaces and airports not captured within the PCP to develop their own plans for RNP implementations, which start from a known PBN capability level.

response

Partially accepted.

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 should be implemented for those areas where superior performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.

comment

390 comment by: *NATS National Air Traffic Services Limited*

The NPA requires all PBN procedures to be predicated on GNSS as the navigation position source, with the implementation of supporting local contingency procedures. In the regulatory timescale proposed, this is very problematic

1. 1. Placing a dependency on the availability, continuity, integrity and robustness of the GNSS system as the prime navigation sensor, so soon after 2018, does not recognise the wide range of issues associated with failure modes and interference,

intentional or unintentional. A complete understanding of what a widespread GNSS failure means to the Network is not believed to be available. The NPA requires locally developed contingency procedures after loss of a core constellation however such a failure will probably affect airspaces in more than one State. It is not clear how the Network can function efficiently if contingency procedures are left to the local airspace managers. Until dual constellation/dual frequency GNSS availability becomes available sometime in the next decade, legislating for the use of the current single constellation/single frequency system seems premature.

2. There is no system capability for local ATS providers to identify single satellite or core constellation GNSS failures, other than through ambiguous pilot reports; mandating GNSS will require a centralised approach to outage notification and subsequent contingency network management. If it remains a requirement for ATS providers to manage contingency locally, then the costs of implementing a detection system would vastly exceed any positive benefits that an RNP airspace would realise over an RNAV airspace, which does not require a GNSS capability.

Suggested resolution: EASA is asked to mandate the RNAV 1 standard which does not *require* GNSS to enable benefits and removes the need to place a dependency on the integrity and robustness of the current GNSS environment. Where ATSPs implement RNP procedures outside of regulation, then appropriate measures for identifying GNSS outages and supporting contingency arrangements can be developed locally and be approved by the NSA.

response

Partially accepted.

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 should be implemented for those areas where superior performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.

The Agency agrees that GNSS is vulnerable and it is subject to a variety of sources of interference (intentional/unintentional, predictable/unpredictable) and outage. For the moment, harmonised contingency procedures reliant on local reversionary navigation solutions and ATM/CNS services are key to ensure safety. AMC/GM to the proposed rule will be further developed to deal with these issues.

comment

394 comment by: *NATS National Air Traffic Services Limited*

Reference (4) (a) above Flight Level 195.

There is no requirement for RNAV Holding for flights above FL195. Holding will take place at levels above FL195 so it is not clear why this performance capability is not required, as it is

for flights below FL195.

Clarification requested.

response *Noted.*

The regulation requires the development and publication of the appropriate routes and procedures by the ATSP. Holding areas are not normally implemented in the upper airspace and are normal associated with TMA operations, therefore, the requirement to use RNAV holding within the design of the upper airspace was not included. This does not preclude the use of this function for tactical or contingency purposes.

comment *398* comment by: *Garmin International*

AUR.PBN.2015
Page 25

AUR.PBN.2015(3)(b) states the routes required by AUR.PBN.2005(3) shall be consistent with the aircraft performance and functionality for "the operations along a vertical path and between two fixes".

Presently, most aircraft with E/TSO-C146() GPS/SBAS navigation equipment and many aircraft with E/TSO-C115() FMS equipment have no vertical navigation capability since VNAV capability is optional in all E/TSO-C115() revisions. Consequently, pilots comply with the altitude constraints without vertical navigation. Such equipment may not provide vertical navigation but is typically capable of meeting most of the other aircraft performance and functionality specified by AUR.PBN.2005(3) routes.

Additionally, even if the aforementioned equipment supports vertical navigation, ICAO 9613 4th edition, Volume II, Attachment A: Barometric VNAV (Baro-VNAV), requires the aircraft to be equipped with either a flight director or autopilot capable of following the vertical path (see paragraph 4.14, item c). There is presently no EASA guidance pertaining to the aircraft performance and functionality for "operations along a vertical path and between two fixes" on PBN "routes required by AUR.PBN.2005(3)"; consequently, it is unclear whether the EASA will require a flight director or autopilot capable of following the vertical path to operate on AUR.PBN.2005(3) routes. It would be very difficult for GA/BA aircraft to comply with a requirement to be equipped with a flight director or autopilot capable of following the vertical path since the vast majority are not so equipped.

It may be that AUR.PBN.3005, Mixed operations, is intended to accommodate aircraft that cannot fully comply with all of the AUR.PBN.2015(3) aircraft performance and functionality requirements but this intent is not clearly stated and may unnecessarily limit the utility of such routes if aircraft are required to be equipped with a flight director or autopilot capable of following the vertical path.

It is strongly recommended that NPA 2015-01 should be closely coordinated with the PBN aircraft and equipment requirements yet-to-be-published in the CS-ACNS NAV section. Additionally, it is strongly recommended that AUR.PBN.2005(3) and

AUR.PBN.2015(3) should be revised to include guidance that routes should be published with the minimum characteristics necessary to accomplish the operational goals in order to maximize the number of aircraft that can utilize the routes.

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 should be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied.

The proposed regulation sets out the requirements for the design of PBN routes and does not address the aircraft equipage.

For RNP 1 and RNAV 1, FTE may be manually controlled by the pilot remaining within ½ full scale deflection of CDI with correct scaling for phase of flight. However, FD/AP is required whenever RF functionality is necessary. Please also refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage and mixed navigation environments.

comment *399* comment by: *Garmin International*

AUR.PBN.2015
Page 25

AUR.PBN.2015(3)(c) states the routes required by AUR.PBN.2005(3) shall be consistent with the aircraft performance and functionality “to maintain a track consistent with an RF leg”.

The RF leg requirement could be problematic for aircraft with E/TSO-C146() GPS/SBAS navigation equipment and aircraft with E/TSO-C115() FMS equipment certified prior to E/TSO-C115c. Such equipment may not support RF legs but is typically capable of meeting the other aircraft performance and functionality specified by AUR.PBN.2005(3) routes.

Additionally, even if the aforementioned equipment supports RF legs, ICAO 9613 4th edition, Volume II, Appendix 1 to Part C: Radius to Fix Path Terminator (RF), requires the aircraft to be equipped with a moving map depicting the RF leg (see paragraph 4.4.2) and roll-steering autopilot/flight director (see paragraph 4.4.1). There is presently no EASA guidance pertaining to the aircraft performance and functionality “to maintain a track consistent with an RF leg”; consequently, it is unclear whether the EASA will require a moving map depicting the RF leg and a roll-steering autopilot/flight director to operate on AUR.PBN.2005(3) routes that include a RF leg. While many GA/BA aircraft can comply with the moving map depicting the RF leg there are some aircraft that cannot. Additionally, it would be difficult for the vast majority of GA/BA aircraft to comply with the roll-steering autopilot/flight director capability since such equipment is atypical.

It may be that AUR.PBN.3005, Mixed operations, is intended to accommodate aircraft that cannot fully comply with all of the AUR.PBN.2015(3) aircraft performance and functionality requirements but this intent is not clearly stated and may unnecessarily limit the utility of routes published with a RF leg when they alternately could be published without a RF leg.

It is strongly recommended that NPA 2015-01 should be closely coordinated with the PBN aircraft and equipment requirements yet-to-be- published in the CS-ACNS NAV section. Additionally, it is strongly recommended that AUR.PBN.2005(3) and AUR.PBN.2015(3) should be revised to include guidance that routes should be published with the minimum characteristics necessary to accomplish the operational goals in order to maximize the number of aircraft that can utilize the routes.

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications.

The proposed regulation sets out the requirements for the design of PBN routes and does not address the aircraft equipage.

Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 should be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied.

For the use of an RF leg, an electronic map display depicting the path is required whenever RF functionality is necessary. Please also refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage and mixed navigation environments.

comment *400* comment by: *Garmin International*

AUR.PBN.2015
Page 25

AUR.PBN.2015 (4)(a)(ii) states the routes required by AUR.PBN.2005(4) shall be consistent with the aircraft performance and functionality for “the operations along a vertical path and between two fixes”.

Presently, most aircraft with E/TSO-C146() GPS/SBAS navigation equipment and many aircraft with E/TSO-C115() FMS equipment have no vertical navigation capability since VNAV capability is optional in all E/TSO-C115() revisions. Consequently, pilots comply with the altitude constraints without vertical navigation. Such equipment may not provide vertical navigation but is typically capable of meeting most of the other aircraft performance and functionality specified by AUR.PBN.2005(4) routes.

Additionally, even if the aforementioned equipment supports vertical navigation, ICAO 9613 4th edition, Volume II, Attachment A: Barometric VNAV (Baro-VNAV), requires the aircraft to be equipped with either a flight director or autopilot capable of following the vertical path

(see paragraph 4.14, item c). There is presently no EASA guidance pertaining to the aircraft performance and functionality for "operations along a vertical path and between two fixes" on PBN "routes required by AUR.PBN.2005(4)"; consequently, it is unclear whether the EASA will require a flight director or autopilot capable of following the vertical path to operate on AUR.PBN.2005(4) routes. It would be very difficult for GA/BA aircraft to comply with a requirement to be equipped with a flight director or autopilot capable of following the vertical path since the vast majority are not so equipped.

It may be that AUR.PBN.3005, Mixed operations, is intended to accommodate aircraft that cannot fully comply with all of the AUR.PBN.2015(4) aircraft performance and functionality requirements but this intent is not clearly stated and may unnecessarily limit the utility of such routes if aircraft are required to be equipped with a flight director or autopilot capable of following the vertical path.

It is strongly recommended that NPA 2015-01 should be closely coordinated with the PBN aircraft and equipment requirements yet-to-be- published in the CS-ACNS NAV section. Additionally, it is strongly recommended that AUR.PBN.2005(4) and AUR.PBN.2015(4) should be revised to include guidance that routes should be published with the minimum characteristics necessary to accomplish the operational goals in order to maximize the number of aircraft that can utilize the routes.

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. RNAV 5 will remain applicable in en-route airspace.

For RNAV 5, FTE may be manually controlled by the pilot remaining within ½ full scale deflection of CDI with correct scaling for phase of flight. Please also refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage and mixed navigation environments.

comment *401* comment by: *Garmin International*

AUR.PBN.2015
Page 26

AUR.PBN.2015(4)(a)(iii) states the routes required by AUR.PBN.2005(4) shall be consistent with the aircraft performance and functionality for "a flight path transition and track consistent with a fixed radius between two route segments;".

The fixed radius transition (FRT) requirement could be problematic for aircraft with E/TSO-C146() GPS/SBAS navigation equipment and aircraft with E/TSO-C115() FMS equipment certified prior to E/TSO-C115c. Such equipment may not support FRT but is typically capable of meeting the other aircraft performance and functionality specified by AUR.PBN.2005(4) routes.

Additionally, even if the aforementioned equipment supports FRT, ICAO 9613 4th edition, Volume II, Appendix 2 to Part C: Fixed Radius Transition (FRT), requires the aircraft to be equipped with a moving map displaying the curved path of the FRT (see paragraph

3.3.2). There is presently no EASA guidance pertaining to the aircraft performance and functionality "a flight path transition and track consistent with a fixed radius between two route segments"; consequently, it is unclear whether the EASA will require a moving map displaying the FRT curved path to operate on AUR.PBN.2005(4) routes that include FRT. While many GA/BA aircraft can comply with the moving map depicting the FRT there are some aircraft that cannot.

It may be that AUR.PBN.3005, Mixed operations, is intended to accommodate aircraft that cannot fully comply with all of the AUR.PBN.2015(4) aircraft performance and functionality requirements but this intent is not clearly stated and may unnecessarily limit the utility of routes published with a FRT when they alternately could be published without a FRT.

It is strongly recommended that NPA 2015-01 should be closely coordinated with the PBN aircraft and equipment requirements yet-to-be- published in the CS-ACNS NAV section. Additionally, it is strongly recommended that AUR.PBN.2005(4) and AUR.PBN.2015(4) should be revised to include guidance that routes should be published with the minimum characteristics necessary to accomplish the operational goals in order to maximize the number of aircraft that can utilize the routes.

response *Noted.*

The FRT functionality is no longer required. Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications and note that RNAV 5 will remain applicable in en-route airspace.

comment *403* ❖ comment by: *LFV*

ENROUTE - AUR.PBN.2005 (4) + AUR.PBN 2015 (4a):

In Sweden FRA is implemented between FL 285-660 with a current requirement on operators to be capable of RNAV5. With a reduced route spacing between parallel routes from 10 – 15 NM (ICAO Annex 11, Attachment A) to 7 NM and the reduction of strategical separation between centerline of a route and an adjoining airspace structure it might be possible to enlarge military airspace structures somewhat or to establish routes free of these structures. Above FL285 from an ATCOs perspective it makes no difference whether B-RNAV (RNAV 5) or Advanced RNP (RNP1) is implemented since separation is not provided strategically but is provided by the ATCO based on surveillance. A very limited positive effect might also be the possibility to reduce spacing between the Transition Routes if SID/STAR final/initial waypoints are re-designed.
The requirement to keep the possibility for non-PBN acft wouldn't be applicable because RNAV5 is required enroute in all Europe and RNAV5 is also PBN. We interpret the NPA so that if FRA is already implemented there is no change needed and there will be no action of "any change" to initiate implementation of RNP 1/Adv-RNP.
FRA eliminates the need for vertical functionality and FRT because no explicit routes are followed.
LFV proposes for Enroute – Airspace to be designed to optimise flight efficiency with FRA by 2023. PCP requirements for High density areas to be followed as they are by 2024. Include requirement on operators with capability for Adv-RNP+ FRT above FL195 and RNP 1+

RNAV Holding below FL195.
However, since mixed-mode en-route operations are not deemed to be beneficial until there is a requirement on aircraft equipage, the positive effects will most likely be beyond the date when a mandate on aircraft performance is implemented.

response

Partially accepted.

The proposed regulation intends to ensure harmonised PBN implementation in Europe where and when needed to reach performance criteria. So, if new or redesigned PBN operations are not necessary, there is no obligation to implement changes.

Please, see the response in the major concerns identified section of the Opinion related to PBN requirements and note that RNAV 5 will remain applicable in en-route airspace and that the FRT functionality is no longer required.

comment

404 ❖ comment by: *LFV*

ENROUTE - AUR.PBN.2005(4) and AUR.PBN.2015(4a,b):

In Sweden all airspace above FL 95 is considered enroute with routes requiring operators' capability of RNAV 5 (B-RNAV) as implemented 1998 in all Europe. Parallel routes are only implemented:

- Stockholm – Copenhagen,
- From Stockholm northbound along the Swedish east-coast,
- Stockholm – Gothenburg,
- Oslo – Copenhagen and
- Stockholm – Oslo.

These routes are more or less straight which reduces the need for Fixed Radius Turns capability although on the boundary between TMA and ACC operations some positive effects could be achieved.
According to the NPA "any change" in that airspace would activate the requirement RNP 1/Adv-RNP capability but in what sense?
- If only one ATS route is changed, will the requirement only apply to that particular ATS route or would all ATS routes be directly affected?
- When a change is required, according to NPA that would also activate the "upgrade" to require RNP1/Adv-RNP capability for acft using that route. At the same time we are obliged to keep the possibility for non-PBN operators to navigate the same routes.
- Firstly – there are currently no non-PBN operators allowed in Europe flying above FL95 because of the requirement of RNAV 5 (which is also a PBN application).
- Second – in Sweden we have no need for closer ATS routes than we already have with RNAV5.
- Third – if in Sweden, we will need to mandate RNP 1/Adv-RNP for the new/changes routes, there would actually be no alternative routes to keep anyway for the non-PBN capable operators.

- Or – Sweden would actually have ATS routes with the exact same configuration, but with two different requirements/possibilities to navigate (RNAV 5 and RNP1/Adv-RNP) for no obvious reason at all.

LFV proposes for Enroute – Airspace to be designed to optimise flight efficiency with FRA by 2023. PCP requirements for High density areas to be followed as they are by 2024. Include requirement on operators with capability for Adv-RNP+ FRT above FL195 and RNP 1+ RNAV Holding below FL195.
However, since mixed-mode en-route operations are not deemed to be beneficial until there is a requirement on aircraft equipage, the positive effects will most likely be beyond the date when a mandate on aircraft performance is implemented.

response *Partially accepted*.

The proposed regulation intends to ensure harmonised PBN implementation in Europe where and when needed to reach performance criteria. So if new or redesigned PBN operations are not necessary, there is no obligation to implement changes.

Please, see the response in the major concerns identified section of the Opinion related to PBN requirements, and note that RNAV 5 will remain applicable in en-route airspace.

comment *405* ❖ comment by: *LFV*

TERMINAL - AUR.PBN 2005(3) and AUR.PBN2015(3):

NPA states that ”when” implementation or when ”any change” of present routes within TMA is initiated, this would activate SID/STAR to be consistent with RNP 1 specification (acft performance and functionality?).

- This proposal could lead to that if no operators request RNP 1 routes for better performance and there is no other driving factor to initiate a change (no new obstacles, no change of WPT coordinates, no environmental needs etc) LFV foresees that the responsible entity would avoid any kind of airspace change for as long as possible. With the result that modernization of TMAs could take forever.

- On the other hand, a simple change of a coordinate could activate the need to redesign the complete SID/STAR system according to RNP 1. That would cause unjustifiable costs for the entity responsible for the SID/STAR system. In the worst case this would be of absolutely no use if no operators have the relevant capability. So there would be totally useless costs without benefit for anyone. And with the need of 36 months prior notice, this is the reality already from today.

- The comments above shows that the date of December 2018 has no positive effect for anyone, not even the SESAR deployment through the PCP.

LFV proposes for TMA – Airspace to be redesigned and optimised, with provision of RNP 1 SID/STAR system where applicable, to provide capacity, efficiency, access, CDO/CCO

according to ATM master plan requirements, by 2020. That will be more realistic and also provide the possibility to include requirements on the operators with capability for RNP1 + RF leg + RNAV holding + ALT constraints. It would also be better in line with the date for implementation of PBN according to the PCP, if necessary.

response *Partially accepted.*

PBN routes should only be implemented where required to meet local performance objectives resulting from operational needs or the requirements stemming from the performance scheme for air navigation services and network functions. Thus, if new or redesigned PBN operations are necessary, it is mandatory to implement PBN proposed navigation specifications.

However, the revised proposal has been simplified and the navigation specifications to be applied has been amended.

Please, see the response to the major concerns identified section of the Opinion related to PBN requirements.

comment *409* ❖ comment by: *LFV*

APPROACH - AUR.PBN.2005(1,2) and AUR.PBN.2015(1a-d, 2a-d):

There should be better consistency and coordination between regulations/recommendations from organisations with steering on states and/or responsible bodies. This is what we get from different directions right now:

- **ICAO** – Requires APV to be implemented to all instrument RWY ends (replace non-precision and back up for ILS) by the end of 2016. Requires at least an LNAV procedure to be implemented if APV not possible, or as fall back in case of GNSS failure during approach.
- **EASA/NPA** – Requires APV to all RWY ends not served with a precision approach procedure by January 2024. Fall back procedures during approach are not mentioned. If limiting obstacles conditions, RNP AR may be implemented.
- **PCP** – Requires implementation of APV but doesn't specify to which RWY ends (all, to replace non-precision, to one of your own choice…), by 2024. Fall back procedures during approach are not mentioned. Is RNP AR considered enough?

1. In Sweden already most of the airports are soon to implement APV procedures according to the recommendations from ICAO, further expressed by Swedish Regulator, by 2016 or as soon as possible. As LFV has understood according to the NPA there is no problem with implementing the procedures in advance of 2024, but the date must be questioned anyway. The requirement from ICAO to implement by 2016 is now established as not completely realistic but many states/airport are actually ready or about to implement which means a delay of just a couple of years would be more reasonable than 2024.

2. Again, the states/airports that have already implemented APVs or are about to, have done so according to ICAO recommendations – to ALL RWY ends. To change that requirement is not in line with ATM master plan or the PCP stating reasons like efficiency,

access, capacity etc as drivers behind PBN, since an APV as back-up to ILS also has that same purpose.

3. If flight safety (reducing CFIT) is one of the drivers behind SESAR, ATM masterplan and PCP – there's no excuse not to also require an LNAV procedure as fall-back to all APV and to set the date as soon as possible, therefore 2018.

LFV proposes for Apch – APV to be implemented to all instrument RWY ends, and at least LNAV procedures where APV is not possible or as fall back to APV by 2018.
That will be more realistic and also give the possibility to include requirements on the operators with capability for APV by 2020.

response

Not accepted.

Please refer to the response to the major concerns identified section of the Opinion related to implementation dates and provisions regarding navigation specifications.

comment

418 comment by: *Rockwell Collins, Inc.*

Page 25
Section 3. Proposed Amendments, Subpart PBN, Section 1 Airspace, AUR.PBN.2015 (4)

Comment: Item AUR.PBN.2005(4) is for network performance, which is seemingly unrelated to AUR.PBN.2014(4) requirements for aircraft (±1NM TSE) performance.

Suggested Resolution: Replace current text with requirements for Network Manager and/or network performance.

Comment is Suggestion

Page 25
Section 3. Proposed Amendments, Subpart PBN, Section 1 Airspace, AUR.PBN.2015 (4)

Comment: The ±1NM 95% TSE for performance above FL195 conflicts with equipment requirements for defaulting to ±5NM (TSO-C115b and TSO-C129a) or ±2NM (TSO-C146AR) en route (outside terminal).

Suggested Resolution: Since Item AUR.PBN.2005(4) is for network performance, either a) Replace text with requirements for Network Manager and/or network performance, or b) Replace text with requirements consistent with ICAO Doc 9613 for en route RNP

Comment is Suggestion

Pages 24-26
Section 3. Proposed Amendments, Subpart PBN, Section 1 Airspace, AUR.PBN.2015 (1), (2), (3), and (4)

Comment: Restating RNP requirements in less detail than ICAO Doc 9613 might result in

implementations inconsistent with ICAO Doc 9613.

- Because these NPA 2015-01 aircraft requirements are less detailed than ICAO Doc 9613, it's not clear whether NPA 20-15-01 requirements are entirely consistent with ICAO Doc 9613.

Because "RNP" is not explicitly mentioned in these NPA 2015-01 paragraphs, it's not clear whether these NPA 2015-01 TSE requirements are intended to supersede ICAO Doc 9613 RNP requirements.

Suggested Resolution: Replace ±0.1NM, ±0.3NM, ±1NM TSE and other performance requirements with references to applicable sections of ICAO Doc 9613 for aircraft performance.

Comment is Observation

response

Partially accepted.

To improve clarity, the new text will explicitly refer to ICAO´s PBN specifications

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 should be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment

448 comment by: *DGAC/DTA*

AUR.PBN.2015

General comment:
This section describes the navigation specification retained for the purpose of the regulation. The PBN manual ICAO Doc 9613 has defined the global navigation specifications to be used for each phase of flight.

Proposal:

Use PBN manual NAV SPECs as RNP1 and RNP APCH or RNP AR APCH to describe the different parts of the AUR.PBN.2015.

Moreover, a RNAV1 navigation specification is sufficient in most of the TMA under radar surveillance where there is no gain for using RNP1. In these cases, the performances of both DME/DME and GNSS are met in RNAV1 specification, unlike RNP1.

Proposal:

Add RNAV1 NAV SPEC in AUR.PBN.2015.

response *Accepted.*

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation.

ICAO's PBN Manual provides implementation guidance for States and operators, but these guidelines do not in themselves constitute regulatory provisions against which either the aircraft or the operator can be assessed and approved. On the other hand, the Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents.

comment *461* comment by: *DGAC/DTA*

AUR.PBN.2015, paragraph (3)

The NPA should enable RNP 0,3 SID and STAR routes for helicopters.

response *Accepted.*

The set of applicable navigation specifications has been simplified in the new EASA's proposal. Also, RNP 0.3 specification has been included for rotorcraft operations.

comment *462* comment by: *DGAC/DTA*

AUR.PBN.2015, paragraph (4), (i)

The ICAO PBN Manual Doc. 9613 doesn't require a RNP 1 navigation specification for En Route, but RNP 2, RNP 4 or RNAV 5, RNAV 2 and RNAV 1. So, why does this proposed amendment specify only RNP 1 for En-route? It looks too stringent without demonstrated benefit.

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance

objectives, have to conform to RNAV 1 performance requirements. Therefore, RNP 1 should be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.

comment

479 comment by: *Belgocontrol*

(3)

- Requirements (a) and (d) imply RNP1 for terminal procedures (SID/STAR).
- RNP1 currently implies "GNSS", as any alternative is currently not available… and "GNSS", currently, and also for the foreseeable future, means "GPS L1" only.
- Requirement (c): RF legs are an *optional* capability for use with RNP 1, RNP 0.3 and RNP APCH rather than a minimum requirement. *How many RNP1-capable aircraft today, support the RF-functionality?*
- The due date (6 December 2018) appears to be *overly optimistic*. According to a recent survey (March 2015), based on the submitted flight plans, only 38% of the departures out of Brussels Airport report to have a Basic RNP1-capability. Not less than 90% are RNAV1 compliant.
- CONCLUSION: RNP1 appears to be the wrong baseline for SID/STAR implementation starting in 2018.

Note: a 'WINDOW' constraint is a common function for a modern FMS, but not foreseen in 'legacy' systems. How many aircraft do currently have that function available?

response

Partially accepted.

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements as a minimum. RNP 1 should be implemented for those areas where higher performance is required.

comment

480 comment by: *Belgocontrol*

(4)

- The combination of the requirements "±1 NM for at least 95 % of the total flight time" and "on-board performance monitoring and alerting" practically mean **RNP1**.
- However ICAO (Doc 9613) does **not** intend to use RNP1 for en-route application: *"The RNP 1 specification is limited to use on STARs, SIDs, the initial and intermediate segments of IAPs and the missed approach after the initial climb phase. Beyond 30 NM from the ARP, the accuracy value for alerting becomes 2 NM."*

It is not clear to which extent this requirement fits with the future structure and utilization (vectoring?) of the airspace, which will provide increasingly *direct routings instead of closely separated ATS routes,* especially in dense airspace.

response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. Therefore, RNP 1 should be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.

comment	*489* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland* Introducing RNP1+RF for all new SIDs/STARs and new ATS routes from December 2018 seems to be unrealistic.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. Therefore, RNP 1 should be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.

comment	*496* comment by: *CAA-N* P 26 AUR.PBN.2015 (4) (b) It remains partly incomplete with RNP1 +RF above FL195, and within TMA for SID/STARs, but below FL 195 enroute there is no requirement for RF capacity. This could amplify and extend the duration of mixed mode operations within TMAs. If the requirements for RNP1+RF shall remain, the deadline must be delayed significantly and a firm set of equipment requirements (mandate) must be established to drive towards a more determinated reduction of mixed mode operations.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion.

comment	*502* comment by: *AEA* **AUR.PBN.2015 Performance and functionality <u>(in the TMA and for RNP APCH):</u>** **Aircraft requirements: RNP1 including Radius to Fix (RF) leg and monitoring and alerting**

function

Comments
RF leg requirements shall be de-coupled from RNP AR.
The RF leg is bound to RNP1. However, RNAV1 provides legally the same, (but which is not allowed by the NPA).
ATC procedures must be developed and validated in support of the RF leg in an RNP1 environment.

Q.: Could it be confirmed that the RF leg is de-coupled from RNP AR ?

response *Noted.*

The RF path terminator is not 'mandatory' as part of the RNP 1 specifications (but optional), though this functionality is certainly compulsory for RNP AR APCH specification.

comment *503* comment by: *AEA*

AUR.PBN.2015 Performance and functionality: (En route > FL 195)
Aircraft requirements: RNP1 and Fixed Radius Turn (FRT)

Comments
FRT functionality is NOT mature, and has not proven to increase en-route capacity and increase efficiency (*The Cost Benefit Analyses provided in the NPA are vague and not conclusive).*
Other airspace improvements like Free Route Airspace (FRA) and ATM flight planning improvements are much cheaper alternatives and are currently being provided by States. FRA is one of the ATM functionalities in the Pilot Common Projects and as such are ready for further proliferation in the European airspace.
FRT will not be used in the free route airspace and there is no indication that any other State in any other region is even contemplating the implementation of FRT. As a consequence the Airline Associations see no value in FRT and its members are not willing to invest in it.
Q. Could you provide evidence that FRT functionality is proven to be mature based on technical investigations in a full scale environment?
Q. Are there ATC tools available to monitor the performance of aircraft flying parallel in curves and could you provide the safety case to allow such operations?
Q. Could a CBA be provided in which airlines will be able to assess whether investments in FRT are beneficial?

response *Noted.*

The FRT functionality is no longer required. Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications and note that RNAV 5 will remain applicable in en-route airspace.

comment *504* comment by: *AEA*

AUR.PBN.2015 Performance and Functionality
<u>En Route < FL 195:</u> Aircraft Requirements: RNP1 and RNAV holding in a pattern defined by a point, the turn direction, an inbound track and an outbound distance

<u>Comments</u>
RNAV Holding is an aircraft functionality that is available in 85 % of the aircraft (Ref. IATA /Eurocontrol Avionic survey 2010). " RNAV holding " design is using less holding airspace and as such is beneficial for allowing introduction of efficient SIDs/STARs in airspace previously occupied by large holding areas. RNAV Holding must be implemented at locations where it enhances en-route capacity

response

Noted.

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications.

Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment

517 comment by: *Thales Avionics*

Comment: Performance and functionnality (3)(c): "maintain a track consistent with an RF leg" is not required Enroute. RF is only used for terminal/Approach procedure.
Proposed formulation/Recommended Change: (3)(c) "execution of fly-over and fly-by turns and fixed radius between two route segments."

response

Noted.

Although the old AUR.PBN.2015 (3) (c) requirement has been withdrawn, it referred to terminal airspace operations, where the use of the RF leg term was correct.

comment

522 comment by: *Thales Avionics*

Comment: RNP performances can be met only under the assumption of GPS coverage. With existing avionics design, reversion to DME/DME indicated as a mitigation to GNSS lost in GM1 AUR.PBN.2010, will not allow to support RNP navigation.

response

Noted.

Please refer to the response to the major concerns identified section of the Opinion. With the exception of RNP APH implementation, the Agency is proposing, as a minimum, the use of RNAV 1.

comment	*530* comment by: *IATA* **<u>Comments -</u> AUR.PBN.2015 Performance and functionality <u>(in the TMA and for RNP APCH):</u>** RF leg requirements shall be de-coupled from RNP AR. The RF leg is bound to RNP1. However, RNAV1 provides legally the same, (but which is not allowed by the NPA). ATC procedures must be developed and validated in support of the RF leg in an RNP1 environment. Q.: Could it be confirmed that the RF leg is de-coupled from RNP AR ?
response	*Noted.*
	The RF path terminator is not 'mandatory' as part of the RNP 1 specifications (but optional), though this functionality is certainly compulsory for RNP AR APCH specification.

comment	*531* comment by: *IATA* **AUR.PBN.2015 Performance and functionality: <u>(En route > FL 195)</u>** **Aircraft requirements: RNP1 and Fixed Radius Turn (FRT)** **<u>Comments</u>** FRT functionality is NOT mature, and has not proven to increase en-route capacity and increase efficiency (*The Cost Benefit Analyses provided in the NPA are vague and not conclusive).* Other airspace improvements like Free Route Airspace (FRA) and ATM flight planning improvements are much cheaper alternatives and are currently being provided by States. FRA is one of the ATM functionalities in the Pilot Common Projects and as such are ready for further proliferation in the European airspace. FRT will not be used in the free route airspace and there is no indication that any other State in any other region is even contemplating the implementation of FRT. As a consequence the Airline Associations see no value in FRT and its members are not willing to invest in it. Q. Could you provide evidence that FRT functionality is proven to be mature based on technical investigations in a full scale environment? Q. Are there ATC tools available to monitor the performance of aircraft flying parallel in curves and could you provide <u>the safety case</u> to allow such operations? Q. Could a CBA be provided in which airlines will be able to assess whether investments in FRT are beneficial?
response	*Noted.*
	The FRT functionality is no longer required. Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications and note that RNAV 5 will remain applicable in en-route airspace.

comment	*532* comment by: *IATA* **AUR.PBN.2015 Performance and Functionality** **<u>En Route < FL 195:</u> Aircraft Requirements: RNP1 and RNAV holding in a pattern defined by a point, the turn direction, an inbound track and an outbound distance** **<u>Comments</u>** RNAV Holding is an aircraft functionality that is available in 85 % of the aircraft (Ref. IATA /Eurocontrol Avionic survey 2010). " RNAV holding " design is using less holding airspace and as such is beneficial for allowing introduction of efficient SIDs/STARs in airspace previously occupied by large holding areas. RNAV Holding must be implemented at locations where it enhances en-route capacity.
response	*Noted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*561* comment by: *HungaroControl* AUR.PBN.2015: The specifications for the en-route and SID / STAR phases are not standard and they are reported incorrectly. The statement referring to the performance is misleading, it could be modified simply rewriting the requirement as A-RNP specification. The same specification should be introduced for the approach phase where necessary;
response	*Partially accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications. Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*562* comment by: *HungaroControl* AUR.PBN.2015 This requirement can lead to wrong assumptions, thus to disharmonized implementation. Reference to one complete specific ICAO conform Navigation Specification would bring a clear picture of what is applicable in Europe – e.g. A-RNP Doc 9613.

	The values given here are insufficient and/or wrongly extracted, e.g. some ENR specifics are not current, for some possibilities industry standards are not available (e.g. point (4) (a) (ii) A-D). The Navigation Specification should be either referenced or transposed in a whole only, not in parts or single sentences
response	*Noted.*
	Indeed, it would be more appropriated to refer to the applicable PBN specifications. As a result, the "Performance and functionality" requirements have been deleted from the revised proposal. Also, refer to the response to the major concerns identified section of the Opinion in relation to the required navigation specifications. Any technical aspect necessary to facilitate and ensure the implementation of these navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*563* comment by: *HungaroControl* AUR.PBN.2015 (3) - Requirements (a) and (d) imply RNP1 for terminal procedures (SID/STAR). - RNP1 currently implies "GNSS", as any alternative is currently not available… and "GNSS", currently, and also for the foreseeable future, means "GPS L1" only. - Requirement (c): RF legs are an optional capability for use with RNP 1, RNP 0.3 and RNP APCH rather than a minimum requirement. How many RNP1-capable aircraft today, support the RF-functionality? - The due date (6 December 2018) appears to be overly optimistic. According to a recent survey (March 2015), based on the submitted flight plans, only 38% of the departures out of Brussels Airport report to have a Basic RNP1-capability. Not less than 90% are RNAV1 compliant. - CONCLUSION: RNP1 appears to be the wrong baseline for SID/STAR implementation starting in 2018. - Note: a 'WINDOW' constraint is a common function for a modern FMS, but not foreseen in 'legacy' systems. How many aircraft do currently have that function available? AUR.PBN.2015 (4) - The combination of the requirements "±1 NM for at least 95 % of the total flight time" and "on-board performance monitoring and alerting" practically mean RNP1. - However ICAO (Doc 9613) does not intend to use RNP1 for en-route application: "The RNP 1 specification is limited to use on STARs, SIDs, the initial and intermediate segments of IAPs and the missed approach after the initial climb phase. Beyond 30 NM from the ARP, the accuracy value for alerting becomes 2 NM." - It is not clear to which extent this requirement fits with the future structure and utilization (vectoring?) of the airspace, which will provide increasingly direct routings instead of closely separated ATS routes, especially in dense airspace.
response	*Partially accepted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Note that regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements as a minimum. RNP 1 should be implemented for those areas where higher performance is required.

comment *581* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

COMMENT:
AUR.PBN.2015 (1) (a) does not indicate if the specified performance is for the initial and intermediate approach segments or some other flight segment.

REASON(S) FOR COMMENT:
In order to avoid eventual misunderstandings and maintain technical consistency with EASA documents AMC 20-27 (Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BAROVNAV Operations) and AMC 20-28 (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), it would be prudent to indicate that such paragraph is intended to be applied on the initial and intermediate approach segments.

PROPOSED CHANGE:
The text passage:

"AUR.PBN.2015 Performance and functionality
(1) The instrument approach procedures required by AUR.PBN.2005(1) shall be consistent with the following aircraft performance and functionality:
(a) the lateral TSE and the along-track error are within ±1 NM for at least 95 % of the total flight time; (…)"

should be changed to:

"AUR.PBN.2015 Performance and functionality
(1) The instrument approach procedures required by AUR.PBN.2005(1) shall be consistent with the following aircraft performance and functionality:

(a) for the initial and intermediate approach segments, the lateral TSE and the along-track error are within ±1 NM for at least 95 % of the total flight time; (…)"

response *Accepted.*

The previous performance requirements where not duly aligned with ICAO´s. Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of these future

navigation applications will be included in the AMC/GM associated to the proposed regulation.

The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents.

comment *582* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

COMMENT:
AUR.PBN.2015 (1) (c) is not harmonized with EASA AMC 20-28 document.

REASON(S) FOR COMMENT:
For approach procedures supported by SBAS, EASA document AMC 20-28 specifies accuracy requirements in terms of Navigation System Error (NSE), Path Definition Error (DPE) and Flight Technical Error (FTE), in paragraph 6.3. NSE, DPE and FTE are specified, respectively, in paragraphs 6.3.1, 6.3.2 and 6.3.3.

Therefore, in order to maintain technical consistency with EASA's airworthiness and operational certification guidance document, it would be more appropriate to reference such paragraphs instead of simply mandating the 0.3 NM value for the TSE (Total System Error).

PROPOSED CHANGE:
The text passage:

"AUR.PBN.2015 Performance and functionality

(1) The instrument approach procedures required by AUR.PBN.2005(1) shall be consistent with the following aircraft performance and functionality:
(…)
(c) for the Final Approach Segment when supported by SBAS, the angular lateral performance shall be equivalent to (b)(i) and (b)(ii) respectively;(…)"

should be changed to:

"AUR.PBN.2015 Performance and functionality
(1) The instrument approach procedures required by AUR.PBN.2005(1) shall be consistent with the following aircraft performance and functionality:
(…)
(c) for the Final Approach Segment when supported by SBAS, the angular lateral performance shall ***comply with the requirements of paragraphs 6.3, 6.3.1, 6.3.2 and 6.3.3 of Annex II to ED Decision 2012/014/R of 17/09/2012 (AMC 20-28: 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)*** ~~*be equivalent to (b)(i) and (b)(ii) respectively meet the specification of paragraph 6.3;(…)"*~~

response	*Not accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation, whose contents should not come into conflict with AMC 20-28.

comment	*583* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* **COMMENT:** Fly-over turn is not compatible with RNP flight tracks. **REASON(S) FOR COMMENT:** Fly-over turns are not compatible with RNP flight tracks, as recognized in ICAO document 9613 (Performance-based Navigation (PBN) Manual), 4th ed., vol. II, paragraph 6.3.3.4.1.1(b) and in EASA document AMC 20-26 (Airworthiness Approval and Operational Criteria for RNP Authorisation Required (RNP AR) Operations), paragraph 7.1, item 21. Also, as recognized in EASA document AMC 20-26, paragraph 7.1, item 21, fly-by turns may be used for limited RNP AR path changes. **PROPOSED CHANGE:** The text passage: ***"AUR.PBN.2015 Performance and functionality*** *(…)* *(2) The instrument approach procedures required by AUR.PBN.2005(2) shall be consistent with the following aircraft performance and functionality:* *(…)* *(c) execution of fly-over and fly-by turns and to maintain a track consistent with an RF leg; and (…)"* should be changed to: *(…)* *(2) The instrument approach procedures required by AUR.PBN.2005(2) shall be consistent with the following aircraft performance and functionality:* *(…)* *(c) execution of ~~fly-over and~~ **compatible** fly-by turns and to maintain a track consistent with an RF leg; and (…)"*
response	*Not accepted.*
	Although fly over turns can only be used on condition that there is no requirement for

repeatable paths (limited path changes), there is no need to eliminate the capability to execute fly-over fixes.

comment *584* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

COMMENT:
Fly-over turn is not compatible with RNP flight tracks.

REASON(S) FOR COMMENT:
The same comment to item 3.1.1, page 25, proposed regulation AUR.PBN.2015(2)(c) also applies to item 3.1.1, page 25, proposed regulation AUR.PBN.2015(3)(c): fly-over turns are not compatible with RNP flight tracks.

PROPOSED CHANGE:
The text passage:

"AUR.PBN.2015 Performance and functionality
(…)
(3) The routes required by AUR.PBN.2005(3) shall be consistent with the following aircraft performance and functionality: (…)
(c) execution of fly-over and fly-by turns and to maintain a track consistent with an RF leg; (…)"
should be changed to:
(…)
(3) The routes required by AUR.PBN.2005(3) shall be consistent with the following aircraft performance and functionality: (…)
*(c) execution of ~~fly-over and~~ **compatible** fly-by turns and to maintain a track consistent with an RF leg; (…)"*

response *Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion pertaining to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. Therefore, RNP 1 should be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied.

It is a common functionality for RNAV 1 and RNP 1 that the execution of automatic leg sequencing is with Fly-By or Fly-Over. Fly over turns can only be used on condition that there is no requirement for repeatable paths (limited path changes), so there is no need to eliminate the capability to execute fly-over fixes.

comment *588* comment by: *DGAC/DTA*

AUR.PBN.2015 paragraphs 1 (a), 1 (b), 2 (a), 4 (a) i, 4 (b) i

The proposed rule is based on the ICAO PBN Manual considering an along track error equal to the total system error (TSE). The design of the procedure is worldwide driven by the ICAO Doc 8168 volume II "PANS-OPS" which Page III-1-2-2, assumes that the along track tolerance (ATT) is ATT = 0,8*TSE. This difference between cross and along track tolerances is the result of influence of guidance along the track on the FTE or the along track error.

This means if the draft IR is approved as it is, all RNAV published procedures, LNAV, APV Baro-VNAV and LPV, SID and STAR, have to be redesigned and existing criteria dealing with waypoint tolerances have to be modified.

Proposal:
It is suggested that direct reference is made to the ICAO PBN navigation specifications without reference to the NSE.

Justification:
The different values of the along track tolerance in PANS-OPS and the along track error in the PBN Manual is an inconsistency between these two ICAO documents. It is better no to refer to the TSE but only refering to the ICAO Navigation specification, so when one of these two documents will be aligned with the second one, it will not impact the PBN IR.

response *Accepted.*

The text has been modified to refer to the relevant ICAO Navigation specification. As a result of this, the text of the proposed regulation has been simplified and “Performance and functionality” requirements of AUR.PBN.2015 have been deleted from the revised proposal.

comment *602* comment by: *Baranes*

Explain the rationale to choose FL195.

The specification for en-route in the PBN manual is the A-RNP.
The RNP1 navigation specification in the ICAO PBN concept is only intended for TMA procedures and not for En-route. RNP2 is the specification intended for implementing on en-route environment. DSNA do not understand if this NPA is suggesting to create a specific deviation to the PBN concept by proposing a “special” RNP 1 En-Route concept for Europe, or that ANSPs implement the PBN Advanced-RNP navigation specification by 2018. This second option does certainly support RNP 1 but also requires additional airborne functions such as Fixed Radius Transition (FRT), which are not yet generalized within the fleet, and will definitively not be by 2018.

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion related to navigation specifications. Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. Therefore, RNP 1 should

be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied.

comment *611* comment by: *Baranes*

AUR.PBN.2015 paragraphes 1 (a), 1 (b), 2 (a), 4 (a) i, 4 (b) i
The proposed rule is based on the ICAO PBN Manual considering an along track error equal to the total system error (TSE). The design of the procedure is worldwide driven by the ICAO Doc 8168 volume II "PANSOPS" which Page III-1-2-2, assumes that the along track tolerance (ATT) is ATT = 0,8*TSE.
This difference between cross and along track tolerances is the result of influence of guidance along the track on the FTE or the along track error.
This means if the draft IR is approved as it is, all RNAV published procedures, LNAV, APV Baro-VNAV and LPV, SID and STAR, have to be redesigned and existing criteria dealing with waypoint tolerances have to be modified.
Proposal:
It is suggested that direct reference is made to the ICAO PBN navigation specifications without reference to the NSE.
Justification:
The different values of the along track tolerance in PANS-OPS and the along track error in the PBN Manual is an inconsistency between these two ICAO documents. It is better no to refer to the TSE but only refering to the ICAO Navigation specification, so when one of these two documents will be aligned with the second one, it will not impact the PBN IR.

response *Accepted.*

The text has been modified to refer to the relevant ICAO Navigation specification. As a result of this, the text of the proposed regulation has been simplified and “Performance and functionality” requirements of AUR.PBN.2015 have been deleted from the revised proposal

comment *613* comment by: *General Aviation Manufacturers Association / Hennig*

GAMA is confused by EASA's reference is AUR.PBN.2015 Performance and functionality in (3)(b) stating that the aircraft's performance and functionality include:

"the operation along a vertical path and between two fixes" on PBN routes.

Various technical standards for avionics equipment provide navigation capability including with vertical guidance, but GAMA has not identified existing EASA guidance that provide this type of capability.

Additionally, many business and general aviation aircraft may be equipped with PBN capabilities, but may not have a flight director or autopilot capable of following a vertical path and this would result in a significant burden that the agency hasn't accounted for in the regulatory analysis.

GAMA recommends that EASA leverage existing standards for the purpose of the establishment of airspace requirements in the European ATM environment and specifically ensure that business and general aviation aircraft capabilities are fully considered.

response *Noted.*

Please note that the “Performance and functionality” requirements have been withdrawn from the revised proposal.

Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation.

Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. Therefore, RNP 1 plus altitude constraints and radius to fix (RF) might be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied.

Altitude constraints are linked to the required capability to define a desired vertical path, where vertical guidance is needed.

Please also refer to the response to the major concerns identified section of the Opinion related aircraft equipage.

comment *614* comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes in AUR.PBN.2015(3)(c) that aircraft performance and functionality should include:

"execution of fly over and fly-by turns and to maintain a track consistent with a RF leg"

While many business and general aviation aircraft have this capability, some do not. GAMA requests that EASA consider the typical capability of business and general aviation aircraft for PBN compliance in context of this rulemaking. Many business and general aviation aircraft are equipped with E/TSO-C145() GPS/SBAS navigation equipment and E/TSO-C115() FMS certified prior to revision c. While this equipment is fully capable of supporting PBN, it does not support RF-leg capabilities.

Complicating the RF-leg requirement is that existing international guidance requires that when operating on an RF leg the aircraft is equipped with a moving map depicting the RF leg and have a roll-steering autopilot/flight director (i.e., ICAO Document 9613). GAMA notes that EASA, however, has not published agency guidance for an aircraft to show capability to operate an RF leg.

GAMA recommends that EASA take steps to ensure that the performance requirements established for PBN operations fully consider existing capabilities in guidance for PBN operations including, specifically, capabilities common the business and general aviation

fleet.

response *Noted.*

Regulated parties, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 plus altitude constraints and radius to fix (RF) might be implemented for those areas where superior performance is required, otherwise the RNAV 1 standard must be applied.

Please, note that CS-ACNS will address the necessary on-board equipage to support specific RNAV/RNP specifications.

comment *641* ❖ comment by: *Virgin Atlantic Airways - Flight Technical Support*

Regarding the requirement for FRT, we do not believe that the need for this functionality is proven from either an efficiency perspective or as capacity enhancment tool. An FMS hardware retrofit would be required on a large number of airframes to meet this requirement - even some that have only recently entered service. A more robust CBA should be provided to enable further assessment by operators.

Additionally, this functionality would not be required to deliver the stated service provision of Free Routes/user-preferred trajectories as it would be inconsistent with the concept; the value in high density airspace is undetermined at this point.

response *Partially accepted.*

FRT functionalities have been removed from the revised draft rule. Please see the response to the major concerns identified section of the Opinion regarding the proposal of navigation specifications to be adopted.

comment *658*

Para (4)
Therefore, the text must contain a clear designation and the complete ICAO description/specification of a procedure to be introduced that is already available in ARINC 424. *(Example: Introduction of RNP2 …etc.).*

This requirement requires functionalities for which no industrial standards exist at present (ARINC 424 functionalities (424-20)). For this reason, we cannot support this requirement.

In item (a)(ii) letters (A) to (D), altitude constraints are required for ENR waypoints: Can ATS routes really be coded with the listed altitude windows? For the time being, this is only possible for SIDs/STARs/APCH. This requirement is completely out of line with the currently available functionalities/capabilities.

	In our opinion, it will take at least 10 years before these technical functionalities are implemented in flight management systems (FMS) and in ARINC 424 format. Aircraft operators would then have to retrofit new FMS because not all of the existing FMS can be updated as necessary. This would involve considerable cost and effort.
response	*Partially accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation. Please note that, in relation to en-route phases of flight, the current requirement of RNAV 5 (previously called BRNAV) is proposed to be maintained.

comment	*659* comment by: *DFS Deutsche Flugsicherung GmbH* Para (4) (a) and (b) Different RNP specifications (here: RNAV holding only up to FL195) on the basis of a fictitious division flight level at FL195 does not generate any added value in operations. The same specifications should apply from GND – UNL so that it is possible to establish RNAV holdings above FL195, too.
response	*Noted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation. Please note that, in relation to en-route phases of flight, the current requirement of RNAV 5 (previously called BRNAV) is proposed to be maintained. The PCP also stipulates that Free Route shall be provided and operated in European airspace at and above flight level 310 as from 2022.

comment	*666* comment by: *DFS Deutsche Flugsicherung GmbH* Para (2) The text must contain a clear designation and the complete ICAO specification of the procedures to be introduced. *(Example: Introduction of RNP AR or A-RNP or RNP1…etc.)*

response	*Accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

comment	*667* comment by: *DFS Deutsche Flugsicherung GmbH* Para (3) The text must contain a clear designation and the complete ICAO specification of the procedures to be introduced. *(Example: Introduction of RNP1 RF or A-RNP or RNP1…etc.)*
response	*Accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*669* comment by: *DFS Deutsche Flugsicherung GmbH* Para (1) The text must contain a clear designation and the complete ICAO specification of the procedures to be introduced. *(Example: Introduction of APV Baro LNAV/VNAV and/or APV SBAS.*
response	*Accepted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal. Any technical aspect necessary to facilitate and ensure the implementation of future navigation applications will be included in the AMC/GM associated to the proposed regulation.

comment	*693* comment by: *UK CAA* **Page No:** 24 **Paragraph No:** AUR.PBN.2015 (1), (2), (3) and (4). **Comment:** It is not understood what "consistent with" means within the context of aircraft performance and functionality. Clarity is sought to explain the meaning of the expression

	''consistent with'' in the context of AUR.PBN.2015 (1), (2), (3) and (4). **Justification:** Clarity.
response	*Noted.*
	Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal and as such the contents of the proposed regulation have been simplified, thus removing the term "consistent with".

comment	*694* comment by: *UK CAA* **Page No:** 24 **Paragraph No:** AUR.PBN.2015 **Comment:** Although AUR.PBN.2015 is titled performance and functionality, not all of the relevant requirements have been included. For example, the functional requirements for each sub-paragraph go far beyond what is listed e.g., path terminators. It is suggested that direct reference is made to the ICAO PBN specifications to which each paragraph relate such that clarity and completeness can be brought to the NPA and the requirement made explicit. **Justification:** EASA Opinion 03/2015 "Revision of operational approval criteria for Performance-Based Navigation (PBN)" makes extensive and direct reference to the ICAO PBN specifications; it is not clear why the same cannot be done here.
response	*Accepted.*
	Reference has been made to the relevant ICAO Navigation specification and, as a result, the "Performance and functionality" requirements have been removed from the revised proposal.

comment	*695* comment by: *UK CAA* **Page No:** 25 **Paragraph No:** AUR.PBN.2015 (1) (b) (ii). **Comment:** It is unclear what performance standard is required for the vertical path. If a vertical performance standard is required UK CAA suggest that reference be made to ICAO Doc 9613 Vol II, Attachment A, Barometric VNAV (BARO-VNAV), paragraph 4.6 (System accuracy).

Justification: UK CAA requests clarification on the performance standard required for the vertical path at AUR.PBN.2015 (1) (b) (ii).

response *Noted.*

The "Performance and functionality" requirements have been withdrawn from the revised proposal, and, as such, the proposed regulation has been simplified thus removing the vertical performance requirement from the rule.

comment *696* comment by: *UK CAA*

Page No: 25

Paragraph No: AUR.PBN.2015 (1) (c).

Comment: Under certain circumstances, obstacles prevent a vertical path being designed to an instrument runway end. Under these conditions an LP or LNAV approach may be the only alternative.

UK CAA suggests that lines of minima be included with LNAV as a required reversion and LP where obstacles prevent implementation of LPV'.

Furthermore, UK CAA suggests that where an RNP APCH procedure is implemented, minima lines be included for LNAV, LNAV/VNAV and LPV to maximise access to the airport for different fleet capabilities.

Justification: The NPA should recognise that a vertical path cannot always be designed to a runway and that a 2D approach is an acceptable alternative under these circumstances.

response *Not accepted.*

APV are required for safety reasons.

comment *697* comment by: *UK CAA*

Page No: 25

Paragraph No: AUR.PBN.2015 (2) (b).

Comment: It is unclear what performance standard is required for the vertical path. If a vertical performance standard is required we suggest that reference is made to ICAO Doc 9613 Vol II Part C Chapter 6 Implementing RNP AR Approach, paragraph 6.3.3.2.4 (Vertical accuracy).

Justification: UK CAA requests clarification on the performance standard required for the vertical path at AUR.PBN.2015 (2) (b).

response | *Noted.*

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal, and as such the proposed regulation has been simplified, thus removing the vertical performance requirement from the rule.

comment | *698* comment by: *UK CAA*

Page No: 25

Paragraph No: AUR.PBN.2015 (3) (b).

Comment: The statement "the operations along a vertical path between two fixes" implies that the aircraft must have a VNAV function i.e., provide vertical flight path guidance on a SID and/or STAR or Transition. It is unclear whether this is the intention. Does EASA have data on how many European aircraft operations can support VNAV today and what level of retrofit might be required? UK CAA requests clarification of intent and revised text as appropriate.

Justification: The regulation contains an implicit requirement for VNAV. This would have an unintended consequence of deterring implementation of PBN at regional airports where fleet mix is more diverse and less capable.

response | *Noted.*

Please note that the "Performance and functionality" requirements have been withdrawn from the revised proposal, and as such the proposed regulation has been simplified, thus removing the vertical performance requirement from the rule.

comment | *722* comment by: *Julian Scarfe, PPL/IR Europe*

AUR.PBN.2015 Performance and functionality
"consistent with the following aircraft performance and functionality" is inadequate wording.

The objective of having PBN specifications is that relatively complex performance and functional requirements can be referred to by reference to a simple label, such as "RNP APCH". They should be used in the regulation.

AUR.PBN.2015 (3)(b) Operation along a vertical path during terminal operations is not envisaged during the timescales to which this regulation applies. Current SESAR work packages, e.g. 5.7.2 do not rely on such capability. The specification is immature, hence its relegation to an attachment to the ICAO PBN Manual. Vertical RNP is neither defined nor included in the PBN Concept.

It is inappropriate to encourage airspace design that relies on this. **Constraints** A-D, not

	"operation along a vertical path", are what are used in practice, and they do not require a sophisticated PBN-based automation ("aircraft performance and functionality" as in 4.7.2.1.2). They are simply a standard aspect of procedure design which can be met by conventional level management in the cockpit.
response	*Partially accepted.*
	Please see the response to the major concerns identified section of the Opinion regarding the proposal of navigation specifications to be adopted. Note that the "Performance and functionality" requirements have been withdrawn from the revised proposal.

AUR.PBN. 2020 Contingency p. 26

comment	*24* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AUR.PBN. 2020 Contingency*** *ATSPs and aerodrome operators shall ensure that appropriate contingency procedures are established in case of reported loss of continuity of the navigation.* **COMMENT:** a) Contingency procedures in case of loss of RNP navigation continuity are already a requirement for airspace users (see EASA AMC 20-27A, 20-28). b) In addition, more detailed information should be provided about the required ATSP "appropriate contingency procedures". The variety of potential implementing scenarios is very high: some without radar coverage, others with almost no availability of conventional reversionary navaids, etc. Without a common reference as to contingency procedure contents for both airspace user and ATSPs, NSAs may apply different criteria when evaluating and approving contingency procedures, hindering the homogeneity of PBN implementation. Proposal: a) to give credit to the contingency procedures of airspace users: b) to define, here or in the related AMC/GM, minimum common European guidelines for contingency planning in case of loss of RNP navigation continuity.
response	*Accepted.*
	In the event of a loss of primary navigation capabilities, harmonised contingency procedures are required in order to be applied by aircraft operators and ANSPs in close coordination. These procedures must be assessed and adapted locally to ensure their effectiveness, taking account of the NAVAID infrastructure and the possibility to revert to an alternative means of

navigation, as well as the specific airspace organization: communication and surveillance services, type of ATS provided, ATS route structure, separation minima, route spacing, obstacle clearance, etc.

Key technical aspects to facilitate the implementation of future navigation applications and their contingency procedures will be further developed and included in the Agency's AMC/GM material.

comment

98 comment by: *CANSO*

AUR.PBN.2020
Contingency procedures inevitably imply a reduction of navigation performance which may cause conflicts if the airspace structure fully takes advantage of the required navigation specification. Until a valid second source is becoming available, it might be advisable to refrain from using a navigation technique fully relying on GNSS (GPS L1) such as RNP1.

response

Noted.

Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. With respect to the implementation of RNP 1 where necessary, the ANSP should assess the NAVAID infrastructure. It should be shown to be sufficient for the proposed operations, including reversionary modes.

comment

156 comment by: *skyguide Corporate Regulation Management*

AUR.PBN.2020 Contingency
ATSPs and aerodrome operators shall ensure that appropriate contingency procedures are established in case of reported loss of continuity of the navigation.

Comment: If this is implemented as described the outcome would be non-harmonisation at the state level, surely not in line with the purpose of the regulation. This should be also harmonised at European level as loss of navigation could be due to the unavailability of a satellite which will impact more than one state.

response

Accepted.

The Agency agrees on the need to harmonise contingency procedures at European level.

Key technical aspects to facilitate the implementation of future navigation applications and their contingency procedures will be further developed and included in the Agency's AMC/GM.

comment

195 comment by: *ENAV*

	- AMC1.AUR.PBN.2020: The contingency, as formulated, results confused, especially where is reported that the RNP1 backup operation requirement is the RNAV1. With the presence of RF functionality the switch is not automatic nor the transition from RNP1 to RNAV 1. It becomes potentially difficult to ensure RNAV1 as a backup if its procedure implementation is effectively blocked by this IR;
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. With respect to the implementation of RNP 1 where necessary, the proposed regulation does not consider RNAV 1 as a reversionary mode or alternative means of navigation in the event that the aircraft cannot comply with RNP 1 requirements.

comment	*231* comment by: *ESSP-SAS* In both EASA AMC 20-27 and AMC 20-28 it is stated that Contingency procedures should be set by Air Operators according to the available infraestructure in the aerodrome, but there is no mention to this within the NPA. It should be included in the Regulation a definition of "Contingency procedures", including a reference to Air Operators (with due requirements, as already included in applicable regulation). The development on guidance material regarding contingency should be done to guarantee the harmonization of contingency procedures across Europe (in particular procedure to follow in case of a GNSS failure).
response	*Accepted.*
	In the event of a loss of primary navigation capabilities, harmonised contingency procedures are required in order to be applied by aircraft operators and ANSPs in close coordination. The Agency agrees on the need to harmonise contingency procedures at European level. Key technical aspects to facilitate the implementation of future navigation applications and their contingency procedures will be further developed and included in the Agency's AMC/GM.

comment	*306* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* How can ATSP mitigate RNP 1, in case of sustained loss of GNSS, as DME/DME is not approved as an area navigation for RNP 1 (as it is for RNAV 1)? We propose that harmonised guidance material on contingency in case of GNSS failure is developed.
response	*Accepted.*

Please refer to the response to the major concerns identified section of the Opinion in relation to applicable navigation specifications.

Contingency procedures must be assessed and adapted locally to ensure their effectiveness (CNS/ATM environment), taking account of the NAVAID infrastructure and the possibility to revert to an alternative means of navigation, as well as the specific airspace organization: communication and surveillance services, type of ATS provided, ATS route structure, separation minima, route spacing, obstacle clearance, etc.

Key technical aspects to facilitate the implementation of future navigation applications and their contingency procedures will be further developed and included in the Agency's AMC/GM.

comment *351* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
AESA fully supports this requirement. We would, however, suggest to call this requirement '*ATS Contingency*' and the procedures themselves '*ATS contingency procedures*' in order to avoid confusion with the aircraft operator contingency procedures required by **EASA AMC 20-26**, **EASA AMC 20-27** and **EASA AMC 20-28**.	It is most important that the risks posed by the use of GPS be mitigated by ATS contingency procedures provided by certified ANSPs.

response *Not accepted.*

The obligations in the requirement are clear and are not addressed to aircraft operators.

comment *391* comment by: *NATS National Air Traffic Services Limited*

The NPA requires all PBN procedures to be predicated on GNSS as the navigation position source, with the implementation of supporting local contingency procedures. In the regulatory timescale proposed, this is very problematic

1. 1. Placing a dependency on the availability, continuity, integrity and robustness of the GNSS system as the prime navigation sensor, so soon after 2018, does not

recognise the wide range of issues associated with failure modes and interference, intentional or unintentional. A complete understanding of what a widespread GNSS failure means to the Network is not believed to be available. The NPA requires locally developed contingency procedures after loss of a core constellation however such a failure will probably affect airspaces in more than one State. It is not clear how the Network can function efficiently if contingency procedures are left to the local airspace managers. Until dual constellation/dual frequency GNSS availability becomes available sometime in the next decade, legislating for the use of the current single constellation/single frequency system seems premature.

2. There is no system capability for local ATS providers to identify single satellite or core constellation GNSS failures, other than through ambiguous pilot reports; mandating GNSS will require a centralised approach to outage notification and subsequent contingency network management. If it remains a requirement for ATS providers to manage contingency locally, then the costs of implementing a detection system would vastly exceed any positive benefits that an RNP airspace would realise over an RNAV airspace, which does not require a GNSS capability.

Suggested resolution: EASA is asked to mandate the RNAV 1 standard which does not *require* GNSS to enable benefits and removes the need to place a dependency on the integrity and robustness of the current GNSS environment. Where ATSPs implement RNP procedures outside of regulation, then appropriate measures for identifying GNSS outages and supporting contingency arrangements can be developed locally and be approved by the NSA.

response *Partially accepted.*

Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications.

comment *458* comment by: *DGAC/DTA*

AUR.PBN.2020

A definition for “contingency procedure” is needed taking into account the “on board” and the “ground” concerns according to the different relevant regulations (AIR-OPS, ATM-ANS, SERA, etc…).

response *Noted.*

In the event of a loss of primary navigation capabilities, harmonized contingency procedures are required in order to be applied by aircraft operators and ANSPs in close coordination. So, the Agency’s AMC/GM will be further developed to ensure harmonisation.

comment	*459* comment by: *DGAC/DTA* **AUR.PBN.2020** According to the regulation 965/2012 CAT.OP.MPA.110, the contingency procedures are relevant to the aircraft operator when establishing aerodrome operating minima. If emergency/contingency procedures are needed for ATS concerns, it should be a separate provision.
response	*Noted.*
	The obligations in the requirement are clear and they are not addressed to aircraft operators but to ANSPs and aerodrome operators. In the event of a loss of primary navigation capabilities, harmonised contingency procedures are required in order to be applied by aircraft operators and ANSPs in close coordination. So the Agency's AMC/GM will be further developed to ensure harmonisation.

comment	*460* comment by: *DGAC/DTA* **AUR.PBN.2020** What about AFIS aerodromes and aerodromes in class G airspace without any ATS? How can ATS measures be prescribed?
response	*Noted.*
	Regardless of the location and the services offered, if the routes and procedures associated with that aerodrome are predicated on GNSS, for example, and there is a loss of GNSS, some form of contingency procedures must be applied.

comment	*485* comment by: *Belgocontrol* Contingency procedures inevitably imply a reduction of navigation performance which may cause conflicts if the airspace structure fully takes advantage of the required navigation specification. Until a valid second source is becoming available, it might be advisable to refrain from using a navigation technique fully relying on GNSS (GPS L1) such as RNP1.
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. With respect to the implementation of RNP 1 where necessary, the ANSP should assess the NAVAID infrastructure. It should be shown to be sufficient for the proposed operations, including reversionary modes.

comment	*505* comment by: *AEA* **AUR.PBN. 2020 Contingency:** "***ATSPs and aerodrome operators shall ensure that appropriate contingency procedures are established in case of reported loss of continuity of the navigation"*** **Comments** The contingency paragraph is too open and could imply that airlines will be faced with additional investments costs by ANSPs (to be paid by airlines through user charges). The paragraph shall impose that contingency procedures have to be harmonized as well.
response	*Accepted.*
	In the event of a loss of primary navigation capabilities, harmonised contingency procedures are required in order to be applied by aircraft operators and ANSPs in close coordination. So the Agency's AMC/GM will be further developed to ensure harmonisation.

comment	*533* comment by: *IATA* **Comments** The contingency paragraph is too open and could imply that airlines will be faced with additional investments costs by ANSPs (to be paid by airlines through user charges). The paragraph shall impose that contingency procedures have to be harmonized as well.
response	*Accepted.*
	In the event of a loss of primary navigation capabilities, harmonised contingency procedures are required in order to be applied by aircraft operators and ANSPs in close coordination. So the Agency's AMC/GM will be further developed to ensure harmonisation.

comment	*564* comment by: *HungaroControl* AUR.PBN.2020 Contingency procedures inevitably imply a reduction of navigation performance which may cause conflicts if the airspace structure fully takes advantage of the required navigation specification. Until a valid second source is becoming available, it might be advisable to refrain from using a navigation technique fully relying on GNSS (GPS L1) such as RNP1.
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. With respect to the implementation of RNP 1 where necessary, the ANSP should assess the NAVAID infrastructure. It should be shown to be sufficient for the proposed operations, including reversionary modes.

comment	*603* comment by: *Baranes* According to the regulation 965/2012 CAT.OP.MPA.110, the contingency procedures are relevant to the aircraft operator when establishing aerodrome operating minima, not to the ATSP or the aerodrome operator. The missed approach procedure as part of the instrument approach procedure is established by the ATS or the aerodrome operator. Furthermore, a definition for "contingency procedure" is needed taking into account the "on board" and the "ground" concerns according to the different relevant regulations (AIR OPS, ATM-ANS, SERA, etc…) **Proposal to delete this paragraph**.
response	*Not accepted.*
	In the event of a loss of primary navigation capabilities, harmonised contingency procedures are required in order to be applied by aircraft operators and ANSPs in close coordination. This requirement is addressed to ANSP and aerodrome operators.

comment	*660* comment by: *DFS Deutsche Flugsicherung GmbH* DFS cannot support the current formulation of this requirement. In our opinion, this would force us to keep practically all of the existing ground-based navigation infrastructure, to maintain it and to renew it, if required. This is not in keeping with the idea of introducing PBN. For this reason, we request EASA to enable general, Europe-wide contingency concepts that are suited to save costs. The procedures must be safe and the associated capacity restrictions must be acceptable. The contingency solution must at the same time enable the phase-out / reduction / removal of ground-based navigation aids.
response	*Accepted.*
	Contingency procedures must ensure that failures of primary means of navigation are mitigated by other means of navigation (e.g. DME-based RNAV operations, conventional navigation), ATS surveillance or ATS procedural service, depending on the ATM/CNS environment. Key technical aspects to facilitate the implementation of future navigation applications and their contingency procedures will be further developed and included in the Agency's AMC/GM.

comment	*699* comment by: *UK CAA* **Page No:** 26 **Paragraph No:** AUR.PBN.2020

Comment: The UK CAA believes that this is a "given" through the (Safety) Management Systems that airports and ANSPs are required to have in place and that this paragraph may be deleted. It will have to be addressed to the regulator (NSA) within any safety case submission.

Opinion 03/2014 and its proposed ATM IR Annexes II and III will require that all notification and changes to procedures (within the Functional System) are subject to risk assessment and mitigation which will require the Competent Authority verifying the content of the change and any contingency measures in the event of infrastructure and equipment failures.

Justification: Contingency is already addressed through other regulations.

Proposed Text: Delete the text at AUR.PBN.2020, Contingency.

response *Not accepted.*

The existing requirements to perform safety assessments do not come into conflict with the need for harmonised contingency procedures.

The AMC/GM drafted by the Agency will be further developed to aid the harmonisation of contingency procedures at European level, so that they can follow common rules, even though adaptation to the local ATM/CNS environment may be needed.

Section I I— Operations AUR.PBN. 3005 Mixed operations p. 26

comment *25* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AUR.PBN. 3005 Mixed operations
(1) ATSPs and aerodrome operators shall ensure that:
(a) approach procedures, Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes based on non-PBN applications are available; or
(b) the required operation procedures are available to permit operation of aircraft that do not conform to the requirements to operate on the Standard Instrument Departures, Standard Arrival Routes and ATS routes required by AUR.PBN.2005.
COMMENT:

Point b) does not make reference to approach procedures. This could give the impression that non-PBN approaches should always be available at airports where PBN approaches have been implemented. This would not be consistent with ICAO EUR Doc 025, in which conventional navaids are needed at the destination airport only if the local safety assessment requires it.

New suggested point (1) (a):

a) approach procedures ***(at the same aerodrome only if required by local safety***

	***assessments)**, Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes based on non-PBN applications are available ; or* *b) the required [...]*
response	*Partially accepted.*
	The proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request: - operational procedures or - approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on non-PBN applications .

comment	*26* comment by: *ENAIRE*
	NPA 2015-01 REFERENCE: ***AUR.PBN. 3005 Mixed operations*** *(1) ATSPs and aerodrome operators shall ensure that:* *(a) approach procedures, Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes based on non-PBN applications are available* **COMMENT:** It is assumed in the document that future PBN ATS routes will be implemented on a National criteria, according to local needs, as it is proposed on para. 2.1. In fact, the PBN NPA recommends to make compulsory the requirement to keep non-PBN procedures. This is something positive by itself – however, jointly with that "there is no direct obligation proposed to aircraft operators to be equipped nor operationally approved" (p. 6), favours the proliferation of non-PBN, RNAV and RNP mixed scenarios, especially when taking into account the lack of provisions for phasing out RNAV procedures where they can be substituted by RNP ones, as already commented by ENAIRE. As a mitigation, the non-PBN procedures should be strictly restricted to emergency or abnormal situations, e.g. traffics losing their PBN capability, State aircraft or specific flights (maintenance, delivery and/or testing). If no clear rules to restrict the access to these non-PBN procedures are set by the NPA, mixed traffic scenarios will be increased – this is not efficient as RNP developments will be subject to the needs of the conventional ones for ATC simplicity. And, in general terms, these scenarios do not permit further improvements, some of them required by SESAR: CDA/CDO, environmental-driven procedures, wider ATC clearances, accessibility, ATS routes continuity when crossing borders, etc.

Mixed scenarios also generate, in ENAIRE's view, significant operational risks which are not discussed in this NPA with the appropriate depth.

Proposal: Non-PBN procedures in a PBN airspace should be present, but restricted to special flights, emergencies or abnormal situations, following the statement of "Best equipped, best served".

response *Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments. The limit of the restrictions proposed may be those that are needed to achieve the performance needs.

comment *89* comment by: *CANSO*

AUR.PBN.3005 mixed operations
Although Para (2) weakens the mandate to perform mixed operations in every case, we suggest to rather cover such needs through the introduction of NPIPs as suggested above. Where mixed operation is allowed, shall be deemed by the national plans. The information provided with requirement AUR.PBN.3005 then could serve as AMC/GM to that NPIP.

response *Not accepted.*

Since the proposed regulation does not require PBN operations to be implemented at all locations, but only where a performance benefit is established, the Agency does not foresee the need to require the creation of National PBN Implementation Plans.

comment *99* comment by: *CANSO*

AUR.PBN.3005 (1)
- It is commonly understood that 'conventional' procedures need to co-exist during an agreed transition period. However, the purpose of a 'mandate' consists in obtaining standardized and homogeneous aircraft and flight operations, conforming to the requirements from a certain date onwards, in order to achieve the intended benefits, at least for all IFR/GAT flights, in the affected airspace.
- The current NPA refers to airspace and operations, however, the text does not mandate any aircraft equipage. Experience and history have clearly demonstrated that voluntary equipage is usually limited, unless aircraft operators are 'forced' by any means to act. Therefore, the "mixed operations" article should be expanded by articles explaining how to come to an end of this unfortunate dual situation!

AUR.PBN.3005 (2)
The practical meaning of this requirement should be clarified.

response *Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments. It should be recognised that this regulation is not a mandate in the traditional sense as it only requires PBN routes and procedures to be implements were a performance improvement can be established.

comment *122* comment by: *Finavia*

The proposed requirement AUR.PBN.3005 shall be removed. In case it is not seen possible, the requirement shall be modified as follows:

(1) ATSPs and aerodrome operators shall ensure that where local needs exist:
(a) approach procedures, Standard Instrument Departures (SID)~~,~~ and Standard Arrival Routes (STAR) ~~and ATS routes~~ based on non-PBN applications are available; or(b) the required operation procedures are available to permit operation of aircraft that do not conform to the requirements to operate on the Standard Instrument Departures, Standard Arrival Routes and ATS routes required by AUR.PBN.2005.

(2) The ~~operational use~~ availability of such approach procedures and routes required by paragraph 1 may be limited, commensurate with the operational performance needs.
Instead of the general obligation to ATSPs and aerodrome operators to provide non-PBN procedures without exceptions, such decision shall be taken on the local level, based on the evaluation of the needs of the concerned airspace users with the associated costs and benefits. Even when seen necessary to provide non-PBN applications in the near term future, it should be possible to define a transition period for the provision of the non-PBN environment.

The selected approach of not proposing any direct obligation to aircraft operators, with the requirement to maintain non-PBN procedures and the supporting navigation infrastructure for undefined time period in the future, is not in line with the objective of the RMT to ensure an efficient and harmonized PBN implementation in Europe.

The cost impact of the general obligation to maintain the non-PBN environment everywhere has not been considered on the appropriate level of accuracy in the RIA. It is clear, that significant additional costs are incurred due to this requirement and in some cases it could even prevent the local PBN implementation as it would not be cost-effective. Even though there were existing non-PBN procedures available, continuous maintenance of the required navigation equipment imply significant additional costs. There are also airports having only PBN procedures available already, where the proposed requirement to also have non-PBN procedures available would only induce additional costs with no operational benefits.

In the end, these additional costs are paid by the airspace users and it is disadvantageous for

	the airspace users already invested on their PBN capability. Regulation based requirements to provide a service level that is not justified by operational performance needs is not in line with the performance scheme objectives set for the provision of air navigation services. Recent assessment of the fleet navigation capabilities in Finland, for example, indicated that less than 1 % of the civil IFR traffic was not capable for RNAV 5.
response	*Partially accepted.*
	The proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request: - operational procedures or - approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on existent non-PBN or PBN applications The revised proposal incorporates the necessity for publishing operational limitations in the AIP.

comment	*157* comment by: *skyguide Corporate Regulation Management* **AUR.PBN.3005 (2) Mixed Operations** 2) The operational use of such approach procedures and routes required by paragraph 1 may be limited, commensurate with the operational performance needs. It needs to be clearly stated: • the 'authority' that can make these limitations, and • the criteria on which this limitation is based.
response	*Partially accepted.*
	The proposed provisions maintain mixed navigation environments (PBN and non-PBN operations) based on local or national performance considerations. The revised proposal incorporates the necessity for publishing operational limitations in the AIP, so that Member States' authorities can decide on them.

comment	*182* comment by: *EUROCONTROL* **Page 26 - AUR.PBN.3005 Mixed operations - (1)** EUROCONTROL makes a comment followed by a clarification that gives rise to a suggestion which could materialize within the framework of the future EASA Opinion:

The requirement to ensure non-PBN procedures are available for non-equipped aircraft removes the incentive for operators to equip. Experience has shown that PBN benefits cannot be realised in a mixed mode environment.

However, it will be up to the ATSP/aerodrome operator to define which proportion of non-PBN equipped traffic it can handle and when it can handle it, so that the PBN benefits can be realised. This may be clarified in the Explanatory Note that will be included in the future EASA opinion.

EUROCONTROL makes an observation from the military perspective and asks two questions:

It should be noted that a separate discussion took place within the Military ATM Board for the specific case of military State aircraft. The subsequent civil-military comments included in EUROCONTROL's comments on NPA 2015-01 are also based on the outcome of this discussion.

Does it mean that the conventional procedures that have been withdrawn will need to be re-introduced?

Does (1)(b) mean that States are to put in place procedures to allow RNAV 1 or other less capable PBN aircraft to operate on the RNP1 SIDs/STARs?

response

Partially accepted.

The proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request:

- operational procedures or

- approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on existent PBN or non-PBN applications

The revised proposal incorporates the necessity for publishing operational limitations in the AIP. Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels together with local operational procedures and limitations should contribute to avoid any adverse impact on military operations and concerns.

The intent of the proposed rule is not to re-introduced conventional navigation already decommissioned, but to keep availability of alternative procedures, so that other aircraft can continue to operate.

comment

204 comment by: *French State Aviation Safety Authority (DSAÉ)*

· Military air operations and training entail the need for unrestricted access to airspace and aerodromes, including where PBN requirements will apply. Those military operations and training will be conducted by non PBN-equipped State aircraft and shall be facilitated, within safety limits, irrespective of its GAT (or OAT) status and mixed mode environment.
· In respect to the absence of exemptions/transition arrangements: SUBPART PBN,

Section II, **AUR.PBN.3005 Mixed operations should ensure that conventional routes and required operational procedures provide the most direct routings without limitations and restrictions for PBN non equipped state aircraft in opérations.**
the requirements outlined in the NPA regarding maintenace of conventional navigation aids should be reflect in the final opinion.
Use of RNAV 5 (B-RNAV) standard for alternative routes, instead of routes based on conventional navaids could also be a solution.

response

Partially accepted.

The proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request:

- operational procedures or

- approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on existent PBN or non-PBN applications

The revised proposal incorporates the necessity for publishing operational limitations in the AIP. Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels together with local operational procedures should contribute to set out these limitations and, consequently, avoid any adverse impact on military/civil aircraft operations.

comment

290 comment by: *AvinorANSP*

AUR.PBN. 3005 Mixed operations
(1) ATSPs and aerodrome operators shall ensure that:
(a) approach procedures, Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes based on non-PBN applications are available; or

Comment:
In this context ATS routes is understood as ATS route (en-route). As B-RNAV (RNAV 5) certification is mandatory for all IFR flights on ATS-routes (en-route) in ECAC states, there should be no requirement for published non-PBN ATS routes (en-route).

Propose new text:
(1) ATSPs and aerodrome operators shall ensure that:

(a) instrument approach procedures, Standard Instrument Departures (SID) and Standard Arrival Routes or (STAR) based on non-PBN applications are available; or

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AUR.PBN. 3005 Mixed operations
(1) ATSPs and aerodrome operators shall ensure that:

(b) the required operation procedures are available to permit operation of aircraft that do not conform to the requirements to operate on the Standard Instrument Departures,

Standard Arrival Routes and ATS routes required by AUR.PBN.2005.

Comment:
In this context ATS routes is understood as ATS route (en-route). As B-RNAV (RNAV 5) certification is mandatory for all IFR flights on ATS-routes (en-route) in ECAC states, there should be no requirement for published non-PBN ATS routes (en-route).
Propose new text:

(b) the required operation procedures are available to permit operation of aircraft that do not
conform to the requirements to operate on the Standard Instrument Departures and Standard Arrival Routes required by AUR.PBN.2005.

AUR.PBN. 3005 Mixed operations

(2) The operational use of such approach procedures and routes required by paragraph 1 may be limited, commensurate with the operational performance needs.

Comment:
Propose new text (editorials):
(2) The operational use of non-PBN IAP and SID/STAR may be limited, commensurate with the operational performance needs.

response | *Partially accepted.*

The text has been revised to adopt most of your suggestions.

comment | *312* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

The requirement on the ATSP/aerodrome operator to provide both conventional procedures, APV and SID/STAR RNP 1 will be very costly.

response | *Noted.*

comment | *332* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland*

The aircraft operators for whom it may not be economical to modify aircraft to operate on PBN route, the meaning of "available but may be limited in application, commensurate with the operational performance needs of the aerodrome or airspace" should be defined/clarified.
Furthermore it is not clear who decide on mixed operations.

response | *Not accepted.*

The proposed provisions are in favour of maintaining mixed navigation environments (PBN and non-PBN operations) based on local or national performance considerations. The revised proposal incorporates the necessity for publishing operational limitations in the AIP. The Agency proposes to further develop the AMC/GM material in support of this requirement.

comment | *354* comment by: *AESA / DSANA*

COMMENT	JUSTIFICATION
AESA fully supports this requirement.	It is most important that all airspace users are catered for in a proper manner.

response | *Noted.*

comment | *355* comment by: *AESA / DSANA*

COMMENT	JUSTIFICATION
Irrespective of the full support expressed **[#354]**, care must be taken to ensure that requirement **AUR.PBN.3005 (2)** does not result in detrimental limitations to non-PBN airspace users.	Again, it is most important that all airspace users are catered for in a proper manner.

response | *Noted.*

The proposed provisions are in favour of maintaining mixed navigation environments (PBN and non-PBN operations) based on local or national performance considerations. The revised proposal incorporates the necessity for publishing operational limitations in the AIP.

comment *371* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 AUR.PBN.3005 '*Mixed operations*'	In **AUR.PBN.3005 (2)**, where it says "*(…) approach procedures and routes required by paragraph 1 may be limited, (…)*" it should say "*(…) approach procedures and routes required by paragraph **(1)** may be limited, (…)*" instead.	Typographical error

response *Accepted.*

The text has been revised and corrections made.

comment *402* comment by: *Garmin International*

AUR.PBN.3005
Page 26

As noted in Garmin comments on AUR.PBN.2015(3) and AUR.PBN.2015(4), the intent of AUR.PBN.3005 may be to accommodate aircraft that cannot fully comply with all of the aircraft and performance requirements expected by AUR.PBN.2015(3) and AUR.PBN.2015(4). However, this intent is not clearly stated and may unnecessarily limit the utility of such routes when they could be otherwise published without the characteristics that cannot be readily accommodated by GA/BA aircraft.

It is strongly recommended that AUR.PBN.3005 should be revised to make clear what ATSPs and aerodrome operators must do to ensure that aircraft that may not fully comply with the aircraft and performance requirements expected by AUR.PBN.2015(3) and AUR.PBN.2015(4) are able to continue to operate.

response *Noted.*

The proposed provisions require mixed PBN and non-PBN operations based on local or national performance considerations. The Agency informs you that the text has been revised to improve clarity.

comment	*406* comment by: *LFV* **TERMINAL** - AUR.PBN.3005 and AMC1 AUR.PBN.3005: Mixed mode operations - The requirement to implement new types of procedures and at the same time find solutions how to serve operators not yet capable of the new procedures is not new but something ANSPs have always coordinated. The difficulty with the regulation described in the NPA is that the responsible entity doesn't have the opportunity to make this decision on actual facts such as amount of capable operators, relevant local objectives etc. This could lead to very odd restrictions and punishing of operators; operators that are important customers for the airports. For example: Many airports in Sweden have RNAV SID/STARs (P-RNAV) implemented. If "any change" is required, according to the NPA proposal these routes must be **replaced** with RNP 1 routes. The NPA proposal also states that "non-PBN" routes should be kept to serve the operators without PBN capability. At these airports the conventional SID/STAR have been decommissioned. That is the general solution at Swedish airports because of the great amount of traffic which is P-RNAV capable, leaving only a small number of operators needing vectors. The result will be this – the operators without PBN capability will not be affected at all because they were not capable of using the RNAV routes before and are still being vectored. But now we also will have all the operators that could use the P-RNAV SID/STARs to vector because most of them will not be RNP 1 capable. Or will there be a requirement for these airports to reimplement conventional routes? This could rarely be a step forward towards a PBN-environment as PBN is the enabler for SESAR to provide capacity, efficiency, access etc. Again, with no mandate for the operators, the NPA proposal will not be beneficial for SESAR deployment and cannot be defined as a "Total System Approach". In addition there's no tool available today to make it possible for all ATCO to separate acft with different capability for different clearances. The FPL system of today does not support filing the capability of RF, FRT or Adv-RNP and is therefore not available information for ATCO. For ATCO to find and keep track of capability of acft would increase ATCO workload and decrease capacity. **LFV proposes -** Implementation of new types of procedures (with new requirements) should be in relation to operator capability and adjusted to operator's needs (a fleet assessment) not to create and increase unnecessary environments/situations of mixed-mode operation.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments and the

proposed navigation specifications.

comment *457* comment by: *DGAC/DTA*

AUR.PBN.3005 Mixed operations
a) or b) requires that aerodrome operators and ATSPs shall either maintain conventional procedures based on NDB or VOR/DME or, ensure radar vectoring to non PBN aircraft. The latter is only practicable in TMA and CTR with radar function.
Consequently, for the aerodromes located in G class airspace (with or without AFIS), it will be mandatory to install or maintain available NAVAIDs, and to design or maintain conventional procedures to comply with this requirement. This is not in line with the objective to progressively rationalise the ground NAVAIDs infrastructure including those to be decommissioned at the end of their lifetime as expected in the ICAO GANP when implementing PBN routes and flight procedures.

Proposal: Add a third bullet

3) "Without prejudice to paragraph 1 and 2, where conventional NAVAIDs and radar vectoring are not available, ATSP or aerodrome operator responsible for the provision of such service may define visual approach procedures to permit the operation of aircraft that do not conform to PBN requirements. "

Visual approach consist on a visual recovery of the aerodrome after an omnidirectional arrival overhead the aerodrome at a safety altitude.

response *Not accepted.*

The proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request:

- operational procedures or

- approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on existent PBN or non-PBN applications

The alternatives proposed above are enough to keep access to the airspace concerned in the event of mixed operations. It is not the intent of the proposed rule to force stakeholders to design conventional navigation solutions in places where those have been already decommissioned.

comment *472* comment by: *EUROPEAN COMMISSION GNSS Programmes*

The drafted NPA establishes an obligation on ANSPs/aerodrome operators to keep approaches procedures, SIDs, STARs and ATS Routes based on non-PBN applications and infrastructure to a *certain level* (the operational use of such approach procedures and routes may be limited, commensurate with the operational performance needs). One of the major

	economic benefits derived from PBN/RNP APCH for ANSPs/aerodrome operators is the replacement of conventional navaids which means that the obligation would have a negative impact on ANSPs and, indirectly, a negative impact also on EGNOS adoption. Moreover, the established obligation is ambiguous because of the uncertainty of the level of non PBN applications to be kept. If this obligation is a permanent obligation to keep conventional infrastructures, this may strongly discourage Airport Operators to see the safety benefits and the need for EGNOS based approach procedures. Additionally, it is to be noted that some ANSPs, also in order to comply with the established ICAO PBN goals, may have already de-commissioned conventional infrastructures and this obligation would definitely put them in a unfavourable position.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments.

comment	*482* comment by: *Belgocontrol* (1) - It is commonly understood that 'conventional' procedures need to co-exist during an agreed transition period. However, the purpose of a 'mandate' consists in obtaining *standardized and homogeneous aircraft and flight operations*, conforming to the requirements from a certain date onwards, in order to achieve the intended benefits, at least for all IFR/GAT flights, in the affected airspace. The current NPA refers to airspace and operations, however, the text does not mandate any aircraft equipage. Experience and history have clearly demonstrated that voluntary equipage is usually limited, unless aircraft operators are 'forced' by any means to act. Therefore, the "mixed operations" article should be expanded by articles explaining how to come to an end of this unfortunate dual situation!
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments. It should be recognised that this regulation is not a mandate in the traditional sense as it only requires PBN routes and procedures to be implemented were a performance improvement can be established.

comment	*483* comment by: *Belgocontrol* (2) The practical meaning of this requirement should be clarified.

response	*Partially accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments. The Agency will further develop the AMC/GM material to support this requirement.

comment	*509* comment by: *Swedavia* Comment: The NPA states that when e.g. a SID needs to be changed, a new RNP 1 SID should be published. A non-PBN SID should be kept, but in many cases it would also need to be redesigned according to the initial need for change. Since many of Swedavia's airports have RNAV SID/STARs implemented, this requirement could lead to that three different SIDs/STARs are needed, non-PBN, RNAV and RNP 1. Since this would be very costly, the aerodrome operators would probably choose only to publish according to the requirements, i.e. conventional and RNP SIDs/STARs. The effect is that also the RNAV 1 capable aircraft would fly conventional routes, which will decrease the navigation accuracy and safety of the system. Since there is no mandate for airspace users to equip their fleet for RNP 1 this is a likely scenario. Swedavia's view is that offering radar vectoring for non-PBN aircraft should be sufficient.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in particular that related to the proposed navigation specifications.

comment	*512* comment by: *CAA-N* P 26 AUR.PBN.3005 Mixed Operations (1) (a) The availability of non-PBN applications should be avoided. Todays requirements for SID/STAR are RNAV1 in Norway. We oppose the RNP1 with RF (FRT), RNAV1 as a minimum would be a better solution. Some non-PBN operations must be permitted within TMA, targetting state Aircraft. But this regulation should be reformulated to avoid a general acceptance of non-PBN Aircraft.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in particular that related to the proposed navigation specifications. Paragraph 2 of the proposal is intended to permit limiting the possible use of the non-PBN applications and hence should therefore avoid a general understanding that non-PBN will also be the standard solution. The Agency will further develop the AMC/GM material to support this requirement.

comment	*521* comment by: *AEA* **AUR.PBN. 3005 Mixed operations** " **(a)** ***Approach procedures, SIDs, STARs and ATS routes based on non-PBN applications are available; or*** ***(b) the required operation procedures are available to permit operation of aircraft that do not conform to the requirements to operate on the Standard Instrument Departures, Standard Arrival Routes and ATS routes required by AUR.PBN.2005" .*** **Comments** AEA and IATA is in favor of the Best Capable Best Served principle and strongly encourages ANPS to apply this principle. The actual aircraft fleet equipage with GNSS is about 80 % and the actual RNP1 equipage is between 40 – 60 % (Ref. a.o. IATA/Eurocontrol survey 2010). EASA is requested to inform Airspace User Associations which analyses have been made to allow safe and efficient PBN operations in a mixed environment. Q. It should be made clear what the percentage of aircraft is that cannot be fitted with PBN capabilities due to economic reasons or aircraft will be ceasing operations soon.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in particular that related to the proposed navigation specifications. As the operational economics for specific aircraft are always changing and are different between operators, providing such meaningful data as request is problematic. It should be emphasised that this regulation only requires PBN to be implemented where a performance benefit can be established and, as such, it is an operator's own economic decision regarding equipage to make use of the benefits or to accept the potential operating limitations.

comment	*534* comment by: *IATA* **Comments** The Airspace User Associations are in favor of the Best Capable Best Served principle and strongly encourages ANPS to apply this principle. The actual aircraft fleet equipage with GNSS is about 80 % and the actual RNP1 equipage is between 40 – 60 % (Ref. a.o. IATA/Eurocontrol survey 2010). EASA is requested to inform Airspace User Associations which analyses have been made to allow safe and efficient PBN operations in a mixed environment. Q.It should be made clear what the percentage of aircraft is that cannot be fitted with PBN capabilities due to economic reasons or aircraft will be ceasing operations soon.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in particular that related to the proposed navigation specifications As the operational economics for specific aircraft are always changing and are different between operators,

	providing such meaningful data as request is problematic. It should be emphasised that this regulation only requires PBN to be implemented where a performance benefit can be established and, as such, it is an operator's own economic decision regarding equipage to make use of the benefits or to accept the potential operating limitations.

comment	*565* comment by: *HungaroControl* AUR.PBN.3005 mixed operations Although Para (2) weakens the mandate to perform mixed operations in every case, we suggest to rather cover such needs through the introduction of NPIPs as suggested above. Where mixed operation is allowed, shall be deemed by the national plans. The information provided with requirement AUR.PBN.3005 then could serve as AMC/GM to that NPIP.
response	*Noted.*
	Since the proposed regulation does not require PBN operations to be implemented at all locations, but only where a performance benefit is established, the Agency does not foresee the need to require the creation of National PBN Implementation Plans.

comment	*566* comment by: *HungaroControl* AUR.PBN.3005 (1) - It is commonly understood that 'conventional' procedures need to co-exist during an agreed transition period. However, the purpose of a 'mandate' consists in obtaining standardized and homogeneous aircraft and flight operations, conforming to the requirements from a certain date onwards, in order to achieve the intended benefits, at least for all IFR/GAT flights, in the affected airspace. - The current NPA refers to airspace and operations, however, the text does not mandate any aircraft equipage. Experience and history have clearly demonstrated that voluntary equipage is usually limited, unless aircraft operators are 'forced' by any means to act. Therefore, the "mixed operations" article should be expanded by articles explaining how to come to an end of this unfortunate dual situation! AUR.PBN.3005 (2) The practical meaning of this requirement should be clarified.
response	*Not accepted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments. It should be recognised that this regulation is not a mandate in the traditional sense as it only requires PBN routes and procedures to be implements were a performance improvement can be established.

comment	*606* comment by: *Baranes* This paragraph demonstrates the need for an on-board mandate. Safety is a key concern for DSNA: APV procedures improve the safety by providing a simpler path in space and vertical guidance. By allowing aircraft to remain non-equipped with no deadline, these aircraft will not benefit from this safety improvement. Moreover, on many runway ends, the conventional approach will be ADF based, with the attached weaknesses of these approaches. This strategy of allowing non-PBN and PBN aircraft with limited constraint on non-PBN ones will prevent to obtain the benefits in term of safety, capacity, and environment improvement that PBN is intended to bring. Finally, this text will prevent from conventional Navaids rationalization.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments.

comment	*627* comment by: *GSA* **Mixed operations and need to keep conventional navaids** The drafted NPA establishes an obligation on ANSPs/aerodrome operators to keep approaches procedures, SIDs, STARs and ATS Routes based on non-PBN applications and infrastructure to a certain level (the operational use of such approach procedures and routes may be limited, commensurate with the operational performance needs). One of the major economic benefits derived from PBN/RNP APCH for ANSPs/aerodrome operators is the replacement of conventional navaids. The established obligation is ambiguous because of the uncertainty of the level of non PBN applications to be kept. If this obligation is a permanent obligation to keep the conventional infrastructure and procedures, this may discourage Airport Operators to see the benefits and the need for EGNOS based approach procedures, so it has a negative impact to the implementation of EGNOS based approach procedures.
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments. The Agency will further develop the AMC/GM material to support this requirement.

comment	*643* comment by: *CAA-NL* AUR.PBN.3005 states as follows: (1) ATSPs and aerodrome operators shall ensure that: (a) approach procedures, Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes based on non-PBN applications are available; or

(b) the required operation procedures are available to permit operation of aircraft that do not conform to the requirements to operate on the Standard Instrument Departures, Standard Arrival Routes and ATS routes required by AUR.PBN.2005.
(2) The operational use of such approach procedures and routes required by paragraph 1 may be limited, commensurate with the operational performance needs.

The appropriate arrangements to accommodate non-PBN (State) aircraft operating as GAT in final approach, terminal and en-route where PBN structures and procedures have been introduced, should be explicitly clear in the regulatory text of the Regulation. It should be safeguarded that all airspace and aerodromes remains accessible for non equipped aircraft. Military air operations and training entail the need for unrestricted access to airspace and aerodromes, including where PBN requirements will apply. Those military operations and training will be conducted by non PBN-equipped State aircraft and shall be facilitated, within safety limits, irrespective of its GAT or OAT status and mixed mode environment. This provision on mixed operation must provide the assurance that ATSPs and aerodrome operators will not limit operations on the basis of non-safety related "operational performance needs" for non equipped aircraft.

The Netherlands understands from this Article that for approach procedures, Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes based on non-PBN applications stay available in general. However aerodromes with multiple runways may choose to do not keep these routes available for <u>all</u> runways, as long as one is available at all times (e.g. depending on wind directions).

Can EASA confirm this interpretation?

response *Partially accepted.*

The Agency confirms your interpretation regarding aerodromes with multiple runways. The proposed regulation explicitly excludes military operations and training. Coordination between civil and military authorities performed at strategic, pre-tactical and tactical levels should contribute to set out limitations for non-PBN state aircraft operations and to ensure its planning and compliance.

comment *664* comment by: *DFS Deutsche Flugsicherung GmbH*

DFS requests EASA to revise this requirement. Detailed specifications concerning en-route, approach and SIDs/STARs must be made. The requirement must be formulated in such a way that non-discriminatory access is ensured.

The requirement *"to meet the airspace performance needs*" is not specific enough. The current formulation of this requirement is not suited to adequately support the introduction of PBN.

In our opinion, the existing formulation would force DFS to keep practically all of the existing ground-based navigation infrastructure, to maintain it and to renew it, if required. This is not in keeping with the idea of introducing PBN.

response | *Noted.*

Please refer to the Response to the major concerns identified section of the Opinion in relation to mixed navigation environments. The Agency will further develop the AMC/GM material to support this requirement.

comment | *700* comment by: *UK CAA*

Page No: 26

Paragraph No: AUR.PBN.3005(1)

Comment: It is the view and experience of the UK CAA that that mixed operations (PBN and non-PBN) compromise both efficiency and safety of airspace, especially in more dense traffic environments.

The UK CAA recommends that AUR.PBN.3005 be deleted and the decision as to what level of mixed operation can be tolerated be left to the airspace controlling authority and their supporting airspace designers to decide, based on the fleet mix.

Justification: The requirement to continue to support conventional procedures supporting airports will impact plans for rationalisation of conventional navaids and require additional investment for new facilities. This does not seem to have been factored in the Regulatory Impact Assessment (RIA).

The need for mixed operations is something best decided by the airport and ANSP and not something that requires a "shall" statement in an EASA regulation. The experience at Schiphol, London and Paris is that mandates for airspace usage are sometimes necessary, albeit on a (potentially) limited basis, for exempted operations e.g., State aircraft.

response | *Partially accepted.*

The proposed provisions maintain mixed navigation environments (PBN and non-PBN operations) based on local or national performance considerations. The revised proposal incorporates the necessity for publishing operational limitations in the AIP.

comment | *713* comment by: *UK CAA*

Page No: 26

Paragraph No: AUR.PBN.3005(1)

Comment: It is unclear whether an airport that has implemented an APV procedure has to also provide a conventional (non-PBN) back-up. This may be uneconomical for a small airport with limited IFR movements having likely made the investment decision to switch

	away from VOR and NDB procedures to those based on GNSS. UK CAA requires clarification on whether or not both types of approach procedure (PBN and non-PBN) need to be provided and maintained. **Justification:** There is a potentially large financial impact if airports are expected to operate both PBN and non-PBN based approaches at the same time.
response	*Noted.*
	The proposed provisions require mixed PBN and non-PBN operations based on local or national performance considerations. The text has been revised to improve clarity.

comment	*714* comment by: *UK CAA* **Page No:** 26 **Paragraph No:** AUR.PBN.3005(2) **Comment:** The regulation states that such approach procedures and routes may be limited. We understood from the workshop held on 09 March 2015 in Brussels that this limitation may be time based and could be permanent if so justified. The UK CAA believes that at the majority of airports, such time limited operations would be impracticable. The UK CAA requests clarification on the 'limited' use of such procedures and how this would be applied. **Justification:** Having noted from the workshop outcome that duality of procedures may be time limited or even permanent; the UK CAA view is that any duality is both impractical and costly.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to mixed navigation environments. The Agency will further develop the AMC/GM material to support this requirement.

comment	*723* comment by: *Julian Scarfe, PPL/IR Europe* AUR.PBN.3005 Mixed operations is most welcome. We would emphasise however that use of a more broadly available set of airborne capabilities will reduce the need for mixed operations.
response	*Partially accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in

relation to aircraft equipage and mixed navigation environments.

AUR.PBN. 3010 Coordinated deployment p. 26

comment *27* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AUR.PBN. 3010 Coordinated deployment
(2) ATSPs and aerodrome operators shall notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes [...]

COMMENT:
The role of the Network Manager should be clarified. According to 2.1 and 4.1.3, coordination with the Network Manager is only directly affected by PBN ATS routes implementation. New suggested text:

(2) ATSPs and aerodrome operators shall notify airspace users and the Network Manager of their intent to implement PBN ATS routes [...]

response *Not accepted.*

The coordinated deployment of the European ATS route network is already regulated by the Regulation (EU) No 677/2011, where it is established that the Network Manager shall perform the design of the European Route Network (ERN) in order develop an integrated ERN Design. For that purpose, the NM is required to put in place an ERN Improvement Plan. The competent authority will remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility.

In addition, notification of new SIDs/STARs is key for airspace users in order to equip their fleets and also to ensure coordination with the NM. SIDs/STARs constitute the links with the ERN and, therefore, must be taken into account by the NM regarding traffic flows and PBN requirements.

comment *81* comment by: *CANSO*

The role of the Network Manager (NM) is not clear in determining where there has to be implementation coordination, in accordance with the European Route Network Improvement Plan (ERNIP), or if it will be left to the State/ANSP if they choose. Where the NM 'harmonises implementations', this suggests that the function would take a greater leadership role than anticipated. We also see a responsibility by the Member State for the overall PBN implementation. Therefore we proposed the creation of a "National PBN implementation Plan".

	CANSO considers that the obligation of the communication to the Network Manager with an advance notice of 36 months before implementation is risky and too binding, especially if referred to individual local implementations. The Network Manager and the Deployment Manager will need to coordinate in advance their roles and derived actions in order to avoid duplication or incompatibilities. As a result of all these issues, we believe that the PBN.3010 should be significantly revised.
response	*Partially accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date. The Agency does not see the need to require states to create national PBN implementation plans because PBN operations are not required at all locations; it is to be implemented only where a performance benefit is established.

comment	*90* comment by: *CANSO* AUR.PBN.3010 The duration of 36 months for coordinated deployment is too long based on our experience and should be reduced to 24 months.
response	*Accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date.

comment	*100* comment by: *CANSO* AUR.PBN.3010 (2) Does the notification period of 36 months relates to a intended local “policy change” or does it relate to each and every procedure which is going to be changed/implemented? One should question the need for any early notification, knowing that conventional procedures need to remain in place in order to serve the non-compliant airspace users…
response	*Partially accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date. This requirement intends to ensure proper coordination with the NM and to enable

operators to prepare for the new operations that are of benefit to them.

comment

123 comment by: *Finavia*

AUR.PBN.3010 (2) shall be modified to make reference to significant airspace re-designs instead of individual procedure implementations. Also in this case, shorter time (maximum of 12 months) for the advance notice must be allowed. If agreed with the airspace users and other stakeholders concerned, it is not of anyone's interest to delay the progress.
It is agreed that significant changes like re-design of high density airspaces and, for example, discontinuation of services based on non-PBN applications must be announced sufficiently in advance. Should it be the objective of this requirement, it is now just making reference to the implementation of individual procedures. The requirement in the form written now would actually prevent the publication of any new SID, STAR or ATS route based on PBN without the 36 months prior notice. It would dramatically slow down or even prevent the possibilities to react in any kind of needs for new procedures.

response

Noted.

The text has been revised to require notification sufficient months in advance of the planned implementation date.

comment

158 comment by: *skyguide Corporate Regulation Management*

AUR.PBN. 3010 Coordinated deployment

2) ATSPs and aerodrome operators shall notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4), 36 months prior to the implementation date.

Comment:

- If this regulation enters into force in December 2018, then this would mean this needs to be done now – completely unfeasible when the regulation is still in draft form.
- What is the purpose of this requirement if the conventional approaches must also be kept.

response

Accepted.

The text has been revised to require notification sufficient months in advance of the planned implementation date.

This requirement intends to ensure proper coordination with the NM and to enable operators to prepare for the new operations that are of benefit to them.

comment	*183* comment by: *EUROCONTROL*
	Page 26 - AUR.PBN.3010 Coordinated deployment - (1) EUROCONTROL makes a comment: Taking into account the current regulatory environment and PCP AF1 in particular, it should be the responsibility of the Deployment Manager (and not of the Member States) to coordinate the deployments (approaches, SIDs/STARs, ATS Routes). **Page 26 - AUR.PBN.3010 Coordinated deployment - (2)** EUROCONTROL raises an issue through a series of questions and makes a porposal: Why should ATSPs and aerodrome operators notify airspace users and the Network Manager of their intent to implement new RNP1 routes only 36 months prior to the implementation date? Would national plans not be published already and the PBN plan updated beforehand? As most of AOs are not going to equip just following the mere publication of this rule, a 36 month notice before an implementation seems very short. Will this give them enough time to retrofit - should they desire? EUROCONTROL therefore understands that the 36 month notice is for NM airspace design coordination reasons only. In this case the 36 month notice is quite adequate. However, to ensure AO's have time to retrofit, ANSPs/States should have to issue their generic intentions well in advance, i.e. 7 years before, through an AIC. EUROCONTROL raises an issue and asks for a clarification: The applicability date of the regulation should be clarified: is it applicable to any airspace design change announcement (i.e. 36 months before deployment) or is it related to the deployment date? In the second case it may invalidate airspace design changes that are already planned or which maybe planned in the near future before this rule is officially published. EUROCONTROL proposes also one additional bullet to AUR.PBN.3010: "(3) The Network Manager and the Member States shall ensure civil-military cooperation as referred to in Article 11 of Regulation (EU) No 677/2011. It shall be noted that airspace design and management remain a full national prerogative of the member States".
response	*Not accepted.*
	Commission Implementing Regulation (EU) No 409/2013 lays down the requirements related to the content of common projects. This common projects are to be implemented on the basis of a deployment programme through implementation projects coordinated by the deployment manager. However, a common project aims to deploy ATM functionalities that

contribute to the achievement of the essential operational changes identified in the European ATM Master Plan. Only ATM functionalities requiring synchronised deployment and contributing significantly to Union-wide performance targets are to be included in a common project. Therefore, the requirements proposed by this regulatory initiative are not subject to a common project.

This requirement intends to ensure proper coordination with the NM. The Agency does not see the need to require states to create specific PBN implementation plans, because PBN operations are not required at all locations, it is to be implemented only where a performance benefit is established.

The text has been revised to require notification sufficient months in advance of the planned implementation date.

The reference to civil-military coordination is already regulated by Regulation (EU) No 677/2011 and Regulation (EC) No 2150/2005 and, therefore, there is no need to include the proposed requirement.

comment

196 comment by: *ENAV*

- AUR.PBN.3010: The obligation of the communication to the Network Manager with an advance notice of 36 months before implementation is risky and too binding, especially if referred to individual local implementations;

response

Partially accepted.

The text has been revised to require notification sufficient months in advance of the planned implementation date.

comment

232 comment by: *ESSP-SAS*

- For ATSPs actually deploying SIDs/STARs/ATS Routes according to proposed regulation, but before december 2018, the notification with 36 months in advance may not be possible (will existing plans for PBN implementation have to be put on hold when the regulation enters into force to guarantee this notice period?). Some exemptions should therefore be included in this section.
- Implementation of a "coordinated and phased implementation" by States, without express guidance or prescribed tools, leaves states at a loss for complying with this article.
- A notice period of 36 months prior to implementation of PBN SIDs, STARs and ATS routes may be too long to further accomodate modifications to ongoing plans.
- Why should this change be notified in the first place when AUR.PBN.3005 requires to maintain non-PBN procedures anyway (i.e. airspace users do not necessarily need to certify against PBN).

response | *Partially accepted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date.

This requirement intends to ensure proper coordination with the NM and to enable operators to prepare for the new operations that are of benefit to them.

comment | *291* comment by: *AvinorANSP*

AUR.PBN.3010 Coordinated Deployment

(2) ATSPs and aerodrome operators shall notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes (en-route) as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4), 36 months prior to the
implementation date.

Comment:

As this is written now it will be required to notify airspace users and Network Manager 36 months in advance of ***any*** changes of ATS-routes (en-route) and/or SID/STAR. If a ATSP or aerodrome operator already have implemented ATS-routes (en-route) or SID/STAR based on PBN and they want to amend or add new routes they should not be required to notify users and Network Manager 36 months in advance. As long as the navigation specification remains the same the requirement of 36 months notice should not apply. This only relates to when PBN implementation exclude airspace users from operating, based on their lack of equipment and/or certifications that support PBN applications. E.g change from RNAV 1 and/or convetional SID/STAR to RNP 1 SID/STAR.

response | *Partially accepted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date.

It should be recognised that the requirement to notify is only applicable when implementing the procedures and routes required by AUR.PBN.2005. If these procedures and routes have been already implemented to comply with AUR.PBN.2005 requirements, this coordination requirement is not applicable.

comment | *314* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

Why has the figure 36 months been chosen for the action to notify the NM and airspace users? If you e.g. need to implement new STARs at the beginning of 2019 you have to notify this next year, but the regulation becomes applicable 6 December 2018.

response | *Accepted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date. This requirement intends to ensure proper coordination with the NM and to enable operators to prepare for the new operations that are of benefit to them.

comment | *356* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
In **AUR.PBN.3010 (1)**, an explicit link with **regulation (EU) No 716/2014** (PCP IR) should be established thus: "*Member States, in coordination with the ATSPs and aerodrome operators shall ensure a coordinated and phased implementation of the instrument approach procedures required by AUR.PBN.2005(1)* ***in conformance with regulation (EU) No 716/2014***".	For the avoidance of inconsistencies between regulations and in order to avoid future issues with the implementation of the regulations.

response | *Not accepted.*

The specific requirements and deadlines stipulated in the PCP Implementing Rule for specific high density TMAs have been duly taken into account and do not come into conflict with this new proposal, so the Agency has not identified the need for any specific reference to the PCP IR.

comment | *395* comment by: *NATS National Air Traffic Services Limited*

SUBPART PBN, AUR.PBN.3010(2)

The NPA requires ATSPs and aerodrome operators to notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4), 36 months prior to the implementation date.

The NPA requirement of 3 years notification for PBN implementations may be too long for those changes taking place very soon after Dec 2018.
For some small changes to SIDs/STRs/ATS routes that can be undertaken quickly if the local

capability exists, 3 years is too long and would unnecessarily delay implementations.
The notice period should not be binding in all cases and is more appropriate for AMC

Suggested resolution:

IR to moved to AMC and text amended:

SUBPART PBN AMC1 AUR.PBN.3010
ATSPs and aerodrome operators should endeavour to notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4), 36 months prior to the implementation date, or if this is not feasible, with as much notice as possible.

response *Partially accepted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date.

It should also be recognised that the requirement to notify is only applicable when implementing the procedures and routes required by AUR.PBN.2005. If these procedures and routes have been already implemented to comply with the AUR.PBN.2005 requirements, this coordination requirement is not applicable.

comment *410* comment by: *LFV*

APPROACH - AUR.PBN.3010(1):

”Member states, in coordination with the ATSPs and aerodrome operators shall ensure coordinated and phased implementation of the instrument approach procedures required by AUR.PBN.2005(1).” –

LFV finds that there is a conflict between the EU deregulation for competition in the areas of air traffic control services, procedure design, flight validation, infrastructure provision etc. and the requirement to coordinate implementation. The many different entities involved makes it very challenging to coordinate these actions and also contradictory to the competition situation.

LFV proposes - The PBN IR needs to reflect reality in order to be applicable and serve its purpose.

response *Not accepted.*

Many entities are involved in the implementation of PBN procedures and routes; however, the Agency is of the opinion that this regulation is correct in its attribution of responsibility to ensure implementation.

comment	*413* comment by: *LFV* **Coordination** - AUR.PBN.3010(2): "… notify airspace users and the NM of their intent … …, 36 months prior to the implementation date." – This part of the proposed PBN IR doesn't correlate to the relation between the different required dates for implementation and the time table for the publication of the PBN IR, from when the regulation is supposed to be valid. **LFV proposes** - The regulation needs to be adjusted to be reasonably applicable.
response	*Accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date.

comment	*463* comment by: *DGAC/DTA* **AUR.PBN.3010 Paragraph (2)** France proposes to reduce the period notification to the Network Manager from 36 months to 12 months. "ATSPs and aerodrome operators shall notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4), ~~36~~ 12 months prior to the implementation date."
response	*Partially accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date.

comment	*471* comment by: *EUROPEAN COMMISSION GNSS Programmes* The drafted NPA establishes a notification obligation for aerodrome operators concerning their intent to implement PBN based procedures (PBN SID-STAR and ATS routes). The aerodromes operators will have to notify 36 months prior to the implementation date the airspace users and the Network Managers. While the objective of a coordinated deployment is well understood, a timespan of 36 months in advance seems excessive. In certain cases, the necessity of this requirement is unclear since the Network Manager, through the EUROCONTROL PBN Approach Map Tool, is already aware of planned PBN implementations. Moreover it is not clear if this requirement will apply only to those TMAs fully conventional

	with no PBN procedures published at the moment or it is applicable to any new PBN procedure.
response	*Partially accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date. The requirement to notify is only applicable when implementing the procedures and routes required by AUR.PBN.2005. If these procedures and routes have been already implemented to comply with the AUR.PBN.2005 requirements, this coordination requirement is not applicable.

comment	*484* comment by: *Belgocontrol* (1) - What is to be understood by “coordinated and phased implementation”? - Who has to coordinate with whom, and for what purpose? Is it locally, nationally or internationally?
response	*Noted.*
	AMC/GM need to be further developed in order to clarify these aspects. Coordination should take place at local level and involve the aerodrome operator together with the ANSPs and their affected services (CNS/ATS). The competent authority should ensure the effectiveness of the process and its implementation in accordance with the proposed rules.

comment	*486* comment by: *Belgocontrol* (2) Does the notification period of 36 months relates to a intended local “policy change” or does it relate to each and every procedure which is going to be changed/implemented? *One should question the need for any early notification, knowing that conventional procedures need to remain in place in order to serve the non-compliant airspace users…*
response	*Noted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date. The requirement to notify is only applicable when implementing the procedures and routes required by AUR.PBN.2005.

comment	*508* comment by: *Swedavia* Comment: If an ATSPs is to implement PBN SID/STARS with RNP 1 after December 2018 and the decision about the changes will be published Q4 2015, it would be difficult to find time to fulfil the notification requirements of AUR.PBN. 3010 (2) for any changes decided after that date.
response	*Accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date.

comment	*513* comment by: *CAA-N* P 26 AUR.PBN.3010 Coordinated deployment (2) The requirement of three years for ATSPs and Aerodrome operators to notify Airspace users and Network Manager will be very demanding. This could cause unnecessary delay in required changes. All Airspace project (and changes) will be subject of involment and safety assessments according to the rules of 1034/2011. Procedure-vice involment of airspace users follows the requirements of Doc 9906 Vol 1 Quality assurance manual for Flight procedure design. The time frame required for Network manager must be reviewed and agreed upon in a more dynamic document than an EU regulation. However for larger Airspace projects and/or a change of the Nav application requirements, a three year period from project initiation until AIRAC date could be more of a normal timescale.
response	*Accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date.

comment	*520* comment by: *AEA* **AUR.PBN. 3010 Coordinated deployment** *AUs shall be notified when RNP1 routes will be implemented 36 months prior to the implementation date.* **Comments:** The 3 years notice time for AUs should be further explained. Airlines expect a complete RNP1 environment in TMA is available after the 3 year notification time. Airlines wishing to equip aircraft with required PBN capability require EASA to have CS ACNS

airworthiness material for PBN available well before the PBN implementation date.

Airlines wishing to invest in / equip with required PBN capabilities also want to be ensured that RNP1 infrastructure is made available and validated prior to the PBN implementation date. Validation shall be done by aircraft that are fitted already with PBN capabilities.

Q. Could the meaning of the 3 years notice time for AUs be explained?
Q. What kind of approval is necessary and when is the EASA CS ACNS approval material available for RNP1, RF leg etc?
Q. A one stop approval shop was promised. Is this available and please explain what it contains?
Q. Does it mean that ATC will have a complete RNP1 TMA design available and ready for use after 3 years notification?

response *Noted.*

The Agency foresees the notification period being to ensure proper coordination with the NM and to enable operators to prepare for the new operations that are of benefit to them. It is the intent that ANSPs work towards establishing the new procedure and Routes within the notification period given.
With respect to the availability of the relevant certification required, the Agency foresees the NPA for CS-ACNS to be published prior to Summer 2016. When referring to a one stop shop approval, the Agency assumes that the comment refers to the obtaining operational approval for PBN operations. This has already been achieved via Opinion 03/2015.

comment *535* comment by: *IATA*

Comments:
The 3 years notice time for AUs should be further explained. Airlines expect a complete RNP1 environment in TMA is available after the 3 year notification time.
Airlines wishing to equip aircraft with required PBN capability require EASA to have CS ACNS airworthiness material for PBN available well before the PBN implementation date.

Airlines wishing to invest in / equip with required PBN capabilities also want to be ensured that RNP1 infrastructure is made available and validated prior to the PBN implementation date. Validation shall be done by aircraft that are fitted already with PBN capabilities.

Q. Could the meaning of the 3 years notice time for AUs be explained?
Q. What kind of approval is necessary and when is the EASA CS ACNS approval material available for RNP1, RF leg etc?
Q. An one stop approval shop was promised. Is this available and please explain what it contains?
Q. Does it mean that ATC will have a complete RNP1 TMA design available and ready for use after the same 3 years?

response *Noted.*

The Agency foresees the notification period being to ensure proper coordination with the

NM and to enable operators to prepare for the new operations that are of benefit to them. It is the intent that ANSPs work towards establishing the new procedure and Routes within the notification period given.
With respect to the availability of the relevant certification required, the Agency foresees the NPA for CS-ACNS to be published prior to Summer 2016. When referring to a one stop shop approval, the Agency assume that the comment refers to the obtaining operational approval for PBN operations. This has already been achieved via Opinion 03/2015.

comment

567 comment by: *HungaroControl*

The role of the Network Manager (NM) is not clear in determining where there has to be implementation coordination, in accordance with the European Route Network Improvement Plan (ERNIP), or if it will be left to the State/ANSP if they choose. Where the NM 'harmonises implementations', this suggests that the function would take a greater leadership role than anticipated. We also see a responsibility by the Member State for the overall PBN implementation. Therefore we proposed the creation of a "National PBN implementation Plan".

CANSO considers that the obligation of the communication to the Network Manager with an advance notice of 36 months before implementation is risky and too binding, especially if referred to individual local implementations.

The Network Manager and the Deployment Manager will need to coordinate in advance their roles and derived actions in order to avoid duplication or incompatibilities.

As a result of all these issues, we believe that the PBN.3010 should be significantly revised.

response

Partially accepted.

The text has been revised to require notification sufficient months in advance of the planned implementation date.

The Agency does not see the need to require States to create national PBN implementation plans as PBN operations are not required at all locations; it is to be implemented only where a performance benefit is established.

comment

568 comment by: *HungaroControl*

AUR.PBN.3010
The duration of 36 months for coordinated deployment is too long based on our experience and should be reduced to 24 months.

response

Partially accepted.

The text has been revised to require notification sufficient months in advance of the planned

	implementation date.

comment	*569* comment by: *HungaroControl* AUR.PBN.3010 (2) Does the notification period of 36 months relates to a intended local "policy change" or does it relate to each and every procedure which is going to be changed/implemented? One should question the need for any early notification, knowing that conventional procedures need to remain in place in order to serve the non-compliant airspace users…
response	*Partially accepted.*
	The text has been revised to require notification sufficient months in advance of the planned implementation date. This requirement intends to ensure proper coordination with the NM and to enable operators to prepare for the new operations that are of benefit to them.

comment	*586* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* **COMMENT:** Notification from the ATSPs and aerodrome operators to the airspace users and the Network Manager of the intent to implement PBN SID, STAR and ATS routes as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4) must be 60 months prior to the implementation date. **REASON(S) FOR COMMENT:** Embraer believes that 36 moths is a too short time for some airspace users to upgrade their aircraft. Some aircraft types will certainly need their respective OEMs to certify a solution that meets the corresponding required navigation specification, thus creating a new development that, depending on the aircraft architecture, can be pretty substantial (for instance, there can be some changes that may require a new avionics vendor and equipment). One clear example of such issues that one can run into is in regards to Fixed Radius Transitions (FRT): the majority of the products currently fielded do not support this functionality. Besides, if one also accounts other time allotments, such as negotiation time and service bulletin/STC deployment in the field, one will easily perceive that a 3-year notice may not be enough to cover fairly all airspace users. **PROPOSED CHANGE:** The text passage: ***"AUR.PBN. 3010 Coordinated deployment*** *(…)* *(2) ATSPs and aerodrome operators shall notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4), 36 months*

prior to the implementation date."

should be changed to:

"AUR.PBN. 3010 Coordinated deployment
(…)
*(2) ATSPs and aerodrome operators shall notify airspace users and the Network Manager of their intent to implement PBN Standard Instrument Departures (SID), Standard Arrival Routes (STAR) and ATS routes as specified in AUR.PBN.2005(3) and AUR.PBN.2005(4), ~~36~~**60** months prior to the implementation date."*

response *Not accepted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date. Please refer to the response to the major concerns identified section of the Opinion in relation to required navigation specifications.

comment *628* comment by: *GSA*

Notification obligation for aerodrome operators

The drafted NPA establishes a notification obligation for aerodrome operators concerning their intent to implement PBN based procedures (PBN SID-STAR and ATS routes). The aerodromes operators will have to notify 36 months prior to the implementation date the airspace users and the Network Managers. While the objective of a coordinated deployment is well understood, a timespan of 36 months in advance seems excessive. In certain cases, the necessity of this requirement is unclear since the Network Manager, through the EUROCONTROL PBN Approach Map Tool, is already aware of planned PBN implementations. Moreover it is not clear if this requirement will apply only to those TMAs fully conventional with no PBN procedures published at the moment or it is applicable to any new PBN procedure.

response *Partially accepted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date.

Additionally, the proposed requirement is applicable to any new or re-designed PBN procedure.

comment *657* comment by: *Virgin Atlantic Airways - Flight Technical Support*

It is not clear what "36 months prior to implementation date" means in this context.

Does this mean that states have to advise Airspace Users by the end of 2017 for implementation end 2020?

Does this refer to invididual procedures at individual airports or for en-route or TMA airspace as a whole?

response *Noted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date.

Additionally, the proposed requirement is applicable to any new or re-designed PBN procedure within TMAs. En-route airspace is now excluded.

comment *663* comment by: *DFS Deutsche Flugsicherung GmbH*

The NM function should not be granted additional competences under PBN. The States and the ATSP will support the NM as consultation body (e.g.: RNDSG) in international coordination processes.

From the present draft Regulation and its explanations, it cannot be seen how the lead time of 36 months was calculated. We think that this is unrealistically long. Based on the processes established and practiced at DFS in airspace and procedures planning as well as in the assessment, validation, regulation and publication of procedures, 20 AIRAC cycles would be sufficient. We propose to set a lead time of 24 months.

response *Partially accepted.*

The coordinated deployment of the European ATS route network is regulated by Regulation (EU) No 677/2011, where it is established that the Network Manager shall perform the design of the ERN in order develop an integrated ERN Design. For that purpose, the NM is required to put in place an ERN Improvement Plan. Member States will remain responsible for the detailed development, approval and establishment of the airspace structures for the airspace under their responsibility.

This requirement intends to ensure proper coordination with the NM.

In addition, the text has been revised to require notification sufficient months in advance of the planned implementation date.

comment *702* comment by: *UK CAA*

Page No: 26

Paragraph No: AUR.PBN.3010

Comment: A coordinated deployment is something that all airports and ANSPs engage upon as a normal course of their business relationship with their customers. The UK CAA does not consider that a regulation is justified or proportionate. UK CAA recommends that

AUR.PBN.3010 be deleted.

Justification: In some cases 36 months is not sufficient notice of change. Consultations over London airspace changes in 2019 are already taking place.

Assuming that the regulation is not published until 2016, there is an inconsistency between the effective date (December 2018) and the requirement for 36 months' notice. The earliest that any procedures could be implemented is therefore 2019.

Proposed Text: Delete AUR.PBN.3010.

response *Accepted.*

The text has been revised to require notification sufficient months in advance of the planned implementation date.

3.1.2. Amendment to Commission Regulation (EU) No 965/2012 p. 27

comment *334* comment by: *DGAC France*

Comment
Requirements concerning equipment (.IDE) are unnecessary as they already lie in PART-AUR regulation.
Requirement related to operations are mentioning operational procedures and training of PART-AUR. Yet PART-AUR does not contain any reference to « procedures » nor « operations » anymore and is equipment oriented.

Justification/proposition
Delete all requirements related to .IDE (see comment 2) concerning article 4 page 22
Insert amended requirement for .OP :
« The operator shall establish operational procedures and training programmes when ACAS is installed and serviceable. » (or for part NCO : « operational procedures and training programmes shall be established when ACAS II is used »)

response *Partially accepted.*

The referred article 4 has been deleted by Commission Regulation (EU) 2016/583 of 15 April 2016. Commission Regulation (EU) No 965/2012 needs to be amended due its reference to Regulation (EU) No 1332/2011 which is proposed to be repealed; the regulatory approach has not changed as a result of this proposal.

comment *357* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION

Proposed amendments Section 3.1.2 CAT.IDE.A.155 '*Airborne collision avoidance system (ACAS)*'	This section should be entitled 'Airborne collision avoidance system (ACAS **II**)'.	This is required for consistency's sake, in order to put this requirement in line with current **regulation (EU) No 1332/2011** and the titles proposed in this NPA for sections **NCO.OP.200** and **SPO.IDE.A.131**.

response *Not accepted.*

The titles of the technical requirements have to remain the same as in Regulation (EC) 965/2012, whose provisions are amended by this proposal.

comment *358* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.2 NCC.IDE.A.140 '*Airborne collision avoidance system (ACAS)*'	This section should be entitled 'Airborne collision avoidance system (ACAS **II**)'.	This is required for consistency's sake, in order to put this requirement in line with current **regulation (EU) No 1332/2011** and the titles proposed in this NPA for sections **NCO.OP.200** and **SPO.IDE.A.131**.

response *Not accepted.*

The titles of the technical requirements have to remain the same as in Regulation (EC) 965/2012, whose provisions are amended by this proposal.

comment	*419* comment by: *Rockwell Collins, Inc.* Page 27 Section 3.Proposed Amendments 3.1.2 ACAS and ACASII Comment: Address edit to "[Insert No of the new Regulation]" in place of No. 1332/2011. Suggested Resolution: Complete intended edit. Comment is Suggestion
response	*Noted.* Commission implementing regulation to amend Commission (EC) No 965/2012 is still unknown. It will be assigned a number once it is been adopted by the Commission.

comment	*738* comment by: *AOPA Sweden*
response	

Draft AMC and GM (Draft EASA Decision) - TABEL OF CONTENTS, SUBPART ACAS p. 28

comment	*159* comment by: *skyguide Corporate Regulation Management* **GM1 AUR.PBN.2010 Surveillance and communications** Noting that the spacing of proximate routes is a function of many factors, studies have shown that with RNP 1 performance the availability of independent or cooperative independent surveillance becomes more critical than with the existing B-RNAV (RNAV 5) implementation. The RNP specification, with the addition of RF and FRT functionality, will permit route spacing between 5–7 NM on straight and turning segments. As such, a loss of surveillance and navigation could result in a catastrophic accident. Comment: The safety elements seem quite light – where is the proposed harmonised solution to avoiding a 'catastrophic accident'?
response	*Noted* The procedure and processes for ensuring the safe design of a procedure are addressed by RMT.0445 (Technical requirements and operational procedures for airspace design, including procedure design (ASD)) and be published as an amendment to the revised common requirements.

comment	*184* comment by: *Universal Avionics Systems Corporation* Pages 28-29 Two terms are undefined within the document. (PSR) Precision Surveillance Radar and (MLAT) Multilateration Radar
response	*Accepted*
	The AMC and GM material will be revised and the definition of these surveillance means will be included.

SUBPART PBN — Performance-Based Navigation p. 29-30

comment	*28* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***GM1 AUR.PBN.2010 Surveillance and communications*** **COMMENT:** General comment – this whole point seems written only for en-route and SID/STAR implementations. We suggest to review it completely so as to take into account the specificities of PBN approach procedures. Several important issues related to this section are commented separately by ENAIRE. In particular, ENAIRE does not agree with the assumption that surveillance and conventional navaid services are present and immediately available for all aircraft losing GNSS guidance when flying PBN approach procedures. Additionally, no guidance to either ATSPs or Air Operators is provided in terms of valid contingency procedures/services. This hinders the homogeneous implementation of PBN as explained in previous comments.
response	*Accepted.*
	Although surveillance and communications considerations were also intended for RNP APCH operations, the AMC/GM proposed in the NPA needed further definition to ensure a harmonised approach. Future action will take place to develop this material, which will take due account of the availability of navigation solutions of aircraft when losing GNSS.

comment	*29* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
GM1 AUR.PBN.2010 Surveillance and communications
PSR/SSR or SSR/ADS-B - GNSS core constellation
Radar vectoring possible if no D/D; ADS-B SUR lost if GNSS lost

COMMENT:
Even in scenarios with optimal PSR/SSR infrastructure, vectoring may not be always possible - especially in approach procedures. Aircraft can lose GNSS when below the minimum vectoring altitude. The local ATC unit can be unable to provide vectoring service, and in any case, the number of simultaneous vectoring instructions is limited. Local terrain could create radar shadow zones. Cones of silence may be placed below the procedures. The last two effects may be enhanced by the unavailabilities of non-essential PSR/SSRs.

All these cases should be taken into account by the text.

Furthermore, it is proposed to replace “D/D” by “DME/DME” for internal consistency.

response *Accepted.*

The AMC/GM proposed in the NPA needed further definition to ensure a harmonised approach; future action will take place to develop this material.

comment *30* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
GM1 AUR.PBN.2010 Surveillance and communications
PSR/SSR or SSR/ADS-B - GNSS core constellation (+DME/DME reversion)
Continued navigation in degraded RNAV mode on ATS Routes with Surveillance Monitoring by ATC for limited time

COMMENT:
The concept and the applicability of “continued navigation” by means of “DME/DME reversion” should be explained and refined.

It could mean, for example, either of the following options:
a) Underlying DME/DME RNAV or RNP procedures designed and promulgated along with each GNSS RNP procedure - which could have negative consequences on the capacity of airborne navigation databases; or
b) A mere contingency use of existing DME signals is meant- then it should be clarified how the DME-guided trajectories would be protected from terrain and obstacles.

The surveillance monitoring by ATC of all aircraft losing GNSS may not always be present as well, due to coverage limitations or ATC personnel cognitive saturation.

response | *Accepted.*

The AMC/GM proposed in the NPA needed further definition to ensure a harmonised approach; future action will take place to develop this material. In this case, DME/DME was considered a possible fall-back infrastructure, which does not mean its present existence or compulsory deployment. It also assumed proper DME/DME coverage.

comment | *31* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
GM1 AUR.PBN.2010 Surveillance and communications
ADS-B -GNSS core constellation
Loss of surveillance & navigation position unacceptable in EUR high density; procedural control might be possible in low density as long as other Navaids, such as VOR, are available to allow aircraft position determination; RNP APCH extraction required.

COMMENT:
The RNP APCH extraction concept:

a) Is already in use to mitigate common GNSS losses in both final and missed approach segments;
b) Is already being applied in scenarios with PSR and SSR, given the limitations for vectoring in approach scenarios.

RNP APCH extraction should be extended to all the cases considered in the table.

response | *Accepted.*

The AMC/GM proposed in the NPA needed further definition to ensure a harmonised approach; future action will take place to develop this material. Extraction (contingency procedures) should be considered by aircraft operators in case of loss of the navigation signal during the approach.

comment | *32* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
GM1 AUR.PBN.2010 Surveillance and communications
ADS-B - GNSS core constellation (+DME/DME reversion)
Loss of surveillance but navigation possible along ATS route though RNP APCH missed approach procedures are required; unacceptable in EUR high density airspace operations but may be acceptable in low density.
COMMENT:

Due to terrain and coverage considerations, it cannot be assumed that RNP APCH procedures

will always have DME/DME coverage available to support alternative conventional missed approaches. The extraction concept should apply here as well unless the role of A-PNT (e.g. based on DME/DME) is included – see ENAIRE general comment in **AUR.PBN.2015 Performance and functionality**.

In addition, promulgating DME/DME missed approaches would require doubling the number of RNP APCH charts according to ICAO Doc. 8168. This would create airborne navigation database capacity issues.

response *Accepted.*

The AMC/GM proposed in the NPA needed further definition to ensure a harmonised approach and future action will take place to develop this material. Extraction (contingency procedures) should be considered by aircraft operators in case of loss of the navigation signal during the approach.

comment *33* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
GM1 AUR.PBN.2010 Surveillance and communications
For the above reasons in accordance with the generic safety analysis that were performed for European PBN airspace concepts, whether an RNAV or RNP specifications, the underlying assumption was either independent or cooperative independent surveillance.

COMMENT:
The Eurocontrol APV Baro generic safety assessment (v1.1), only one known to ENAIRE covering that type of operation, states that, on the contrary,

2.1.4 APV BARO OPERATIONAL ENVIRONMENT DESCRIPTION
[CNS/ATM 2]. Radar surveillance might be available or not. APV Baro can be flown in non radar environment.

This is also the case in the SESAR 5.6.3 D15 APV SBAS generic safety assessment:

3.1 Operational environment for the LPV approach implementation
Radar surveillance optional except if radar vectoring is used for the ILS interception.

As said before, it is suggested that this paragraph applies only to en-route and SID/STAR (SID only above a certain threshold altitude). For approach procedures and initial SIDs this does not seem realistic.

In addition, ENAIRE suggests that the text references the safety analysis used in support of this section.

response	*Noted.*
	The AMC/GM proposed in the NPA needed further definition to ensure a harmonised approach and future action will take place to develop this material.

comment	*61* comment by: *ENAC ATM* What is the position of NEXT GEN dealing with ADS-B surveillance added to RNP specifications in case of GNSS core constellation outage?
response	*Noted.*
	Both navigation and surveillance systems relay on GNSS. So, in case of core constellation outage, there is a common point of failure. The considerations for a backup surveillance system will be dependent upon the decisions for the backup navigation system, and vice-versa the backup navigation is dependent on the decisions regarding the backup surveillance system.

comment	*101* comment by: *CANSO* GM1 AUR.PBN.2010 When both the navigation and surveillance “pillars” of the ATM-system are relying on the same (single) input sensor (GPS L1), there is a huge problem. Note that the SPI IR is obliging European airspace users of aircraft >5700 kg to be ADS-B compliant by 2020. This NPA will tell them that this investment will hardly provide any return in dense European airspace.
response	*Noted.*
	Both navigation and surveillance systems relay on GNSS. So, in case of constellation outage, there is a common point of failure. The present proposal intents to foster the increased usage of GNSS technology, but with no direct obligation to remove existing procedures based on traditional technology. Also, future rulemaking tasks in the field of surveillance will address this common concern.

comment	*185* comment by: *EUROCONTROL* **Page 29 - AMC1 AUR.PBN.2010 Surveillance and communications** Since the proposal incorrectly generalises the need for non-cooperative and independent surveillance sources in all environments, EUROCONTROL proposes a revision of text as follows:

"AMC1 AUR.PBN.2010 Surveillance and communications
In European en-route or terminal airspace where reversion to procedural control in the event of a GNSS outage is not operationally acceptable, the ATS surveillance solution should include at least one horizontal position source that does not depend on the on-board horizontal position source that supports the PBN operations. In these cases, the ATS surveillance solution should include an independent co-operative (e.g. SSR or WAM) surveillance source and, where required from an ATS surveillance perspective, supplemented by a non-cooperative (e.g. PSR) surveillance source."

Page 30 - GM1 AUR.PBN.2010 Surveillance and communications - 1st paragraph

EUROCONTROL proposes editorial updates as follows:

"GM1 AUR.PBN.2010 Surveillance and communications
PBN operations, in particular with respect to RNP navigation and ADS-B surveillance, rely upon GNSS core constellation position determination. As such, there is a common point of failure in the event of a GNSS outage. The effects of such a failure are determined by a specific operating environment which is summarised in the following table, with reference to defining ATS surveillance solutions."

Pages 29-30 - GM1 AUR.PBN.2010 Surveillance and communications - Table

EUROCONTROL makes a first observation that is followed by one question and an assumption (under the form of a question):

It appears that DME/DME reversion is possible but there is no stipulated requirement for the aircraft to carry any alternative navigation capability.
Furthermore, why is it for a "limited time"?
Has this to do with time synchronisation between radar sources/MLAT?

EUROCONTROL makes a second observation that gives rise to a substantial proposal for changes in content:

The table describing the effects of GNSS outage does not reflect the ATS surveillance solutions in a comprehensive and systematic way. In addition it includes elements that are not relevant in any combination of ATS surveillance and RNP navigation.

Accordingly an updated table followed by complementary text is provided below:

Surveillance position information sources	**Navigation position information sources**	**Effects of GNSS outage**
Including Independent SUR Source	GNSS	Radar vectoring based navigation
Including	GNSS + DME/DME	

Independent SUR Source	reversion	Continued navigation in degraded RNAV mode plus surveillance monitoring by ATC
Dependent SUR Source Only	GNSS	Loss of surveillance & navigation position source. Only acceptable where reversion to procedural control is operationally permissible, i.e. it may be considered in low density airspace. This may be based on other Navaids, such as VOR, being available to allow aircraft position determination. In addition, diversion to alternate aerodromes may be another option.
Dependent SUR Source Only	GNSS + DME/DME reversion	Continued navigation in degraded RNAV mode without surveillance monitoring by ATC. Only acceptable where reversion to procedural control is operationally permissible, i.e. it may be considered in low density airspace.

Independent ATS Surveillance (SSR, WAM, MLAT) systems may depend on GNSS as a source of time synchronisation. In case of a partial GNSS outage, these systems should work nominally.

Note:
GNSS timing (with accuracy better than 10 ns) only requires the acquisition of one satellite whereas positioning with GNSS requires four satellites. So, GNSS may remain a reliable source of time whereas it is no longer a reliable source of position information.

In case of a full GNSS outage (affecting the signals from all satellites), these systems are specified to work in a (full performance) reversion mode for a certain time, and afterwards in a degraded mode (reduced performance). These modes of operation should be notified to the surveillance data users, as specified. It is noted that many ATS surveillance systems use other synchronisation mechanisms that do not rely on GNSS.

The above explanation is also applicable to any surveillance sensor which uses GNSS as the source for time-stamping its data outputs. Still, these must have an internal time source as a back-up, with an appropriate performance, in order to maintain a sufficiently accurate time-stamping for a given duration.

Page 30 - GM1 AUR.PBN.2010 Surveillance and communications - 1st paragraph below Table

EUROCONTROL proposes a change in the formulation of the underlying assumption. The proposed change is as follows:

For the above reasons, in accordance with the generic safety analysis that was (not "were") performed for European PBN airspace concepts, whether an RNAV or RNP specifications, the underlying assumption was that independent surveillance is available (instead of "was either

independent or cooperative independent surveillance"), (unless reversion to procedural control is operationally permissible).
Page 30 - GM1 AUR.PBN.2010 Surveillance and communications - 2nd paragraph below Table

In line with the change proposed for the 1st paragraph EUROCONTROL proposes a change for the 2nd paragraph. The proposed change is as follows:

Noting that the spacing of proximate routes is a function of many factors, studies have shown that with RNP 1 performance the availability of independent surveillance becomes more critical than with the existing B-RNAV (RNAV 5) implementation.EUROCONTROL asks a series of questions that are followed by an observation:

Why does the availability of independent surveillance become more critical? What is the underlying issue? Is the statement referring to the performance of surveillance systems or the availability of surveillance in general? Moreover, the safety case for a spacing of 10-15 NM with B-RNAV/RNAV5 was based on an increased ATC intervention.

Page 30 - GM1 AUR.PBN.2010 Surveillance and communications - 3rd paragraph below Table

EUROCONTROL asks first for a clarification and makes an assumption to explain.
Then, in the context of ATS surveillance solutions, EUROCONTROL questions the relevance of the envisaged 3D strategic deconfliction:

The last part of second sentence stating "... and in other cases there is virtually a 3D strategic deconfliction where the spacing considers aircraft on proximate routes to be at the same flight level." is not understood. Could this mean that, by design, airspace planners can build in vertical separation at points where lateral separation is not possible (i.e. crossing points between the inbound and outbound flows of traffic)?

What is the relevance for this discussion to guidance on ATS surveillance solutions?

response *Partially accepted.*

The initial set of AMC/GM needs to be updated and EUROCONTROL's proposals will be taken into account when drafting this material. Also, RMT.0679 aims at revising the current 'SPI regulation', it will also be considered to develop surveillance material.

comment *217* comment by: *AIRBUS*

AMC1 AUR.PBN.2010 Surveillance and communications

Comment

With respect to Navigation and Surveillance common mode failure, EASA should refrain from being too prescriptive by imposing PSR or SSR/WAM for ATS Surveillance.

GNSS is not a sole means of navigation on most of the aircraft.
Many ways to use ADS-B out data for ATS Surveillance (NRA, RAD…). In radar environment, ADS-B data are used as augmentation means and not primary means.

Given the large number of possible CNS sensors, the safety requirement should be defined as "performance-based" requirement rather than prescriptive requirement.

Rationale for Comment

From a global safety perspective, harmonization with FAA is a key issue and consistency with ICAO is of utmost importance.

To address GPS vulnerability issue: FAA is actively working with the U.S. Department of Defense and other U.S. Government Agencies to detect and mitigate these effects and make sure that the GPS and any related augmentation systems are available for safe aviation operations.

Recommendations

The new dependencies between Communication, Navigation and Surveillance shall be assessed in term of TLS.

response *Accepted.*

Future rulemaking tasks in the field of surveillance will address this common mode of failure. Rulemaking Programme 2016–2020 contemplates RMT.0679 Revision of surveillance performance and interoperability (SPI). The Agency is working to increase the level of definition of the initially proposed AMC/GM and means of surveillance will be aligned with future evolution of the SPI Regulation. Also, the AMC/GM will be redrafted in order to refer to surveillance technologies in a generic way: independent, dependent, cooperative and non-cooperative.

comment *220* comment by: *AIRBUS*

GM1 AUR.PBN.2010 Surveillance and communications

Comment

This guidance material should be simply removed. Two main reasons for that:
Firstly, mention is made of a generic safety analysis but without any reference of a recognized organization and secondly, it is not correct to say that loss of surveillance and navigation could result in a catastrophic accident; there are still other CNS means available (GNSS & ADS-B are not sole means of navigation and surveillance).

Rationale for Comment

This should avoid discrepancy with the ICAO PBN Manual which relies upon the local implementation safety case of the PBN.

Recommendations

We recommend to delete this GM.

response

Not accepted.

A full review of the AMC/GM will be conducted, taking account of surveillance and navigation applications available for large aircraft and also for small aircraft.

comment

233 comment by: *ESSP-SAS*

- It is not clear where this requirement comes from.
- It is not clear if the statement "the sources of position information for surveillance and navigation should be different" intends to put a requirement in the on-board equipment (for collaborative surveillance) or it only refers to ANSPs and ground systems.
- In an area with only ADS-B coverage (due to radar maintenance, for example) and with SBAS data within the ADS-B message, this requirement could imply (due to NSA interpretation of the "should") that a RNP APCH based on SBAS (LPV) would not be possible to be used until the radar is available. Therefore LPV availability would not only come from EGNOS availability but from an external element (the radar), which would bring extra activities to ANSPs having to take this into account (in terms of costs, for example).
- Not all European en route areas may be served by PSR/SSR/WAM systems, e.g. oceanic areas where only ADS-C information may be available (being GNSS and Inertial the only position sources available).
- "ATS surveillance" is not an ANS according to Reg. No 549/2004.
- This AMC may put requirements over other ANSPs such as Communication providers (Reg. No 549/2004 Article 2.16) Navigation providers (Reg. No 549/2004 Article 2.30) and Surveillance providers (Reg. No 549/2004 Article 2.38) which are not under the scope of the regulation. Please reconsider the scope in order to accomodate this.
- It is stated that ADS-B out relies upon GNSS core constellation position determination, but to be accurate, it should be stated that it relies upon GNSS position determination (it may rely on augmented GNSS position determination). Single point of failure exists in a mono-constellation environment; provision about a future multi-constellation environment should be addressed.

- FAA AC 20-165A talks about positioning sources other than GNSS for ADS-B Out function. The AC says FAA does not know of any currently available non-GNSS position sources that can meet the necessary performance requirements, but at least leaves the door open to qualify a non-GNSS position source (DME/DME, VOR/DME, INS/IRS) for use in an ADS-B system. If the same approach is used in Europe, then the table would be different.

response *Noted.*

Surveillance and navigation sources should be different in order to avoid a common point of failure. Future rulemaking tasks in the field surveillance will address this common mode of failure. Rulemaking Programme 2016–2020 contemplates RMT.0679 Revision of surveillance performance and interoperability (SPI). The Agency is working to increase the level of definition of the initially proposed AMC/GM and means of surveillance are to be aligned with future evolution of the SPI Regulation.

ATM/ANS provided in the airspace specified in the Basic Regulation are under the scope of the proposed rules.

Certainly, RNP specifications and ADS-B surveillance rely on GNSS position determination, including augmentations, as corrected by the commenter.

The NAVAID infrastructure must comply with the navigation specification requirements.

comment *234* comment by: *ESSP-SAS*

- The second column of the table needs clarifications (what does Ind or dep mean?). The relationship with the first column must be clear and now is confusing.
- It is not explained what D/D or SUR means in the first row.
- In the second row it is not explained why, after a GNSS loss, but with PSR/SSR available, the surviellance monitoring by ATC is limited in time (with radar it does not depend on GNSS).
- ADS-B surveillance is not necessarily lost in all cases if GNSS is lost, because an Inertial position source can be on-board feeding ADS-B data.
- There is no definition of MLAT.
- Assuming that MLAT is Multilateration, it should be clarified why the only case considered is the MLAT by its own and not with a Radar providing independent/cooperative surveillance, understanding that MLAT is applicable in the scope of this regulation for Final Approach and some segments are usually still covered in this phase by SSR.
- EGNOS is a source of time totally independent from GPS. For MLAT systems having both GNSS systems as possible time sources, even in a case of GPS time lost the MLAT could provide surveillance service with no need of any degraded mode, increasing safety. Our proposal is include some information about this in the regulation.
- The objective of GM1 AUR.PBN.2010 section is not understood, as only an assumption and not a requirement or recommendation is stated.

response | *Noted.*

The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material.

comment | *293* comment by: *AvinorANSP*

AMC1 AUR.PBN.2010 Surveillance and communications
The sources of position information used for surveillance and navigation should be different when
deploying PBN operations in European en route or terminal airspace. The ATS surveillance should be
provided by a non-cooperative (PSR) or cooperative independent (SSR or WAM) surveillance service as required to support the spacing of proximate RNP ATS routes.

GM1 AUR.PBN.2010 Surveillance and communications
PBN operations, in particular the RNP specifications and ADS-B surveillance, rely upon GNSS core
constellation position determination, and as such, there is a common point of failure in the event of a GNSS core constellation outage. The effect of such a failure is determined by a specific operating
environment which is summarised in the following table stepping through different SUR types.

Comment:
In a PBN environment - ADS-B surveillance does indeed have one significant disadvantage in that it creates a total dependency of GNSS satellite constellation position determination. In high density traffic areas I agree that the surveillance support should be provided by independent cooperative or non- cooperative surveillance service (SSR/WAM/PSR)
However, safety and performance requirements have been developed that enable ADS-B operation in a number of scenarios:

- ADS-B-NRA Sole means of surveillance in non-radar airspace for low density traffic environments.
- ADS-B-RAD A supplement to radar, potentially reducing redundancy requirements (i.e. radar coverage overlap) and hence offering cost benefits in terms of deployed infrastructure.
- ADS-B-APT Surface movement surveillance at airports, where ADS-B may be used as sole means to enhance visual operations, or used in combination with other systems such as SMR to support low visibility operations

response | *Noted.*

comment	*297* comment by: *Bombardier* The third column in the PBN table says “RNP” in each row and does not add any value as written. Is this missing RNP values (RNP 2, RNP 1, etc.) to indicate the achievable performance? Please clarify or remove.
response	*Noted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material.

comment	*298* comment by: *Bombardier* The term D/D is not clear - is this equivalent to DME/DME? Please clarify.
response	*Accepted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material.

comment	*299* comment by: *Bombardier* Has EASA considered implementations using a secondary GNSS constellation as a backup in case of loss of the primary constellation?
response	*Noted.*
	Additional space-based navigation aid infrastructures, like GALILEO, will be addressed when they are available.

comment	*321* comment by: *Airbus Helicopters* Page 30: GM1 AUR.PBN.2010: The sentence dealing with 2D and 3D strategic deconfliction is not very clear: *"... there is a 2D strategic deconfliction where the 3rd dimension (vertical) is managed by the controller, and in other cases there is virtually a 3D strategic deconfliction where the spacing considers aircraft on proximate routes to be at the same flight level*" It is suggested to improve sentence wording for better clarity.
response	*Accepted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material.

comment *359* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.2 AMC1 AUR.PBN.2010 '*Surveillance and communications*'	We understand that this AMC mandates the use of radar for the surveillance of route (and terminal airspace (SID/STAR)?) whilst at the same time bans the use of ADS-B for that same purpose due to its reliance on GNSS. Further to this, it doesn't deal with PBN approach procedures and seems to imply that no C&S is required in this case. We would welcome clarification and full development of the **AMC**.	In order to avoid future issues with the implementation of the regulation.

response *Accepted.*

The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. The AMC1 AUR.PBN.2010 intends to encompass PBN operations in terminal airspace, which includes RNP APCH procedures.

comment *372* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.2 GM1 AUR.PBN.2010 '*Surveillance and communications*'	In the last paragraph of **GM1 AUR.PBN.2010**, where it says "*(…) there is a 2D strategic deconfliction where the 3rd dimension (vertical) is managed by the controller (…)*" it should say "*(…) there is a 2D strategic deconfliction where the **3rd** dimension (vertical) is managed by the controller (…)*" instead.	Typographical error

response | *Accepted.*

comment | *373* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.2 GM1 AUR.PBN.2010 '*Surveillance and communications*'	In **footnote 17**, where it says "*GNSS timing (with accuracy better than 10 ns) only requires the acquisition of one satellite and not four4 for positioning. (…)*" it should say "*GNSS timing (with accuracy better than 10 ns) only requires the acquisition of one satellite and not four**4** for positioning. (...)*" instead (i.e. the number **4** after '*four*' should be removed).	Typographical error

response | *Accepted.*

comment | *412* comment by: *LFV*

CNS - AMC1 AUR.PBN.2010:

Where the document states “ATSP” it has to be changed to “State” almost everywhere in the NPA document where CNS issues are addressed due to the different circumstances in competition in various countries. The State has to delegate responsibility to various certified ATSPs depending on how the market situation is or keep it as a state obligation and maybe use an appointed certified C, N or S supplier to achieve it.

LFV proposes – EASA needs to describe the role, task and responsibility of the entity that EASA wants the regulation to apply to.

response	*Accepted.*
	The scope of the regulation has been amended to require PBN to be implemented by ANPS's or aerodrome operators.

comment	*420* comment by: *Rockwell Collins, Inc.* Page 29 Section 3. Proposed Amendments GM1 AUR.PBN.2010 Surveillance and Communications (Table) Comment: The third row (for RNP, GNSS core constellation) states for "Effects if GNSS lost" that "Loss of surveillance & navigation position" is "unacceptable in EUR high density". The failure classification "unacceptable" and associated failure modes are unclear and undefined. Taken literally, "unacceptable" could imply 0% (less than 10^{-9}) probability of unspecified combinations of aircraft equipment and satellite failures. This would be impossible to implement. Suggested Resolution: If the intent is that the failures could be mitigated, identify allocations among aircraft equipage, infrastructure, and Air Traffic Services. For example, a recent SESAR study into GPS outage in Central European airspace (including pilot and controller aspects) presented the following results: "The sector capacity limits are acceptable, because situational awareness, workload and taskload remain within acceptable limits. •The number of GPS only capable aircraft per sector is acceptable, because the separation of flights is maintained within safe limits. •The ATC/Pilot working procedures developed for GPS outage are adequate, because ATCOs know which aircraft needs radar vectoring and which one does not. •The GPS outage information requirements are in line with ATCO needs, because ATCOs know where and when GPS outage occurs" Comment is Suggestion
response	*Noted.*

comment	*421* comment by: *Rockwell Collins, Inc.* Page 29 Section 3. Proposed Amendments GM1 AUR.PBN.2010 Surveillance and Communications (Table) Comment: The third row (for RNP, GNSS core constellation) states for "Effects if GNSS lost" that "RNP APCH extraction required. RNP APCH extraction is not possible unless the missed approach procedure is entirely conventional, which often is not the case.

Suggested Resolution: If the intent is that RNP APCH requires conventional missed approach to mitigate for GNSS constellation failures, clarify the assumption regarding state's responsibilities: a) that RNP APCH missed approach overlay a conventional missed approach, and b) to provide auxiliary services, such as maintaining conventional navaids, to support the required performance.

Comment is Suggestion

response *Not accepted.*

Missed approach procedures based on conventional navigation may not be available. Extraction procedures are not subject to existence of conventional NAVAID infrastructure for missed approaches. Pilots should assess their capability to navigate in case of failure of GNSS navigation depending on available NAVAID infrastructure. After extraction, they should also consider the actions necessary to successfully divert to an alternate destination. In that case, diversions should rely on alternative navigation sensors.

comment *422* comment by: *Rockwell Collins, Inc.*

Page 29
Section 3. Proposed Amendments GM1 AUR.PBN.2010 Surveillance and Communications (Table)

Comment: The third row (for RNP, GNSS core constellation + DME/DME reversion) states for "Effects if GNSS lost" that "loss of surveillance but navigation possible along ATS route through missed approach is required, and also "unacceptable in EUR high density."

· a) The failure classification "unacceptable" and associated failure modes are unclear and undefined. Taken literally, "unacceptable" could imply 0% (less than 10^{-9}) probability of unspecified combinations of aircraft equipment and GNSS satellite, and DME ground station failures.

· b) Tt's not clear what failures are unacceptable. Is loss of both GNSS and DME/DME unacceptable for navigation? Is this aircraft and/or infrastructure?

· c) Is the loss of surveillance "unacceptable"? Is the intent to require the aircraft have reversion to DME/DME for ADS-B purposes?

d) DME/DME is not required currently for navigation or surveillance.

Suggested Resolution: For the intended failure classifications, reference instead the existing regulatory guidance for airworthiness approval for defined failure conditions and classifications. Also, clarify allocation between the airspace and the airspace to meet safety requirements.

Comment is Objection

response *Noted.*

The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. It was not the intent of this GM to make reference to airworthiness failure conditions but to give some more guidance as to

	what needs to be considered.

comment	*423* comment by: *Rockwell Collins, Inc.* Page 29 Section 3. Proposed Amendments GM1 AUR.PBN.2010 Surveillance and Communications (Table) Comment: The fourth row (for RNP, GNSS core constellation + DME/DME reversion) states for "Effects if GNSS lost" that "loss of surveillance but navigation possible along ATS route through missed approach is required, and also "unacceptable in EUR high density." The failure classification "unacceptable" and associated failure modes are unclear and undefined. Taken literally, "unacceptable" could imply 0% (less than 10^{-9}) probability of unspecified combinations of aircraft equipment and GNSS satellite, and DME ground station failures. Suggested Resolution: Reference existing airworthiness requirements for aircraft requirements. Reference existing policy regarding infrastructure. Clarify allocation between the airspace and the airspace to meet safety requirements. Comment is Objection
response	*Noted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. It was not the intent of this GM to make reference to airworthiness failure conditions but to give some more guidance as to what needs to be considered.

comment	*424* comment by: *Rockwell Collins, Inc.* Page 30 Section 3. Proposed Amendments GM1 AUR.PBN.2010 Surveillance and Communications Comment: The penultimate paragraph states, "The RNP specification, with the addition of RF and FRT functionality, will permit route spacing between 5-7NM on straight and turning segments. As such, a loss of surveillance and navigation could result in a catastrophic accident." Is the intent to add an airworthiness requirement that loss of surveillance and navigation is a catastrophic failure condition? Note that if that is the case, this would be material to be contained under *.1309 (like CS25 Book 2, AMC 25.1309 System Design and Analysis, para 7. *Failure condition classifications and probability terms)*

	Suggested Resolution: Replace text regarding "catastrophic" failures with references to existing airworthiness regulatory guidance addressing failure classification for loss of surveillance and navigation. Clarify allocation between the airspace and the airspace to meet safety requirements for aircraft separation. Comment is Objection
response	*Noted.*
	It was not the intent of this GM to make reference to airworthiness failure conditions but to give some more guidance as to what needs to be considered.

comment	*464* comment by: *DGAC/DTA* **AMC 1 AUR.PBN.2010** The AMC says that sources (position information used for surveillance and navigation) should be different, which can be interpreted as it is mandatory to have at least a surveillance service. The French NSA think that this requirement is not justified in every case, especially for aerodromes without a lot of traffic where others specific requirements are set up. **Proposal:** Clarify that this requirement applies where a surveillance system is used for ATS in SID and STAR or at aerodrome.
response	*Accepted.*
	The AMC/GM included in the NPA needs further definition in order to clarify these aspects and future action will take place to develop this material. It was not the intent of this AMC to propose the deployment of surveillance system. Procedural control could be an alternative in low density airspaces in case of failure of the primary navigation solution.

comment	*487* comment by: *Belgocontrol* GM1 Obviously, when both the navigation and surveillance "pillars" of the ATM-system are relying on the same (single) input sensor (GPS L1), there is a huge problem! Note that the SPI IR is obliging European airspace users of aircraft >5700 kg to be ADS-B compliant by 2020. This NPA will tell them that this investment will hardly provide any return in dense European airspace…
response	*Noted.*
	Surveillance and navigation sources should be different in order to avoid a common point of failure. Future rulemaking task RMT.0679 (Revision of surveillance performance and

	interoperability (SPI)) will address this common mode of failure. The Agency is working to increase the level of definition of the initially proposed AMC/GM, and means of surveillance are to be aligned with future evolution of the SPI Regulation.

comment	*490* comment by: *EUROPEAN COMMISSION GNSS Programmes* The scenario of RNP and not ATS surveillance should be also listed with similar mitigation actions than for ADS-B + RNP. PBN RNP APCH could be used in aerodromes with no surveillance available, just communications ATC-Pilot. The NPA should mention SBAS as a way to improve availability in case of ADS-B usage, as it has been deeply demonstrated and furthermore it is part of the US mandate for using ADS-B.
response	*Partially accepted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. Procedural control could be an alternative in low density airspaces in case of failure of the primary navigation solution. The use of satellite augmentation is part of GNSS, and as such was discarded when it comes to SUR systems.

comment	*536* comment by: *IATA* **Surveillance and Communication requirements when GNSS is failing** **Comments:** The requirements for ADS-B and NAV when GNSS is failing should be challenged and need further discussion and special attention needs to paid to the route spacing in the en-route phase of flight for capacity and safety reasons. RNP1 is an essential enabler to increase capacity in the TMA in the departure / arrival routes by allowing reduced spacing. The NAV and SUR requirements are in the GM 1 paragraph and leaves room for any individual ANSP to seek compliance, which has the risk of fragmentation, i.e. some ANSPs will only provide RNAV1 and others might be happy with RNP1 procedures. Therefore, the Airspace User Associations are requesting EASA to move this paragraph into the Implementing Rule.
response	*Not accepted.*
	The implementing rule will address the obligation with respect to what needs to be implemented and the AMC will provide the supporting means to achieve the requirement.

	However, the Agency recognises that the AMC/GM presented for consultation needs further amendment to be aligned with the revised proposal.

comment	*537* comment by: *IATA* **AMC1: The ATS route surveillance should be provided by a non-cooperative (PSR) or cooperative independent (SSR or WAM) surveillance service as required to support the spacing of proximate RNP ATS routes.** **Comments** It needs clarification why ADS-B is not mentioned as surveillance service means for en-route spacing (WAM is mentioned instead of ADS-B). It could be a mistake and ADS-B should be mentioned here? Q. Could EASA clarify why only WAM is mentioned and not ADS-B as surveillance service for en- route spacing requirements?
response	*Noted.*
	Both ADS-B and RNP 1 require GNSS for position estimation purposes. Since ADS-B is cooperative dependent surveillance, it was excluded to avoid a common point of failure.

comment	*570* comment by: *HungaroControl* GM1 AUR.PBN.2010 When both the navigation and surveillance “pillars” of the ATM-system are relying on the same (single) input sensor (GPS L1), there is a huge problem. Note that the SPI IR is obliging European airspace users of aircraft >5700 kg to be ADS-B compliant by 2020. This NPA will tell them that this investment will hardly provide any return in dense European airspace.
response	*Noted.*
	Both navigation and surveillance systems relay on GNSS, so in case of constellation outage, there is a common point of failure. The present proposal intent is to foster the increased usage of GNSS technology, but with no direct obligation to remove existing procedures based on traditional technology. Also, future rulemaking tasks in the field of surveillance will address this common concern.

comment	*574* comment by: *AEA* **AMC1: The ATS route surveillance should be provided by a non-cooperative (PSR) or cooperative independent (SSR or WAM) surveillance service as required to support the**

spacing of proximate RNP ATS routes.

Comments
It needs clarification why ADS-B is not mentioned as surveillance service means for en-route spacing (WAM is mentioned instead of ADS-B). It could be a mistake and ADS-B should be mentioned here?

Q. Could EASA clarify why only WAM is mentioned and not ADS-B as surveillance service for en- route spacing requirements?

response *Noted.*

Both ADS-B and RNP 1 require GNSS for position estimation purposes. Since ADS-B is cooperative dependent surveillance, it was excluded to avoid a common point of failure.

comment *575* comment by: *AEA*

Surveillance and Communication requirements when GNSS is failing

Comments:
The requirements for ADS-B and NAV when GNSS is failing should be challenged and need further discussion and special attention needs to paid to the route spacing in the en-route phase of flight for capacity and safety reasons.

RNP1 is an essential enabler to increase capacity in the TMA in the departure / arrival routes by allowing reduced spacing.

The NAV and SUR requirements are in the GM1 paragraph and leaves room for any individual ANSP to seek compliance, which has the risk of fragmentation, i.e. some ANSPs will only provide RNAV1 and others might be happy with RNP1 procedures.

Therefore, the Airspace User Associations are requesting EASA to move this paragraph into the Implementing Rule.

response Not accepted.

The implementing rule will address the obligation with respect what needs to be implemented and the AMC will provide the supporting means to achieve the requirement. However, the Agency recognises that the AMC/GM presented for consultation needs further amendment to be aligned with the revised proposal.

comment *615* comment by: *General Aviation Manufacturers Association / Hennig*

EASA states that for the EUR high-density environment, the loss of "surveillance & navigation position" is "unacceptable which may infer a zero acceptance of this situation.

The term "unacceptable" is difficult to quantify in terms of aircraft system design requirements which are more commonly quantified term of failure classification terminology.

GAMA recommends that EASA consider establishing the safety performance for surveillance and navigation performance in terms of well-established failure classification terminology.

response *Noted.*

It was not the intent of this GM to make reference to airworthiness failure conditions but to give some more guidance as to what needs to be considered.

comment *623* comment by: *GSA*

Surveillance and communications

The scenario of RNP and not ATS surveillance should be also listed with similar mitigation actions than for ADS-B + RNP. PBN RNP APCH could be used in aerodromes with no surveillance available, just communications ATC-Pilot.
The NPA should mention SBAS as a way to improve availability in case of ADS-B usage, as it has been deeply demonstrated and furthermore it is part of the USA mandate for using ADS-B.

response *Partially accepted.*

The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. Procedural control could be an alternative in low density airspaces in case of failure of the primary navigation solution.

The use of satellite augmentation is part of GNSS, and as such was discarded when it comes to SUR systems.

comment *653* comment by: *DFS Deutsche Flugsicherung GmbH*

GM1 AUR.PBN.2010, Table second line, ("DME/DME reversion"):

Irrespective of our request to delete AUR.PBN.2010, DFS requests EASA to explain how this requirement would be implemented for aircraft that are only equipped with one GPS device.

response *Noted.*

The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. This table does not intend to require DME/DME coverage, but to summarize different scenarios by combining possible

	navigation and surveillance infrastructure.

comment	*703* comment by: *UK CAA* **Page No:** 29 **Paragraph No:** GM1 AUR.PBN.2010 **Comment:** Whilst recognising the common-mode failure linked to surveillance and navigation from loss of GNSS, the UK CAA is of the view that it is inappropriate to highlight the common dependency within an AUR Subpart PBN section. GNSS impacts not only surveillance and navigation but also data communications and safety systems such as TAWS. Consider removal of GM1 to AUR.PBN.2010 and move to an appropriate regulation addressing infrastructure as a whole e.g., ATM IR Part-CNS. **Justification:** GNSS is an important multi-modal infrastructure that could be better addressed by the proposed ATM IR's Part-CNS, rather than one specifically detailing PBN.
response	*Partially accepted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material.

comment	*704* comment by: *UK CAA* **Page No:** 29 **Paragraph No:** GM1 AUR.PBN.2010 **Comment:** Within the table, it is unclear what constitutes high density and low density airspace operations. If terms such as high density and low density airspace are to be used within the GM, a definition should be either included or else referenced. **Justification:** Clarity.
response	*Accepted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material.

AMC1 AUR.PBN.2015 Performance and functionality p. 30-32

comment	*34* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AMC1 AUR.PBN.2015 Performance and functionality*** **COMMENT:** Proposal: to add document ICAO EUR DOC 025 - RNP APCH Guidance Material (1st Ed., 2012).
response	*Accepted.*
	Guidance material on implementation of RNP APCH is planned to be published after the adoption of the proposed rule.

comment	*35* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AMC1 AUR.PBN.2015 Performance and functionality*** *2. When implementing approach procedures with vertical guidance (APV), the published obstacle clearance altitude (OCA) should be such to permit operation of aircraft using either BARO-VNAV or SBAS vertical guidance.* **COMMENT:** The current version could be interpreted as if only one OCA (flyable with both systems) should be present, as currently happens with Baro-VNAV OCAs - also flown with SBAS thanks to EASA CM-AS-002. That would avoid the definition of more favourable, SBAS-only approach minima. Proposal: to eliminate bullet (2).
response	*Partially accepted.*
	The paragraph will be reworded so as to permit both SBAS and BARO-VNAV OCH to be published as required.

comment	*36* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AMC1 AUR.PBN.2015 Performance and functionality*** *4. Approach procedures, SIDs/STARs and ATS routes should be such that aircraft qualified in accordance with the applicable certification requirements corresponding with the performance and functionality specified in ICAO Document 9613 AN/937 — 'Performance-based Navigation (PBN) Manual', 2013, 4th Edition, as follows, are capable of the desired operations.* **COMMENT:** It should be clarified why only ICAO documents are quoted as source for aircraft certification/qualification means of compliance. No mention is made to EASA documents, namely AIR-OPS AMCs and GMs). This would seem inconsistent with previous sections asking for compliance with 965/2012 (ORO.GEN.110) and 923/2012 (SERA.5015).
response	*Accepted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material.

comment	*62* comment by: *ENAC ATM* 1. (f) Dealing with PBN phraseology, amendment of document ICAO 4444 should be carried out (k (k) Add ICAO Document 9432 , PBN phraseology should be added.
response	*Not accepted.*
	Phraseology will be subject to the SERA regulation amendments.

comment	*82* comment by: *CANSO* - AMC1 AUR.PBN.2015: Regarding the performance of GNSS, it would be appropriate to add references to SARPS (annex 10);
response	*Partially accepted.*
	The AMC/GM included in the NPA needs further definition in order to clarify these aspects and future action will take place to develop this material. The performance of a GNSS system is an assumption for the correct implementation of PBN.

comment	*147* comment by: *European Helicopter Association (EHA)* Para 3.2 AMC1 AUR.PBN.2015 (4): The PBN manual section related to RNP 0.3 implementation is missing. Low Level IFR helicopter routes in constraining environments (mountainous terrain, dense terminal airspace) are expected to be based on RNP 0.3 navigation specification. We recommend to introduce: (h) VOLUME II – IMPLEMENTING RNAV AND RNP OPERATIONS, PART C – IMPLEMENTING RNP 0.3 – 7.3 NAVIGATION SPECIFICATION, 7.3.3 Aircraft requirements.
response	*Accepted.*
	Guidance material on implementation of RNP APCH is planned to be published after the adoption of the proposed rule.

comment	*164* comment by: *skyguide Corporate Regulation Management* **Chapter 3 Equipment requirements** Equipment requirements for aircraft operators should be introduced to allow a harmonised transition to a PBN environment.
response	*Not accepted.*
	The rule is addressed to ANSP and aerodrome operators, not aircraft operators, thus the inclusions of aircraft equipment requirements is not foreseen.

comment	*186* comment by: *EUROCONTROL* **Page 30 - AMC1 AUR.PBN.2015 - Performance and functionality - 1st paragraph** EUROCONTROL asks a question: For States where GNSS is not yet recognised as a means of navigation, how will EASA expect this issue to be resolved? **Page 31 - AMC1 AUR.PBN.2015 - Performance and functionality - 2nd paragraph** EUROCONTROL raises a point giving rise to a question: This paragraph can be interpreted in different ways. It implies that there is a single published OCA. Some have interpreted it as being just a requirement for publishing the Baro/VNAV procedures. Others have interpreted it as follows: the LPV minima should be the same as the LNAV/VNAV minima. What is the actual intention? **Page 31 - AMC1 AUR.PBN.2015 - Performance and functionality - 4th paragraph**

	EUROCONTROL asks the question again: What about helicopter operations and RNP0.3?
response	*Noted.*
	GNSS is the only navigation technology that can support RNP proposed operations. This proposal intent is to foster the increased usage of GNSS technology, but with no direct obligation to remove existing procedures based on traditional technology where there are no performance needs. Furthermore no State has advised the Agency that it does not recognise GNSS as a means of navigation. Regarding OCA, the intention was to make clear that an APV approach is required for each RWY end where no precision approach procedure are in place, it may be an APV BARO or an APV SBAS. The paragraph will be reworded so as to permit both SBAS and BARO-VNAV OCH to be published as required. With respect to rotorcraft operations, the proposed rule has been revised and incorporates routes to be implemented in accordance with RNP 0.3 specification.

comment	*197* comment by: *ENAV* - AMC1 AUR.PBN.2015: Regarding the performance of GNSS, it would be appropriate to add references to SARPS (annex 10);
response	*Partially accepted.*
	The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. The performance of a GNSS system is an assumption for the correct implementation of PBN.

comment	*221* comment by: *AIRBUS* **AMC1 AUR.PBN.2015 Performance and functionality** Comment A new Guidance Material GM1 AUR.PBN 2015 should be developed aiming at setting an EU/US harmonized AFM PBN entries referential. Rationale for Comment Appropriate Guidance for issuing PBN information in the AFM should be provided. Harmonized wording between EASA and FAA for declaring PBN functionalities against

relevant airworthiness standards should be sought.

Recommendations

We recommend to develop a specific guidance for declaration of aircraft PBN capability in the AFM.

response *Not accepted.*

Such guidance material will be addressed in the appropriate airworthiness requirements.

comment *223* comment by: *AIRBUS*

AMC1 AUR.PBN.2015 Performance and functionality

Comment

It is not clear how the obstacle clearance altitude (OCA) could be published for APV to permit operation of aircraft using either BARO-VNAV or SBAS vertical guidance while realizing the benefits of the SBAS.

Rationale for Comment

The safety and operational benefits of the SBAS (improved airport accessibility) should be preserved.

Recommendations

The minima for LPV (SBAS) should not be increased artificially to accommodate dual operation (SBAS and Baro-VNAV) due to the way the obstacle altitude clearance is published.

response *Partially accepted.*

The Agency thanks you for your comments.

Regarding OCA, the intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, so it may be an APV BARO or an APV SBAS, The paragraph will be reworded so as to permit both SBAS and BARO-VNAV OCH to be published as required.

comment *235* comment by: *ESSP-SAS*

As long as publication of procedures is involved, AIS providers (Reg. No 549/2004 Article 2.3) should be mentioned to some extent.

response	*Not accepted.*
	The publication of data will be addressed in accordance with RMT.0477 Technical requirements and operational procedures for aeronautical information services (AIS) and aeronautical information management (AIM).

comment	*236* comment by: *ESSP-SAS* The listing of applicable documents/references shall be extended to "subsequent versions", and not limited to the current edition of the listed documents/references.
response	*Not accepted.*
	The use of open reference that implies that all versions of a document are acceptable is not permitted as changes to these documents are issued by third parties. Subsequent changes may not comply with the intent of the regulation.

comment	*237* comment by: *ESSP-SAS* AMC1 AUR.PBN.2015 Performance and functionality (2): If the published OCA is to be the same for APV-Baro and for APV-SBAS, this means that there would be no benefit in using an LPV procedure (APV-SBAS) over a APV-Baro. This requirement is neither in the PBN manual, nor in any related document, and it is not included in the Reg. No 716/2014 PCP. There is no rationale for this requirement within the NPA, and taking into account that the minima is usually lower for the LPV procedure, it makes absolutely no sense to develop a regulation preventing an ANSP from using a more beneficial RNP APCH procedure for many reasons, but in particular from a safety point of view (a lower minima increases the level of safety). APV-Baro has a severe safety issue regarding the tuning in the minima due to temperature effect in the barometric altimeter. The criticality of the onboard altimeter setting procedures is much higher in Baro-VNAV (LNAV/VNAV) procedures than in SBAS (LPV) procedures, as the later do not base the vertical guidance on the barometric altimeter. This is for example the reason why remote altimeter settign is not allowed for LNAV/VNAV. Incredibly, this safety consideration has not been taken into account in the analysis of safety impacts! (section 4.5.1.1). Another safety benefit is the SBAS CAT-1 will provide OCH as low as 200ft, whereas Baro-VNAV will remain at 250ft. This has neither be analysed in 4.5.1.1. Finally, LPV procedures are not affected by temperature. Again, this operational and safety benefit has not been analysed in 4.5.1.1. Therefore, it is suggested to mandate the implementation of LNAV and LPV procedures, and only implement LNAV/VNAV procedures when requested by aircraft operators. This is fullly comatible with the PCP IR already in place.

	This section invites to probably use a higher minima (and with a lower level of safety) in all the cases in which the regulation must be applied, which again makes no sense at all. This requirement must be deleted from the final text.
response	*Partially accepted.*
	Regarding OCA, the intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, so it may be an APV BARO or an APV SBAS. The paragraph will be reworded so as to permit both SBAS and BARO-VNAV OCH to be published as required. The Agency has no intent to mandate the use of LPV procedures, the use of LPV or LNAV/VNAV will depend upon the performance required and the operators at each aerodrome and is therefore subject to a local decision

comment	*238* comment by: *ESSP-SAS* ICAO IFPP is currently working on the criteria for LP+BaroVNAV. Therefore and in line with the previous comments, this shall be the mandated option in those environments where, for whatever reasons, is not possible to deploy an "only SBAS" LPV procedure.
response	*Not accepted.*
	The criteria for LP+BaroVNAV is still in development, until such time as these criteria have been published, the Agency cannot reference it as a possible solution.

comment	*239* comment by: *ESSP-SAS* AMC1 AUR.PBN.2015 Performance and functionality (4-f): Advanced RNP Navigation Specification is refered to in section 4-f of AMC1 AUR.PBN.2015, but there is no other mention to A-RNP in the whole NPA. Please clarify why this specification is considered within the regulation.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. The requirement for aircraft to conform to A-RNP specification is no longer included in the proposal.

comment	*240* comment by: *ESSP-SAS* Reference should be made to existig AMCs (20-27, 20-28) added to ICAO documentation on performance requirements.
response	*Partially accepted.*

	Where applicable, reference to the appropriate existing AMC material will be made.
comment	*292* comment by: *AvinorANSP* ***AMC1 AUR.PBN.2015 Performance and Functionality*** *2. When implementing approach procedures with vertical guidance (APV), the published obstacle clearance altitude (OCA) should be such to permit operation of aircraft using either BARO-VNAV or SBAS vertical guidance.* **Comment:** We do not understand the need for this requirement.
response	*Noted.*
	Regarding OCA, the intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, so it may be an APV BARO or an APV SBAS. The paragraph will be reworded so as to permit both SBAS and BARO-VNAV OCH to be published as required. The Agency has no intent to mandate the use of LPV procedures, the use of LPV or LNAV/VNAV will depend upon the performance required and the operators at each aerodrome and is therefore subject to a local decision.
comment	*320* comment by: *Airbus Helicopters* Page 31: AMC1 AUR.PBN.2015 (§2): Obstacle Assessment Surfaces (OAS) related APV-SBAS are very different from those related to APV-Baro. Publishing the same OCA for both types of procedures will not allow to take benefits of SBAS which enables lower minima than vertical Baro-guidance (APV-Baro). SBAS specific OAS and OCA should be used when implementing APV-SBAS at aerodromes.
response	*Accepted.*
	Regarding OCA, the intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, so it may be an APV BARO or an APV SBAS, The paragraph will be reworded to so as to permit both SBAS and BARO-VNAV OCH to be published as required. The Agency has no intent to mandate the use of LPV procedures, the use of LPV or LNAV/VNAV will depend upon the performance required and the operators at each aerodrome and is therefore subject to a local decision.
comment	*322* comment by: *Airbus Helicopters* Airbus Helicopters fully shares comment n° 147 posted by EHA.

response | *Accepted.*

See response to comment 147.

comment | *350* ❖ comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.1.1 AUR.PBN.2015 '*Performance and functionality*' **Section 3.1.2 AMC1 '*AUR.PBN.2015 Performance and functionality*'**	We feel that the way that this requirement is structured, passing the formal ICAO PBN specification to **AMC1**, difficults its full understanding and may, in its turn, complicate its applicability.	As already stated, the structure proposed difficults the full understanding of the requirements. In fact, setting the PBN specifications in AMCs would send the message that there are alternative ways to the **ICAO PBN Manual** to fulfil this requirement. This goes directly against the main objective of the rulemaking task and of ICAO when introducing the PBN concept. We propose to state the specifications directly in the requirement **AUR.PBN.2015** itself and delete **AMC1**.

response | *Accepted.*

The approach adopted is different. The “Performance and functionality” requirements have been withdrawn from the revised proposal. Reference to the applicable ICAO PBN specifications has now been made in the simplified rule.

comment | *360* comment by: *AESA / DSANA*

COMMENT	JUSTIFICATION
Irrespective of our comment proposing the	Although this comment is quite

removal of this AMC **[#350]**, should it be kept, in **AMC1 AUR.PBN.2015 1.(a)** the reference to actual amendments of ICAO Annexes implies that the resulting regulation will have to be updated in synchronization with ICAO activity.	obvious, it is worth making it explicit in the light of former and current situations derived from the way these synchronization activities are carried out in the EU.

response *Noted.*

The issue referred to primarily relates to the synchronisation of the ICAO provisions listed in the EU regulations. The updating and synchronising of any document listed in an AMC/GM can be achieved via an EASA ED decision relatively quickly should the change just not impact compliance significantly.

comment *361* comment by: *AESA / DSANA*

COMMENT	JUSTIFICATION
Irrespective of our comment proposing the removal of this AMC **[#350]**, should it be kept, AESA fully supports requirement **AMC1 AUR.PBN.2015 2.**. We actually propose to establish this requirement directly within the requirement **AUR.PBN.2015** itself and delete **AMC1**.	It is most important that both types of APV are treated on an equal stance, in line with the recommendations put forward by ICAO and so that all airspace users are catered for in a proper manner.

response *Noted.*

The Agency thanks you for your support.

Regarding OCA, the intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, so it may be an APV BARO or

an APV SBAS. The wording will be revised to improve clarity.

comment

392 comment by: *NATS National Air Traffic Services Limited*

The NPA requires all PBN procedures to be predicated on GNSS as the navigation position source, with the implementation of supporting local contingency procedures. In the regulatory timescale proposed, this is very problematic

1. 1. Placing a dependency on the availability, continuity, integrity and robustness of the GNSS system as the prime navigation sensor, so soon after 2018, does not recognise the wide range of issues associated with failure modes and interference, intentional or unintentional. A complete understanding of what a widespread GNSS failure means to the Network is not believed to be available. The NPA requires locally developed contingency procedures after loss of a core constellation however such a failure will probably affect airspaces in more than one State. It is not clear how the Network can function efficiently if contingency procedures are left to the local airspace managers. Until dual constellation/dual frequency GNSS availability becomes available sometime in the next decade, legislating for the use of the current single constellation/single frequency system seems premature.

2. There is no system capability for local ATS providers to identify single satellite or core constellation GNSS failures, other than through ambiguous pilot reports; mandating GNSS will require a centralised approach to outage notification and subsequent contingency network management. If it remains a requirement for ATS providers to manage contingency locally, then the costs of implementing a detection system would vastly exceed any positive benefits that an RNP airspace would realise over an RNAV airspace, which does not require a GNSS capability.

Suggested resolution: EASA is asked to mandate the RNAV 1 standard which does not *require* GNSS to enable benefits and removes the need to place a dependency on the integrity and robustness of the current GNSS environment. Where ATSPs implement RNP procedures outside of regulation, then appropriate measures for identifying GNSS outages and supporting contingency arrangements can be developed locally and be approved by the NSA.

response

Accepted.

Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. Contingency procedures must ensure that failures of GNSS are mitigated by other means of navigation (e.g. DME-based RNAV operations,

	conventional navigation), ATS surveillance or ATS procedural service. Key technical aspects to facilitate the implementation of future navigation applications and their contingency procedures are meant to be included in the Agency's AMC/GM.
comment	*428* comment by: *Rockwell Collins, Inc.* Page 32 AMC1 AUR.PBN.2015 Comment: "Advanced RNP" is mentioned only twice (pages 11 and 32), but the application is unclear. Everywhere else, the NPA only discusses ±1NM and ±0.3NM. Are Scaleable RNP values not needed? Suggested Resolution: Clarify aircraft and airspace requirements for using database RNP values, especially where and when RNP values other than 2NM, 1NM, and 0.3NM may be implemented. Comment is Suggestion
response	*Noted.*
	Regulated parties, ANSPs or aerodrome operators, when implementing Standard Instrument Departure (SID)/Standard Instrument Arrival (STAR) in order to meet local performance objectives, have to conform to RNAV 1 performance requirements. RNP 1 plus altitude constraints and radius to fix (RF) might be implemented for those areas where higher performance is required, otherwise the RNAV 1 standard must be applied. RNAV 5 will remain applicable in en-route airspace.
comment	*451* comment by: *EUROPEAN COMMISSION GNSS Programmes* *2. When implementing approach procedures with vertical guidance (APV), the published obstacle clearance altitude (OCA) should be such to permit operation of aircraft using either BARO-VNAV or SBAS vertical guidance.* The below proposed text concerning APV implementation and requiring the OCA publication could be understood as a requirement of having LPV minima aligned on the minima BARO-VNAV. To avoid this misunderstanding the text should be modified to clarify that different OCAs for APV Baro and APV SBAS can be published in the same RNP APCH chart to allow operations of aircraft using both systems. If the issue will not be duly clarified, this requirement will be extremely unfavourable to EGNOS since it will systematically offer same benefits to APV BARO-VNAV.
response	*Accepted.*

The intention of the draft rule was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, it may be an APV BARO or an APV SBAS. The paragraph will be reworded to permit both SBAS and BARO-VNAV OCH to be published as required. The Agency has no intent to mandate the use of LPV procedures, the use of LPV or LNAV/VNAV will depend upon the performance required and the operators at each aerodrome and is therefore subject to a local decision.

comment

453 comment by: *DGAC/DTA*

AMC 1 AUR PBN 2015 paragraph 1
Proposal to add DME/DME to cope with RNAV 1 nav spec and to be downgraded as a GM:

"1. Approach procedures, SIDs/STARs and ATS routes should be predicated on the GNSS and/or DME/DME as navigation position source and conform to the following ad hoc edition of ICAO documentation without prejudice to the differences notified by the States to ICAO for Annexes and in their national AIP for both Annexes and PANS."

response

Partially accepted.

The reference to DME/DME as a navigation position source will be added. However, reference to notified differences will not be added as an AMC as the regulation requires the procedures and routes to conform to the ICAO RNAV or RNP specifications.

comment

465 comment by: *DGAC/DTA*

AMC 1 AUR PBN 2015, paragraph 2

APV Baro-VNAV and APV SBAS have two different protection areas shapes. The OCA depends on the controlling obstacle within the appropriate protection area of each kind of procedure.

This statement is then irrelevant and France proposes to delete this paragraph.

response

Partially accepted.

The intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, so it may be an APV BARO or an APV SBAS, The paragraph will be reworded to permit both SBAS and BARO-VNAV OCH to be published as required. The Agency has no intent to mandate the use of LPV procedures, the use of LPV or LNAV/VNAV will depend upon the performance required and the operators at each aerodrome and is therefore subject to a local decision.

comment

514 comment by: *CAA-N*

P 31 AMC1.AUR.PBN.2015
2.
The meaning of this AMC is not clear. In Norway we have combined challenges in some regions, there are some IRE located on the edge of EGNOS northern Latitude coverage. And some others (a few in the same area) has terrain and/or Obstacles that requires a LNAV/VNAV > 3,5 °
So at a few Aerodromes you could only publish LNAV/VNAV, because you are located outside EGNOS Signal continuity Area. And at a few others the need for steep Approach permits only LPV to be published. In this context we find the AMC text ambigous.

response *Noted.*

The intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, so it may be an APV BARO or an APV SBAS, The paragraph will be reworded to permit both SBAS and BARO-VNAV OCH to be published as required.

comment *571* comment by: *HungaroControl*

- AMC1 AUR.PBN.2015: Regarding the performance of GNSS, it would be appropriate to add references to SARPS (annex 10);

response Partially accepted.

The AMC/GM included in the NPA needed further definition in order to clarify these aspects and future action will take place to develop this material. The performance of a GNSS system is an assumption for the correct implementation of PBN.

comment *587* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

COMMENT:
ICAO Document 9613 AN/937, 'Performance-based Navigation (PBN) Manual, 2013, 4th Edition should also be referenced in AMC1 AUR.PBN.2015.1 and not just in AMC1 AUR.PBN.2015.4.

REASON(S) FOR COMMENT:
Airspace planners, procedure designers, airworthiness authorities and controllers also make use of ICAO PBN manual, when planning and implementing PBN in a designated airspace.

PROPOSED CHANGE:
The text passage:

*"**AMC1 AUR.PBN.2015 Performance and functionality***
1. Approach procedures, SIDs/STARs and ATS routes should be predicated on the GNSS as the

	navigation position source and conform to the following: *(a) ICAO Annex 4, 'Aeronautical Charts', 2009, 11th Edition, Amendment 58;* *(…)* *(j) ICAO Document 9689 AN/953, 'Manual on Airspace Planning Methodology for determination of separation minima', 1998, 1st Edition, Amendment 1."* should be changed to: ***"AMC1 AUR.PBN.2015 Performance and functionality*** *1. Approach procedures, SIDs/STARs and ATS routes should be predicated on the GNSS as the navigation position source and conform to the following:* *(a) ICAO Annex 4, 'Aeronautical Charts', 2009, 11th Edition, Amendment 58;* *(…)* *(j) ICAO Document 9689 AN/953, 'Manual on Airspace Planning Methodology for determination of separation minima', 1998, 1st Edition, Amendment 1;* ***(k) ICAO Document 9613 AN/937, 'Performance-based Navigation (PBN) Manual, 2013, 4th Edition.***
response	Not accepted.
	ICAO Document 9613 does not provide the detailed requirements for the design and implementation of procedure or route.

comment	*605* comment by: *Baranes* To 1. ICAO materials : Ad-hoc editions and differences declared by State shall be taken into account
response	*Not accepted.*
	Reference to notified differences will not be added as an AMC as the regulation requires the procedures and routes to conform to the ICAO RNAV or RNP specifications.

comment	*607* comment by: *Baranes* To 2. **Not relevant** ICAO PBN Charting allows the publication of 3 minima (3 OCA if needed). This text will prevent the benefits of APV with LPV minima compared to APV with LNAV/VNAV minima. **Paragraph to be deleted.**
response	*Partially accepted.*

The intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, it may be an APV BARO or an APV SBAS, The paragraph will be reworded to permit both SBAS and BARO-VNAV OCH to be published as required

comment

624 comment by: *GSA*

Published Obstacle Clearance Altitude and APV procedures implementation

2. When implementing approach procedures with vertical guidance (APV), the published obstacle clearance altitude (OCA) should be such to permit operation of aircraft using either BARO-VNAV or SBAS vertical guidance.

The proposed NPA, through the above text concerning APV implementation and requiring the OCA publication, could be understood as LPV minima will have to be aligned on the minima BARO-VNAV. To avoid this misunderstanding it should be clarify than different OCAs for APV Baro and SBAS could be published in the same RNP APCH chart to permit operation of aircraft using both systems, otherwise this proposition would be extremely unfavourable to EGNOS since it systematically offers same benefits to APV BARO-VNAV.

response

Accepted.

The intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, it may be an APV BARO or an APV SBAS, The paragraph will be reworded to permit both SBAS and BARO-VNAV OCH to be published as required.

comment

641 ❖ comment by: *Virgin Atlantic Airways - Flight Technical Support*

Regarding the requirement for FRT, we do not believe that the need for this functionality is proven from either an efficiency perspective or as capacity enhancment tool. An FMS hardware retrofit would be required on a large number of airframes to meet this requirement - even some that have only recently entered service. A more robust CBA should be provided to enable further assessment by operators.

Additionally, this functionality would not be required to deliver the stated service provision of Free Routes/user-preferred trajectories as it would be inconsistent with the concept; the value in high density airspace is undetermined at this point.

response

Accepted.

FRT functionalities have been removed from the revised draft rule. Please see the response to the major concerns identified section of the Opinion regarding the proposal of navigation specifications to be adopted.

comment	*705* comment by: *UK CAA* **Page No:** 31 **Paragraph No:** AMC1 AUR.PBN.2015 2. **Comment:** It is not understood why the published OCA has to support either Baro-VNAV or SBAS vertical guidance. **Justification:** The minima should be dependent on the selected approach and the obstacle clearance altitude supported by each approach system minima. It makes no sense to have a single value. **Proposed Text:** Delete AMC1 AUR.PBN.2015 2.
response	*Partially accepted.*
	The intention was to make clear that an APV approach is required for each RWY end where no precision approach procedures are in place, it may be an APV BARO or an APV SBAS, The paragraph will be reworded to permit both SBAS and BARO-VNAV OCH to be published as required.

AMC1 AUR.PBN. 2020 Contingency p. 32

comment	*576* comment by: AEA **For procedures envisaged in AUR.PBN.2005(1) and AUR.PBN.2005(2), Air Traffic Service Providers and aerodrome operators should ensure that adequate missed approach procedures are provided for any envisaged degradation of navigation capability.** **<u>Comments</u>** The emphasis on the provision of adequate missed approach procedures in a RNP1 context appears important and a safe execution of all operations in a TMA (combination of SIDs/STARs/MAPt and runway usage) will set requirements for the SUR and NAV infrastructure needed. The provision of missed approach procedures when navigation capabilities degrade shall be specified explicitly. If DME/DME shall be required then a cost analysis has to be included but it is preferred to be based on IRS/IRU capabilities to get away from additional costs for the operators. The impact of this AMC paragraph is highly unsure in terms of costs and must be explained further. Furthermore irrespective of the explanation, the provision of adequate missed approach

procedures shall be done in a harmonized way as well (to avoid contradicting local solutions) and therefore have to be moved into the Implementing Rule.
Q. Could EASA show a CBA to provide an indication what the costs for AUs are to coop with this AMC paragraph?

response

Partially accepted.

Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established).

Approach concepts already cover all segments of the instrument approach, i.e. initial, intermediate, final and missed approach. Missed approach procedures may be supported by either RNAV or conventional segments (e.g. based on NDB, VOR, DME).

The intent of this specific paragraph will be reworded.

comment

37 comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AMC1 AUR.PBN. 2020 Contingency
For procedures envisaged in AUR.PBN.2005(1) and AUR.PBN.2005(2), Air Traffic Service Providers and aerodrome operators should ensure that adequate missed approach procedures are provided for any envisaged degradation of navigation capability.
COMMENT:

a) This section seems to ignore the initial, intermediate and missed segments of approach procedures. Indeed, neither can they be considered as SID/STARs, nor can missed approaches always be considered as valid mitigations in this case.
b) Missed approaches are always provided –they are an integral part of any approach procedure design. On the other hand, the case of common GNSS loss between final and missed approaches is addressed in NPA 2015-1 by **4.5.1.1 Final Approach Operations,** where the weight of the mitigation is set on the "careful" study of the "associated safety case"- no mention to alternative missed approaches is made. Please clarify.
c) As a consequence of a) and b), it is suggested to add new text developing in more detail the role of surveillance and communications in the event of GNSS loss during initial, intermediate and missed approaches. Missed approach procedures should only be regarded as valid mitigations for GNSS losses in the final approach.
d) This AMC should integrate the role of airspace users' contingency measures (required by EASA AMC 20-27A and 20-28), including coordination between airspace users and ATSPs/aerodromes.

Additionally, the fact that ICAO Documents 8168, 9905 and 9906 have already been mentioned would permit the removal of "adequate" in this paragraph.

response	*Accepted.*
	Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established). Approach concepts already cover all segments of the instrument approach, i.e. initial, intermediate, final and missed approach. Missed approach procedures may be supported by either RNAV or conventional segments (e.g. based on NDB, VOR, DME). The intent of this specific paragraph will be reworded. Furthermore, the Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents.

comment	*38* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AMC1 AUR.PBN. 2020 Contingency*** *For Standard Instrument Departures and Standard Arrival Routes and ATS Routes, using PBN envisaged in AUR.PBN.2005 (3) or AUR.PBN.2005 (4), Air Traffic Service Providers and aerodrome operators should provide the adequate Navaid infrastructure for suitably equipped aircraft to enable these aircraft to continue meeting the performance requirements described either in AUR.PBN.2015 (3)(a) or AUR.PBN.2015 (4)(a)(i), (4)(b)(i).* **COMMENT:** a) Note that without underlying RNAV or RNP procedures designed according to ICAO Doc 8168, or underperforming RNAV-compliant RNP 1 procedures, a DME-based navaid infrastructure does not guarantee by itself in all cases the safety of continued, reversionary, non-GNSS navigation. Additionally, DME-based RNP procedures are not, according to the PBN manual, suited for widespread implementations such as that envisaged by this NPA. b) Initial segments of SIDs should receive a distinct treatment, due to its similarities with the approach procedure scenario.
response	*Accepted.*
	AMC/GM proposed in the NPA need further definition. The Agency will improve their contents and coordinate with relevant stakeholders.

comment	*39* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
AMC1 AUR.PBN. 2020 Contingency
In those instances where aircraft are unable to maintain the performance requirements described in AUR.PBN.2015 (3)(a) or AUR.PBN.2015 (4)(a)(i), (4)(b)(i), Air Traffic Service Providers should provide a vectoring service using ATS Surveillance based on independent or cooperative independent surveillance. In the absence of independent or cooperative independent surveillance, reversion to procedural control in the event of GNSS core constellation outage could be envisaged when the operating environment so permits.
COMMENT:

The case of initial segments of SIDs should receive a distinct treatment, as they are normally placed under the minimum vectoring altitude.

response | *Noted.*

The Agency recognises that AMC/GM proposed in the NPA need further definition. The Agency will improve their contents and coordinate with relevant stakeholders.

comment | *63* comment by: *ENAC ATM*

RNP1 specification doesn't offer much option in case of contingency.
From ATC point of view, it may be difficult to have any idea of aircraft behaviour in case of missed approach.
RNAV1 specification offers DME/DME option.

response | *Noted.*

The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents. Please refer to the response to the major concerns identified section of the Opinion related to applicable navigation specifications to be used for implementation.

comment | *80* comment by: *CANSO*

AMC1.AUR.PBN.2020: The contingency, as formulated, results confused, especially where is reported that the RNP1 backup operation requirement is the RNAV1. With the presence of RF functionality the switch is not automatic nor the transition from RNP1 to RNAV 1.
It becomes potentially difficult to ensure RNAV1 as a backup if its procedure implementation is effectively blocked by this

response | *Noted.*

The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*124* comment by: *Finavia* The second paragraph shall be modified to not require specific missed approach procedures for any envisaged degradation of navigation capability. Perhaps the paragraph should be deleted at all. According to EASA AMC 20-27 and ICAO Doc 9613, the operator should develop the contingency procedure for the loss of the RNP APCH capability during the approach. Also the envisaged degradation of the navigation capability should be taken into account in them, as well as in the ATS procedures the possibility for such contingency situations. However, it should not be understood as an additional requirement for the provided missed approach procedure. According to PANS-OPS, only one missed approach procedure can be promulgated. In case all envisaged degradations of the navigation capability would be taken into account in the missed approach procedure, GNSS based missed approach could not be applied at all. However, GNSS based missed approach is one of the options supported in EASA AMC 20-27.
response	*Partially accepted.*
	Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established). Approach concepts already cover all segments of the instrument approach, i.e. initial, intermediate, final and missed approach. Missed approach procedures may be supported by either RNAV or conventional segments (e.g. based on NDB, VOR, DME). The intent of this specific paragraph will be reworded. Furthermore, the Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents.

comment	*125* comment by: *Finavia* In the third paragraph, it is proposed to add in the end of the sentence: "where airspace performance needs require". It would clarify the significance of the navaid infrastructure in meeting the performance requirements in contingency situations where the defined navigation performance is strictly required for the separation purpose.
response	*Noted.*
	The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*160* comment by: *skyguide Corporate Regulation Management* **AMC1 AUR. PBN.2020 Contingency** 1. Contingency procedures appropriate to the complexity of the airspace structure should be

defined and implemented by ATS providers in the event of a degradation of navigation capability resulting from such items as outage of the GNSS core constellation or navigation failures of individual aircraft.
Comment: Refer to comment at IR level.

2. For procedures envisaged in AUR.PBN.2005(1) and AUR.PBN.2005(2), Air Traffic Service Providers and aerodrome operators should ensure that adequate missed approach procedures are provided for any envisaged degradation of navigation capability.
Comment: Missing definition for **adequate** missed approach procedures.

3. In those instances where aircraft are unable to maintain the performance requirements described in AUR.PBN.2015 (3)(a) or AUR.PBN.2015 (4)(a)(i), (4)(b)(i), Air Traffic Service Providers should provide a vectoring service using ATS Surveillance based on independent or cooperative independent surveillance.
Comment: what if below the MVA?

response *Noted.*

Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established).

Furthermore the Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents in conjunction with the relevant stakeholders.

comment *161* comment by: *skyguide Corporate Regulation Management*

AMC AUR.PBN.2020

ANSP should have to flexibility to provide missed approach procedures as necessary and useful.

- Missed approach procedures have to be provided for any envisaged degradation of navigation capabilities.
- Such a requirement does not exist for conventional approaches and would make the decommissioning of conventional navigation facilities impossible.

response *Noted.*

Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established).

Furthermore the Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*241* comment by: *ESSP-SAS* Shouldn't references to AUR.PBN.2015 (4)(a)(i) and (4)(b)(i) be changed to (4)(a) and (4)(b)?
response	*Not accepted.*
	The requirement for an en-route standard has been removed from the proposal.

comment	*268* comment by: *EUROCONTROL* **Page 32 - AMC1 AUR.PBN.2020 Contingency - 1st and 4th paragraphs** EUROCONTROL makes a proposal in wording: On the subject of reversion/contingencies it is proposed to replace GNSS core constellation outage by GNSS outage. This update should be consistently implemented throughout the entire NPA document. EUROCONTROL makes comments: The proposed text highlights the need to keep an independent surveillance system (not based on GNSS) but it lacks the description of the many aspects to be considered as has been identified in the RTS. The 4th paragraph incorrectly generalises the need for non-cooperative and independent surveillance sources (also using incorrect terminology). The key element here is the ATS service provided to the aircraft unable to comply. The availability and dependency of surveillance sources to provide these services are already addressed in GM AUR.PBN.2010. EUROCONTROL therefore proposes a new formulation for the 4th paragraph: "In those instances where aircraft are unable to maintain the performance requirements described in AUR.PBN.2015 (3)(a) or AUR.PBN.2015 (4)(a)(i), (4)(b)(i), Air Traffic Service Providers should provide a vectoring service. In the event of GNSS outage and in the absence of independent surveillance, reversion to procedural control could be envisaged when the operating environment so permits." This also means that the reversion procedure must take into account the capability of ATCOs to revert from surveillance control to procedural control.
response	*Partially accepted.*
	The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders. The proposed text will

be used as appropriate in the revised text.

comment *294* comment by: *AvinorANSP*

AMC1 AUR.PBN. 2020 Contingency
For procedures envisaged in AUR.PBN.2005(1) and AUR.PBN.2005(2), Air Traffic Service Providers and aerodrome operators should ensure that adequate missed approach procedures are provided for any envisaged degradation of navigation capability.

Comment:
This is not ATSPs or aerodrome operators responsibility. This is a contingency situation which the aircraft operators are responsible to resolve. This is no different from when e.g a LOC or VOR stop working while an aircaft is using these navigation aids to perform an instrument approach. The missed approach procedure will then become unavailable and the operators are obligated to have contingency procedures.
There is not possible to have two different MAP for one IAP.

If this requirement should become effective, then we should have an alternative MAP for all IAP, not only for RNP APCH procedures.

response *Noted.*

Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established).

Furthermore, the Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment *362* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
Although AESA fully supports this requirement, we feel that the related AMC mixes two different concepts: the *aircraft operator contingency procedures* required by **EASA AMC 20-26**, **EASA AMC 20-27** and **EASA AMC 20-28** and what we have suggested to call '*ATS Contingency*', which is the object of this requirement. We proposed that the second paragraph "*For procedures envisaged in AUR.PBN.2005(1) and AUR.PBN.2005(2), (...)*" should be removed for this reason.	In order to avoid future issues with the implementation of the regulation.

response | Partially accepted

Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established).

Furthermore, the Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment | *393* comment by: *NATS National Air Traffic Services Limited*

The NPA requires all PBN procedures to be predicated on GNSS as the navigation position source, with the implementation of supporting local contingency procedures. In the regulatory timescale proposed, this is very problematic

1. 1. Placing a dependency on the availability, continuity, integrity and robustness of the GNSS system as the prime navigation sensor, so soon after 2018, does not recognise the wide range of issues associated with failure modes and interference, intentional or unintentional. A complete understanding of what a widespread GNSS failure means to the Network is not believed to be available. The NPA requires locally developed contingency procedures after loss of a core constellation however such a failure will probably affect airspaces in more than one State. It is not clear how the Network can function efficiently if contingency procedures are left to the local airspace managers. Until dual constellation/dual frequency GNSS availability becomes available sometime in the next decade, legislating for the use of the current single constellation/single frequency system seems premature.

2. There is no system capability for local ATS providers to identify single satellite or core constellation GNSS failures, other than through ambiguous pilot reports; mandating GNSS will require a centralised approach to outage notification and subsequent contingency network management. If it remains a requirement for ATS providers to manage contingency locally, then the costs of implementing a detection system would vastly exceed any positive benefits that an RNP airspace would realise over an RNAV airspace, which does not require a GNSS capability.

Suggested resolution: EASA is asked to mandate the RNAV 1 standard which does not *require* GNSS to enable benefits and removes the need to place a dependency on the integrity and robustness of the current GNSS environment. Where ATSPs implement RNP procedures

	outside of regulation, then appropriate measures for identifying GNSS outages and supporting contingency arrangements can be developed locally and be approved by the NSA.
response	Partially accepted.
	Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. Contingency procedures must ensure that failures of GNSS are mitigated by other means of navigation (e.g. DME-based RNAV operations, conventional navigation), ATS surveillance or ATS procedural service. Furthermore, the Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*411* comment by: *LFV* **CNS** - AMC1 AUR.PBN.2020: The relationship between ground infrastructure NAV aids and GNSS based NAV procedures has to be explained. It's unclear what a fallback to GNSS procedures shall be capable of handling or even if a fallback is required. Most likely it is since there are only demands on aircraft to use GNSS in B-RNAV (RNAV 5) airspace in Europe. The level and requirements of a fall back system/contingency procedures in case of a GNSS failure should be clearly regulated on the state level and cannot be an issue and responsibility for the ATSP/Airport to decide on.
response	*Not accepted.*
	Contingency procedures must ensure that failures of GNSS are mitigated by other means of navigation (e.g. DME-based RNAV operations, conventional navigation), ATS surveillance or ATS procedural service. Such mitigation could be local and therefore subject to the establishment by the local ANSP.

comment	*454* comment by: *DGAC/DTA* **AMC1 AUR.PBN. 2020 Contingency** A missed approach is designed for each instrument flight procedure. The contingency procedure in a missed approach is an emergency procedure and it is relevant neither to the aerodrome operator nor to the ATSPs. This underlines the need for a navigation specification less stringent than RNP1 in congested TMAs. An individual loss of continuity is manageable, but a satellite core constellation outage is not acceptable in a GNSS based navigation. A navigation specification RNAV1 allows DME/DME as primary navigation sensor and is more suitable than RNP1 in most of the cases.

response | *Noted.*

Please refer to response to the major concerns identified section of the Opinion in relation to applicable navigation specifications. Contingency procedures must ensure that failures of GNSS are mitigated by other means of navigation (e.g. DME-based RNAV operations, conventional navigation), ATS surveillance or ATS procedural service.

Furthermore, the Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment | *538* comment by: *IATA*

For procedures envisaged in AUR.PBN.2005(1) and AUR.PBN.2005(2), Air Traffic Service Providers and aerodrome operators should ensure that adequate missed approach procedures are provided for any envisaged degradation of navigation capability.

Comments
The emphasis on the provision of adequate missed approach procedures in a RNP1 context appears important and a safe execution of all operations in a TMA (combination of SIDs/STARs/MAPt and runway usage) will set requirements for the SUR and NAV infrastructure needed.

The provision of missed approach procedures when navigation capabilities degrade shall be specified explicitly. If DME/DME shall be required then a cost analysis has to be included but it is preferred to be based on IRS/IRU capabilities to get away from additional costs for the operators.

The impact of this AMC paragraph is highly unsure in terms of costs and must be explained further.

Furthermore irrespective of the explanation, the provision of adequate missed approach procedures shall be done in a harmonized way as well (to avoid contradicting local solutions) and therefore have to be moved into the Implementing Rule.

Q. Could EASA show a CBA to provide an indication what the costs for AUs are to coop with this AMC paragraph?

response | *Noted.*

Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established).

Furthermore, the Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders. With respect to a CBA, the rule is addressed to ANSP and aerodrome operators, not aircraft

	operators, thus the inclusions of aircraft equipment requirements is not foreseen
comment	*572* comment by: *HungaroControl* AMC1.AUR.PBN.2020: The contingency, as formulated, results confused, especially where is reported that the RNP1 backup operation requirement is the RNAV1. With the presence of RF functionality the switch is not automatic nor the transition from RNP1 to RNAV 1. It becomes potentially difficult to ensure RNAV1 as a backup if its procedure implementation is effectively blocked by this
response	*Noted.*
	The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.
comment	*608* comment by: *Baranes* Missed approach is part of the "normal" procedure. In case of contingency, aircraft operators have to define the extraction procedure (annex 6). **Proposal to delete the text.**
response	*Partially accepted.*
	Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established). Furthermore the Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.
comment	*609* comment by: *Baranes* 3rd paragraph : Modify to write : “For Standard Instrument Departures and Standard Arrival Routes and ATS Routes, using PBN envisaged in AUR.PBN.2005 (3) or AUR.PBN.2005 (4), Air Traffic Service Providers and aerodrome operators should provide the adequate Navaid infrastructure **based on the TMA density** for suitably equipped aircraft to enable these aircraft to continue meeting the performance requirements described either in AUR.PBN.2015 (3)(a) or AUR.PBN.2015 (4)(a)(i), (4)(b)(i).”
response	*Noted.*
	The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders. The proposed text will

	be used as appropriate in the revised text.

comment	*661* comment by: *DFS Deutsche Flugsicherung GmbH* According to ICAO Document 8168, ICAO does not permit the publication of more than one missed approach procedure per approach. In Germany, these additional conventional missed approach procedures have been successively withdrawn since 2010. In Germany, a potential risk of navigation degradation is countered through air traffic control service (e.g. radar vectoring). The relevant procedures for pilots are defined in the operations regulations for RNP APCH procedures.
response	*Noted.*
	Missed approaches are not considered contingency procedures. They can be executed when an approach cannot be continued to a successful landing because of a number of reasons (e.g. visual references have not been established). The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*706* comment by: *UK CAA* **Page No:** 32 **Paragraph No:** AMC1. AUR,PBN.2020 **Comment:** It is unclear what is meant by “adequate missed approach procedures are provided”. Terminology such as “adequate Navaid infrastructure for suitably equipped aircraft” is considered vague and imprecise and provides little direction or clarity within proposed AMC material. Opinion 03/2014 and the proposed Annex 11 will require that all notification and changes to procedures (within the Functional System) are subject to risk assessment and mitigation which will require the Competent Authority verifying the content of the change and any contingency measures in the event of infrastructure and equipment failures. UK CAA proposes that the text at AMC1 AUR.PBN.2020, Contingency is removed. **Justification:** The requirement is already addressed through other regulations.
response	*Not accepted.*
	Safety assessments are not incompatible with the establishment of harmonized contingency procedures in case of loss of navigation capabilities. In this case, they should also check that

acceptable means of compliance have been followed.

AMC1 AUR.PBN.3005 Mixed operations p. 32-33

comment	*40* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***AMC1 AUR.PBN. 3005 Mixed operations*** *The air traffic service provider should ensure that the air traffic controllers are capable of assigning appropriate and feasible clearances to aircraft. This may require that the aircraft capability is conveyed to the air traffic controller.* **COMMENT:** Aircraft capability is already being conveyed to the controllers via Flight Plan Data Processing Systems. The AMC seems to hint here at more conspicuous display of aircraft capability, e.g. appearance of FPL fields 10/18 in radar screens. If this is the case, they should be explicitly mentioned.
response	*Accepted.*
	The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*41* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***GM AUR.PBN. 3005 Mixed operations*** *Mixed operations are characterised by:* *(i) a combination of non-PBN and PBN applications within the same airspace; and* *(ii) a combination of different PBN applications within the same airspace.* *Mixed operations envisaged in (i) can either include different final approach procedures using ILS and/or GL, or those procedures envisaged in AUR.PBN.2015 (1), or PBN and non-PBN routes envisaged in AUR. PBN.2005(3) or (4).* **COMMENT:** Suggest to add MLS and GBAS (replacing "GL") as alternative systems for precision approach.
response	*Accepted.*

	The text will refer to fully recognised abbreviations or correctly define them.

comment	*64* comment by: *ENAC ATM* "ATC are capable of assigning appropriate clearance to aircraft. The aircraft capability is conveyed to the ATC" That is necessary. But what is expected for states? What is the level of equipment we may expect especially for terminal approach ATC? Has any survey been conducted?
response	*Noted.*
	The Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*162* comment by: *skyguide Corporate Regulation Management* **AMC1 AUR.PBN. 3005 Mixed operations** The air traffic service provider should ensure that the air traffic controllers are capable of assigning appropriate and feasible clearances to aircraft. This may require that the aircraft capability is conveyed to the air traffic controller. Comment: For skyguide this is a big technical issue and a big operational change. It requires that the ATCO knows the NAV of the aircraft and gives approach clearance. This requires the FDPs to be improved.
response	Noted.
	The Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*222* comment by: *AIRBUS* **GM AUR.PBN. 3005 Mixed operations** Comment Correct typing error. Recommendations "GL" should be read as "GLS".

response	*Accepted.*
	The text will be amended.

comment	*242* comment by: *ESSP-SAS* There is a reference to "GL", but it is not defined in the text of the regulation. Is it GLS? If so, please amend it and include definition.
response	*Accepted*
	The text will refer to recognised abbreviations or correctly define them.

comment	*269* comment by: *EUROCONTROL* **Page 32 - AMC1 AUR.PBN.3005 Mixed operations** EUROCONTROL questions the practical relevance through two questions: "…may require that the aircraft capability is conveyed to the air traffic controller." How will this requirement be met? In case it is intended to meet the requirement by using the flight plan, what are the appropriate codes for RF, FRT, etc.?
response	*Noted.*
	The Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents in conjunction with the relevant stakeholders. Please refer to the response to the major concerns identified section of the Opinion for the revision of the appropriate navigation specification to be used for implementation.

comment	*311* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* Is there a reason for the airline operator to equip when the aerodrome operator continues to provide conventional procedures? This applies also to the requirement of RF and FRT (en-route and SID/STAR) as there is a limited amount of users with this capability today?! The lack of mandate to equip aircraft for APV will not help to fight against CFIT: the airline operators will have no incentive to equip as ATSP/aerodrome operator are asked to manitain conventional procedures for users not equipped for APV, even beyond 2024. Also ATSP/aerodrome operator will not achieve infrastructure rationalisation benefits as they have to maintain conventional procedures.

response | *Noted.*

Please refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage and mixed navigation environment.

comment | *363* comment by: *AESA / DSANA*

COMMENT	JUSTIFICATION
Care has to be taken in relation to the possibility set by this requirement **AMC1 AUR.PBN.3005** that "*may require that the aircraft capability is conveyed to the air traffic controller*".	This possibility would require changes to the ATM systems in order to retrieve de information from **items 10** and **18** of the flight plan. These changes would have an operational and economical impact on the ATSPs.

response | *Noted.*

The Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents in conjunction with the relevant stakeholders. However, an AMC is one acceptable mean to comply with the requirement, and other ways may be possible.

comment | *374* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments **Section 3.2** **AMC1 AUR.PBN.3005** '***Mixed operations***'	In **AMC1 AUR.PBN.3005**, where it says *"The air traffic service provider should ensure that the air traffic controllers are capable of (…)*" it should say "***T****he* ***A****ir Traffic Service* ***P****rovider should ensure that the air traffic controllers are capable of (…)*" instead.	Typographical error

response | *Accepted.*

The typographical errors will be correct, please note that the revised proposal refers to ANSPs.

comment | *375* comment by: *AESA / DSANA*

PART	COMMENT	JUSTIFICATION
Proposed amendments Section 3.2 GM1 AUR.PBN.3005 '*Mixed operations*'	In the last paragraph of **GM1 AUR.PBN.3005**, where it says "*Mixed operations envisaged in (i) can either include different final approach procedures using ILS and/or GL, or those procedures envisaged in AUR.PBN.2015 (1), or PBN and non-PBN routes envisaged in AUR. PBN.2005(3) or (4).*" it should say "*Mixed operations envisaged in (i) can either include different final approach procedures using ILS and/or GL**S**, or those procedures envisaged in AUR.PBN.2015-(1), or PBN and non-PBN routes envisaged in AUR. PBN.2005(3) or (4).*" instead.	Typographical error

response | *Accepted.*

The typographical errors will be correct.

comment | *396* comment by: *NATS National Air Traffic Services Limited*

For mixed operations, the NPA requires aircraft capability to be displayed to controllers. This is evident but is dependent on the flight planning indications.

For planned airspace changes immediately post 2018, it is not clear whether it is feasible to update ICAO FPL2012 to ensure that RF, FRT and A-RNP functionalities can be entered into a

	flight plan by operators. Suggested resolution: A change to FPL2012 would not be required to support an RNAV1 mandate as provisions for entering RNAV capability currently exist.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation the required navigation specification to be used for implementation.

comment	*406* ❖ comment by: *LFV* **TERMINAL** - AUR.PBN.3005 and AMC1 AUR.PBN.3005: Mixed mode operations - The requirement to implement new types of procedures and at the same time find solutions how to serve operators not yet capable of the new procedures is not new but something ANSPs have always coordinated. The difficulty with the regulation described in the NPA is that the responsible entity doesn't have the opportunity to make this decision on actual facts such as amount of capable operators, relevant local objectives etc. This could lead to very odd restrictions and punishing of operators; operators that are important customers for the airports. For example: Many airports in Sweden have RNAV SID/STARs (P-RNAV) implemented. If "any change" is required, according to the NPA proposal these routes must be **replaced** with RNP 1 routes. The NPA proposal also states that "non-PBN" routes should be kept to serve the operators without PBN capability. At these airports the conventional SID/STAR have been decommissioned. That is the general solution at Swedish airports because of the great amount of traffic which is P-RNAV capable, leaving only a small number of operators needing vectors. The result will be this – the operators without PBN capability will not be affected at all because they were not capable of using the RNAV routes before and are still being vectored. But now we also will have all the operators that could use the P-RNAV SID/STARs to vector because most of them will not be RNP 1 capable. Or will there be a requirement for these airports to reimplement conventional routes? This could rarely be a step forward towards a PBN-environment as PBN is the enabler for SESAR to provide capacity, efficiency, access etc. Again, with no mandate for the operators, the NPA proposal will not be beneficial for SESAR deployment and cannot be defined as a "Total System Approach". In addition there's no tool available today to make it possible for all ATCO to separate acft with different capability for different clearances. The FPL system of today does not support filing the capability of RF, FRT or Adv-RNP and is therefore not available information for

	ATCO. For ATCO to find and keep track of capability of acft would increase ATCO workload and decrease capacity. **LFV proposes -** Implementation of new types of procedures (with new requirements) should be in relation to operator capability and adjusted to operator's needs (a fleet assessment) not to create and increase unnecessary environments/situations of mixed-mode operation.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to the obligations to equip aircraft and mixed navigation environments. The Agency recognises that AMC/GM proposed in the NPA need further definition and will improve their contents in conjunction with the relevant stakeholders.

comment	*466* comment by: *DGAC/DTA* **AMC1 AUR.PBN. 3005 Mixed operations** This mean of compliance solely states upon an air traffic control operator. Most of the time in class G airspace there is an AFIS agent whom is not allowed to give ATC clearance anyway.
response	*Accepted.*
	The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders. AFIS aerodromes may need to be specifically taken into account.

comment	*610* comment by: *Baranes* This operational concept is not mature. The flight plan is not accurate enough. ATM system not designed for displaying aircraft and aircrew capabilities. More studies have to be conducted to propose acceptable means of compliance.
response	*Noted.*
	The Agency recognises that AMC/GM proposed in the NPA needed further definition and will improve their contents in conjunction with the relevant stakeholders. Please refer to the response to the major concerns identified section of the Opinion in relation the required navigation specification to be used for implementation.

4. Regulatory Impact Assessment (RIA) - 4.1 Issues to be addressed p. 34

comment	*126* comment by: *Finavia* In practice, ICAO Doc 7030 and the European RNAV concepts implemented before the PBN have already limited the selection of applicable PBN specifications in Europe. The existing implementation status of RNAV 5 for ATS routes and RNAV 1 (P-RNAV) for TMA operations, should have been recognized also in this context. It is important that the regulation allows a controlled transition to new PBN requirements where needed.
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion. The introduction of PBN procedure as required to meet performance needs should ensure a controlled transition to PBN operations.

comment	*243* comment by: *ESSP-SAS* The third paragraph makes reference to ICAO Assembly Resolution 37-11 aiming at APV implementation to all instrument runway ends, while in the next sentence, the proposed regulation adresses only those where there is only a non-precission approach procedure in place.
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion.

comment	*270* comment by: *EUROCONTROL* **Page 34 - Regulatory Impact Assessment (RIA) - 4.1. Issues to be addressed** EUROCONTROL raises a point: Why, if left alone, would the State's choice of a PBN specification be also "unsafe" (3rd line)? Surely States would undertake safety assessments and build safety cases for their implementations.
response	*Noted.*
	Lack of harmonisation in respect of RNP or RNAV specifications implemented in adjacent airspaces may have an impact on safety.

comment	*323* comment by: *Airbus Helicopters* Definition of Type A and Type B approaches is missing. In 4.1.1 (a)(1), it is not clear which approaches are Type B. It is recommended to define Type A and Type B approaches in 4.1.
response	*Accepted*
	Approach operations have recently been classified by ICAO in accordance to the achieved minima: Type A (250 ft. or above) & Type B (below 250 ft.).

comment	*498* comment by: *AEA* **Regulatory Impact Assessment (Chapter 4, page 34)** **Comments** The impact analyses related to the introduction of RNP1 infrastructure in the TMAs and en-route airspace are assessed in a qualitative way and are not really convincing. Q. What is the reason that NO quantitative impact assessment was made for not even a couple of TMAs. It also would have made sense to include a few mixed traffic scenarios, e.g. 80/20, but apparently this was not done? A quantitative assessment provides better insight about the actual economic impact. Without having the intention to uphold progress in the implementation and usage of RNP1, the Airspace User Associations are requesting that such an impact assessment is made available to facilitate airspace users making RNP1 decisions in PBN investments for retrofit purposes.
response	*Noted.*
	The introduction of PBN procedure as required by the regulation is to meet local performance needs. Such local performance needs should demonstrate the benefits for an operator to equip their aircraft with the required PBN capability or not dependent upon the need to obtain the benefits from operating a PBN procedure.

comment	*526* comment by: *IATA* **Comments** The impact analyses related to the introduction of RNP1 infrastructure in the TMAs and en-route airspace are assessed in a qualitative way and are not really convincing. Q. What is the reason that NO quantitative impact assessment was made for not even a couple of TMAs. It also would have made sense to include a few mixed traffic scenarios, e.g. 80/20, but apparently this was not done? A quantitative assessment provides better insight about the actual economic impact. Without having the intention to uphold progress in the implementation and usage of RNP1, the Airspace User Associations are requesting that such

	an impact assessment is made available to facilitate airspace users making RNP1 decisions in PBN investments for retrofit purposes.
response	*Noted.*
	The introduction of PBN procedure as required by the regulation is to meet local performance needs. Such local performance needs should demonstrate the benefits for an operator to equip their aircraft with the required PBN capability or not dependent upon the need to obtain the benefits from operating a PBN procedure.

comment	*707* comment by: *UK CAA* **Page No:** 34 **Paragraph No:** 4. Regulatory Impact Assessment (RIA) **Comment:** To be consistent with the approach taken by EUROCONTROL in the PBN IR RAD and ANNEX E, Preliminary Economic Impact Assessment, the UK CAA believes that this RIA should also factor retrofit costs in the assessment. The UK CAA suggests that ANNEX E from the EUROCONTROL RAD, including the current levels of equipage in paragraph E.3.2.4, the projected levels of equipage in paragraph E.3.2.5 and the aircraft retrofit costs in E.3.2.7 are accounted for in the RIA. **Justification:** The proposed equipage requirements will introduce costs to operators using aircraft that are not RNP 1 and RF or Advanced RNP and FRT compliant from December 2018. Insisting on Mixed Operations is both inefficient and costly and will likely not be the outcome proposed by ANSPs. Therefore the cycle between aircraft operators and airspace change will not be broken and an unintended consequence will be a delay until a cost benefit for RNP 1 and RF or Advanced RNP and FRT can be shown.
response	*Noted.*
	One of the objectives of this proposed regulation is to implement proportionate PBN requirements for operators of aircraft for which the retrofit costs would be disproportionate compared to the expected benefits. The proposal enables the airspace users to operate aircraft having the capabilities to fly these new PBN routes and procedures when they have assessed a positive business case to do so or to operate their other aircraft (e.g. those which are expensive to retrofit or which are not yet retrofitted) to fly ATS routes and procedures where these capabilities are not needed. It is therefore an operator's individual assessment of the benefits of operation the route and procedure or not. Please also refer to the response to the major concerns identified section of the Opinion in relation to aircraft equipage and mixed navigation environment.

4.1.1. Background p. 34

comment *42* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
4.1.1. Background
(*a) 3D approach (or precision approach (PA)) is a final approach with both lateral and vertical*
guidance. There are 2 types of 3D approaches:

(1) 3D approach where the final approach is performed using ILS, MLS, GLS or SBAS-CAT I (Type A and Type B);

(2) 3D approach (or approach with vertical guidance – APV) including APV Baro-VNAV and APV SBAS (Type A).
[...]
(b)
(2) 2D PBN approach (or PBN approach with Lateral Navigation – LNAV only).
COMMENT:

1) APVs are not considered as precision approaches. Therefore 3D approaches are not always precision approaches- APVs should be addressed by a separate point. Please refer to e.g. ICAO Annex 10, Amendment 88B.
2) In the current state of ICAO documentation, "GLS" is a procedure title (Doc. 8168) and "GBAS" a navigation system name (Annex 10). It is then suggested to change here "GLS" for "GBAS" as this text refers to the system supporting a final approach.
3) It is suggested to use a single, homogeneous PBN terminology about approaches. Thus, "APV Baro" and "APV SBAS" should be replaced all throughout the document by "RNP APCH (down to) LNAV/VNAV and LPV" minima, respectively. Note that this terminology is already used e.g. in 4.5.2.1.

<u>New suggested text</u> (in this case only):
(a)
(2) 3D approach (or approach with vertical guidance – APV) including RNP approaches to LNAV/VNAV (Baro-VNAV) and LPV (SBAS) minima (Type A).

response *Partially accepted.*

The terminology regarding approaches is complex and a need for harmonisation is advisable. The Agency will use the correct terminology as appropriate.

Neither ICAO (Annex 6) nor Regulation (EU) No 923/2012 consider APV as a precision approach procedure. However, ICAO (Annex 6) refers to GLS when providing examples of precision approach procedures.

comment	*65* comment by: *ENAC ATM* For ICAO, APV is not included in Precision Approach classification. (a) (1) SBAS-CAT1(type A and type B) should be clarified (a) (2) APV SBAS (type A) should be clarified
response	*Partially accepted.*
	Certainly, neither ICAO (Annex 6) nor Regulation (EU) No 923/2012 consider APV as a precision approach procedure. Also, the text includes an error and should refer to SBAS CAT I instead of CAT 1. Please refer to ICAO Annex 6 in relation to classification of instrument approach operations based on the designed lowest operating minima.

comment	*244* comment by: *ESSP-SAS* It is not understandable why the way ICAO classifies instrument approaches is presented in such a different way within this IR. This adds complexity so something that is very well explained in ICAO documentation (Annex 6, Annex 14…).
response	*Noted.*
	The terminology regarding approaches is complex since they can be classified (also by ICAO) in accordance with different criteria.

comment	*245* comment by: *ESSP-SAS* In the "2D PBN approach" section, LP should ahve also been considered, as it provides lateral guidance with SBAS.
response	*Accepted.*
	LP is a recognised 2D minima and was omitted by error.

comment	*271* comment by: *EUROCONTROL* **Page 34 - Regulatory Impact Assessment (RIA) - 4.1.1 Background - (a)(1)** EUROCONTROL makes an observation:

SBAS-CAT I does not exist yet.

Page 34 - Regulatory Impact Assessment (RIA) - 4.1.1 Background - (b)

EUROCONTROL makes an observation:

For consistency, why did 2D approaches not have the ICAO classification Type A? Describing "2 types of 2D approaches" is confusing.

Page 34 - Regulatory Impact Assessment (RIA) - 4.1.1 Background - (b)(2)

EUROCONTROL makes a suggestion:

For clarity call a "2D PBN approach" a "RNP APCH" with lateral guidance only - LNAV.

response *Noted.*

The terminology regarding approaches is complex since they can be classified in accordance with different criteria. The Type A could have been added to the description as per the 2D description. However, the a 2D approach is a descriptive term and the applicable navigation specification is RNP APCH

SBAS CAT I is designed for 3D instrument approach operations and it is already recognised by ICAO as a precision approach procedure (see Annex 6).

comment *364* comment by: *AESA / DSANA*

COMMENT	**JUSTIFICATION**
The note included in this section is not totally correct. In particular: a) **3D** approaches performed using xLS or SBAS-CAT I (LPV200) can only be **Type A** (DH ≤ 250 ft); b) In fact, **SBAS-CAT I** is not a recognised standard; c) **3D** approaches performed using **SBAS** or **Baro-VNAV** (i.e. the current APVs) can only be **Type B** (DH > 250 ft);	It is precisely to overcome the current classification of approaches (NPA, APV, PA) that the new classification (2D/3D, Type A/B) has been developed.

response	*Not accepted.*
	APV SBAS operations flown to LPV minima can potentially get down to 200 ft (DA/H) if the aerodrome is appropriately equipped and within the appropriate EGNOS system coverage. SBAS CAT I has already been recognised by ICAO as a precision approach procedure (see Annex 6). Furthermore, it is possible to operate 3D approaches to a DH > 250ft. Thus, the description used the text are considered correct.

comment	*731* comment by: *AOPA Sweden* 4.1.1. (b) (1) There is one more type of 2D conventional approach: Localizer approach is also a non-precision approach - ILS without glide slope).
response	*Accepted.*
	LP is a recognised 2D minima and was omitted by error.

4.1.2. Safety risk assessment p. 35-36

comment	*127* comment by: *Finavia* The baseline situation described in the paragraph 'SIDs and STARs' on page 36 is at least partly outdated. It should have been recognized that the PBN is already implemented at many airports in Europe (for example 75% of the airports in Finland), mainly based on the navigation specification RNAV 1 (P-RNAV).
response	*Noted.*

comment	*733* comment by: *AOPA Sweden* This analysis should to a larger extent take into account GA operations. For further statistics on IFR and RNAV approaches AOPA and the Air Safety institute would be

	happy to share the statistics with EASA. According the Air Safety Institue, attempts to fly VFR into IMC caused 2.4 times more accidents as instrument approaches and 2.5 as many fatal accidents.For instance VFR flight in Mariginal weather can, with an RNAV approach in place , instead be flown safely under IFR. This is as strong reason why also smaller airports should get published RNAV approach procedures - also airports that today are limited to VFR due to lack of ATC.
response	*Noted.*
	The publication of an approach procedure is subject to a local decision. It should be also recognised that the scope of the affected airports is limited to that of the basic regulation.

4.1.3. Who is affected? p. 36

comment	*43* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.1.3. Who is affected?*** *The affected stakeholders are:* *— Air Traffic Service Providers (ATSPs) or aerodrome operators who will have to ensure the design and implement the mandated PBN approach procedures at all instrument runway ends where only a non-precision approach procedure is currently in place;* *— Air Traffic Service Providers (ATSPs) when they are required to implement PBN SIDs/STARs in* *order to meet performance objectives; and* **COMMENT:** Initial segments of SIDs could fall under the responsibility of aerodrome operators. It is suggested to widen the scope to include them, as in the case of approaches.
response	*Accepted.*
	The requirements reflect the possible involvement of aerodrome operators in the provision of SIDs/STARs.
comment	*44* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
4.1.3. Who is affected?
The following stakeholders will be indirectly affected by the rule [...]
COMMENT:

Suggest to add as indirectly affected stakeholders Air Navigation Service Providers (ANSPs) which are not ATSPs. For example, the implementation of PBN procedures could impact MET or DME/DME providers independent from the local ATS service provider.

response *Accepted.*

The regulation has been amended to be applicable to ANSPs.

comment *246* comment by: *ESSP-SAS*

The second bullet point refers to ATSPs "when they are required to implement PBN SIDs/STARs in order to meet performance objectives". It is deemed necessary to provide more reference on how this performance objectives are derived and by whom.

response *Accepted.*

The Agency will further developed the AMC/GM in conjunction with stakeholders to provide more detailed guidance on how to assess performance.

comment *247* comment by: *ESSP-SAS*

Airspace users will be affected not only because having to ensure about the proper training of their crews, but also about the proper airworthiness of their aircraft.

response *Not accepted.*

The regulation is addressed to ANSP and aerodrome operators who are required to implement the appropriate PBN requirements dependent upon performance needs. It is the aircraft operator's choice to operate those more beneficial procedure or not.

4.1.4. How could the issue/problem evolve? p. 36-38

comment *128* comment by: *Finavia*

Taking into account the advanced RNAV 5 implementation and many already existing RNAV 1 implementations in Europe, benefits of a harmonized RNP 1 implementation will be focused

	on airspaces with the highest capacity needs. As far as there will also be the requirement to maintain non-PBN procedures and the supporting NAVAID infrastructure, the maximum performance improvement is not going to be achieved, regardless of the selected PBN navigation specification.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

comment	*129* comment by: *Finavia* Regarding the discussion on page 38 about the implementation rates of APV, it is not credible to assume that the implementation rate observed during the last 3 years would define a linear trend applicable for almost 20 years of time in the future. The estimated year of the full compliance could then be whatever, depending on the assumptions made. The year 2033, however, is later presented as a result of Option 0, as well as used as a basis for the cost-benefit analysis. Furthermore, ICAO Assembly resolution 37-11 urges States to implement APV by 2016. The statement that without any regulatory provision the rate of implementation will remain far behind the schedule recommended by ICAO is agreed, but by defining the applicability date of the requirement to 2024 will not effectively expedite the implementation rate in the short term.
response	*Accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable implementation dates.

comment	*167* comment by: *skyguide Corporate Regulation Management* *Information collected in the ECTL PBN Map Tool* Plans in the Eurocontrol PBN Approach Map Tool are not systematically shown - especially the time frame from 2017+. It is not possible to evaluate the situation 2017-2024 with this tool and the extrapolation to 2033 does show a wrong picture. This part should be revised.
response	*Noted.*
	The date of 2033 was based on the extrapolated dated available. Any change to that date will affect the projected date.

comment *248* comment by: *ESSP-SAS*

It is highly suggested to update the information on PBN implementation as it has deeply evolved from end 2013. In fact, from an internal analysis based on ESSP's data gathering activities (shared with the GSA), the figures in page 37 of the NPA can be updated as follows (data corresponding to the **end of 2014**):

- 342 ~~501~~ of the instrument runway ends (IRE) out of ~~1291~~ 1302 have no precision or PBN approach procedure;
- ~~790~~ 579 IREs have no precision approach procedure, of which:
  - ~~104~~ 237 have currently an APV procedure and a non-precision PBN approach procedure in place;
  - ~~287~~ 165 have plans for the implementation of a APV procedure in the short term (before 2020~~4~~).

The number of runway ends which have an APV procedures are as follow:

- ~~605~~ 845 IREs with a precision or APV approach in 2013 (~~47~~ 65 % of the total);
- ~~892~~ 1010 IREs with a precision or APV approach or implementation plan for an APV approach before 2020~~4~~ (~~69~~ 78% of the total).

The instrument runway ends without precision or APV approach procedures are as follows:

- ~~399~~ 292 runway ends had at the end of 201~~43~~ no plans to implement an APV approach in the short term (before 2020~~4~~).
- However, if plans are not maintained, the number of instrument runway ends with no precision approach procedure in place would be ~~686~~ 457.

These figures show a perceptible acceleration of the PBN implementation in 2014, which cannot be obviated. This invalidates the argument (page 38) that all instrument runways in EU28+4 would be covered by a 3D approach by 2033; in fact, the figure in 2014 (845) would be quite close to the ICAO objectives (green columns in Figure 6, around 900 IREs for 2014), rather than to the extrapolated number (around 650 IREs). In summary, the pessimistic horizon for implementation stated in this NPA (2024) can be challenged following the current trends, therefore it could be possible to achieve more ambitious goals.

response *Noted.*

The data is always changing and the projection was based on the 2013 data. Subsequent data may show different results. With respect to the 2024 implementation date, please refer to the response to the major concerns identified section of the Opinion in relation to applicable implementation dates.

comment *273* comment by: *EUROCONTROL*

Page 37 - Regulatory Impact Assessment (RIA) - 4.1.4 How could the issue/problem evolve?

EUROCONTROL identifies four typos:

- The number of runway ends which have an APV procedure (singular, not plural) are as follows (with an "s")
- The word "precision" in 1st bullet under "The number of runway ends which have an APV procedure are..." should be retyped
- The instrument runway ends **without** precision or APV approach procedure (singular, not plural)

response *Noted.*

comment *296* comment by: *AvinorANSP*

The ICAO Assembly resolution 37-11[26] creates a strong commitment for the full implementation of RNP approaches by 2016 with an intermediate objective of 70 % implementation by the end of 2014 which is not being achieved. Therefore, if no regulatory provision is put in place, the rate of implementation of RNP approaches will remain far behind of the schedule recommended by the ICAO Assembly resolution 37-11.

Comment:

We agree that there is a need for a regulatory provision to ensure the implementation of RNP approaches. However the extension of 8 years compared to ICAO Assembly resolution 37-11 is not supported. We support the dates recommended by RAD Draft Interoperability Implementing Rule on Performance Based Navigation from SES/ Eurocontrol mandating implementation of APV approaches by 2018.

response *Not accepted.*

Please refer to the response to the major concerns identified section of the Opinion in relation to applicable implementation.

comment *437* comment by: *EUROPEAN COMMISSION GNSS Programmes*

The information data regarding PBN implementation within the European airspace has been extracted from the Eurocontrol PBN Approach Map Tool in 2013. These data, used to elaborate the Regulatory Impact Assessment, hardly take into account EC/GSA EGNOS adoption actions. Scenarios regarding planned and future APV implementation approaches within the European airspace may appear slightly different to what shaped by the 2013 PBN Approach Map Tool data.

response *Accepted.*

	The projections were based on the data used; any additional and separate initiatives will change these projections.

comment	*515* comment by: *CAA-N* P 38The ICAO Assembly resolution 37-11... ..."Therefore, if no regulatory provision is put in place, the rate of implementation of RNP approaches will remain far behind of the schedule recommended by the ICAO Assembly resolution 37-11" If the ICAO A37-11 and its content is emphasized like this, CAA-N questiones the time line in Article 6 2., with Subpart PBN AUR.PBN.2005(1) applying from 26. january 2024!
response	*Accepted.*
	Please refer to the response to the major concerns identified section of the Opinion regarding implementation dates.

comment	*625* comment by: *GSA* **Data used for the Regulatory Assessment** The information data regarding PBN implementation within the European airspace has been extracted from the Eurocontrol PBN Approach Map Tool in 2013. These data, used to elaborate the Regulatory Impact Assessment, hardly take into account EC/GSA EGNOS adoption actions. Scenarios regarding planned and future APV implementation approaches within the European airspace may appear slightly different to what shaped by the 2013 data analysis. In fact, from an internal analysis GSA-ESSP, the figures in page 37 of the NPA can be updated as follows (data corresponding to the **end of 2014**): · 342 ~~501~~ of the instrument runway ends (IRE) out of ~~1291~~ 1302 have no precision or PBN approach procedure; · ~~790~~ 579 IREs have no precision approach procedure, of which: o ~~104~~ 237 have currently an APV procedure and a non-precision PBN approach procedure in place; o ~~287~~ 165 have plans for the implementation of a APV procedure in the short term (before 2020~~4~~). The number of runway ends which have an APV procedures are as follow: · ~~605~~ 845 IREs with a precision or APV approach in 2013 (~~47~~ 65 % of the total); · ~~892~~ 1010 IREs with a precision or APV approach or implementation plan for an APV approach before 2020~~4~~ (~~69~~ 78% of the total). The instrument runway ends without precision or APV approach procedures are as follows: · ~~399~~ 292 runway ends had at the end of 201~~43~~ no plans to implement an APV approach in the short term (before 2020~~4~~). · However, if plans are not maintained, the number of instrument runway ends with no precision approach procedure in place would be ~~686~~ 457.

	These figures show a perceptible acceleration of the PBN implementation in 2014, which cannot be obviated. This invalidates the argument (page 38) that all instrument runways in EU28+4 would be covered by a 3D approach by 2033; in fact, the figure in 2014 (845) would be quite close to the ICAO objectives (green columns in Figure 6, around 900 IREs for 2014), rather than to the extrapolated number (around 650 IREs). In summary, the pessimistic horizon for implementation stated in this NPA (2024) can be challenged following the current trends, therefore it could be possible to achieve more ambitious goals.
response	*Noted.*
	The projections were based on the data used; this data is always changing and as the projection was based on the 2013 data, subsequent data may show different results.

4.2 Objectives p. 39

comment	*130* comment by: *Finavia* The proportion aspect is only reviewed from the perspective of aircraft operators, for which the retrofit costs are applicable. The assessment shall also take into account additional costs incurring to ATSPs and aerodrome operators, as well as to aircraft operators already invested on their PBN capability.
response	*Noted.*
	The regulation is addressed to ANSP and aerodrome operators who are required to implement the appropriate PBN requirements dependent upon performance needs. The cost incurred by ANSPs in implementing such routes and procedures should be part of the performance analysis.

comment	*249* comment by: *ESSP-SAS* • It is stated that a specific objective is to improve safety at "all" European aerodromes, but by not following ICAO recomendation many RWY ends will not have RNP APCH procedures. • Within the specific objectives there is no consideration towards the costs for ANSPs (maybe disproportionate compared to the expected benefits).
response	*Noted.*
	The regulation is addressed to ANSP and aerodrome operators who are required to implement the appropriate PBN requirements dependent upon performance needs. The cost incurred by ANSPs in implementing such routes and procedures should be part of the

	performance analysis. The safety needs are ensured at the other locations via the use of a Precision Approaches.

comment	*397* comment by: *NATS National Air Traffic Services Limited* Reference the "specific objectives of this task" section: The listed objectives of the task are supported but the choice of RNP leads to a greater fleet mix. The greater the fleet mix, the less efficient the airspace design becomes. EASA is asked to mandate the RNAV1 performance requirements for the reasons as given in comment 389 and as this would meet the overall objectives of the rulemaking task.
response	*Accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

4.3 Policy options p. 39

comment	*66* comment by: *ENAC ATM* No option is carried out about RNAV1 specification for terminal and En Route airspace. Only, the do-nothing or RNP1 specification is proposed (option 0 or 1).
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

comment	*131* comment by: *Finavia* Option 0 It is not agreed that in the Option 0 the PBN implementation would be on a pure voluntary basis. The RNAV 5 implementation requirement for the European ATS routes, as well as existing RNAV 1 (P-RNAV) implementations should have been taken into account in this context. In practice, ICAO Doc 7030 and the European RNAV concepts before the PBN have already limited the selection of available PBN specifications in Europe. There are also national PBN implementation plans directing the local implementations. Thus, also the Option 0 would include a certain level of harmonisation. It is also stated in the text that the Option 0 holds the risk of a delayed implementation of

	the ICAO Assembly resolution 37-11. However, as the proposed target of 2024 in Option 1 is far beyond the ICAO objective, it is not clear how the risk of the delayed implementations was higher in the case of Option 0 compared to Option 1. Option 1 The aim of the Option 1 is told to be the acceleration of the implementation of APV procedures. However, the implementation objective of ICAO for APV procedures is by 2016 and in the proposed PBN IR the objective was 2018. The proposed target of 2024 is far beyond the ICAO objective and is not likely to accelerate the implementation as there would be many years of time before the requirement would become applicable. The statement about non-mandatory requirements is not agreed and it is suggested to modify the text accordingly. The baseline situation in Europe is rather the ATS route network based on RNAV 5 that is PBN already. Many States already publish only RNAV based ATS routes. It is then difficult to see any other direction but to continue with PBN applications in any foreseen needs for changes in the ATS route network. Thus, the proposed Option 1 effectively is a mandatory requirement to move from RNAV 5 to RNP 1. The same applies also to RNAV 1 SIDs/STARs. This must be more clearly identified and assessed in the RIA. Regarding the functionality and performance requirements the PBN concept, as described in ICAO Doc 9613, includes a set of well defined navigation specifications. They are the basis of both the operational approvals and the published requirements applicable for each route or a procedure. It would be more unambiguous to also use those as a reference in the regulation or associated AMC, instead of just picking up a few attributes of the navigation specifications.
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

comment	*148* comment by: *European Helicopter Association (EHA)* Para 4.3: There is no policy Option considering the implementation of APV approach procedures at heliports. Only implementation at runways ends is considered. As reminded in 4.2, one main objective of the BR is to improve safety at all European aerodromes; i.e. including implicitly heliports. On another hand, it is widely recognized that APV approaches at Heliports improves safety of helicopter operations in adverse weather conditions. We recommend that in order to be fully in line with BR objectives, a 3rd policy Option which considers also the implementation of APV-SBAS (LPV) approach procedures at heliports is introduced.
response	*Noted.*
	With respect to rotorcraft operations, please note that the proposed rule has been revised and now incorporates routes and approach procedures to be implemented in accordance with RNP 0.3 specification.

comment	*165* comment by: *skyguide Corporate Regulation Management* **Chapter 4 RIA Policy Options** This will also give time to airspace users to plan the progressive upgrade of their fleets in order to avoid potential bottlenecks due to shortage of upgrade slots at the airframe manufacturers or at an approved Design Organisation or due to shortage of relevant equipment at avionics manufacturers. Comment: This regulation seems to look after the airspace user but forces ATC and Airports into mixed modes of Operations which creates additional complexity impacting on safety.
response	*Noted.*
	Please refer to response to the major concerns identified section of the Opinion in relation to mixed mode operations.

comment	*274* comment by: *EUROCONTROL* **Page 39 - 4.3 Policy options - Option 0 - 4th paragraph** EUROCONTROL makes an observation: "... it holds a risk of a delayed implementation... ". This NPA provides in fact an 8 year delay, which cannot be qualified as a risk.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to implementation dates.

comment	*324* comment by: *Airbus Helicopters* Airbus Helicopters fully shares comment n° 148 posted by EHA. Furthermore, at non-instrument Heliports, these APV-SBAS (LPV) procedures shall be of "Point-in-Space" type.
response	*Noted.*
	With respect to rotorcraft operations, please note that the proposed rule has been revised and now incorporates routes and approach procedures to be implemented in accordance with RNP 0.3 specification.

comment	*577* comment by: *CAA-N* P 39 Option 0 Furthermore, it holds the risk of a delayed... The text here implies negative implications if the ICAO A37-11 are being delayed. Consequently delaying the ICAO A37-11 are negative and should be avoided. This rationale raises even more questions to the date in Article 6, 2.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to implementation dates.

Option 1 p. 40-43

comment	*131* ❖ comment by: *Finavia* Option 0 It is not agreed that in the Option 0 the PBN implementation would be on a pure voluntary basis. The RNAV 5 implementation requirement for the European ATS routes, as well as existing RNAV 1 (P-RNAV) implementations should have been taken into account in this context. In practice, ICAO Doc 7030 and the European RNAV concepts before the PBN have already limited the selection of available PBN specifications in Europe. There are also national PBN implementation plans directing the local implementations. Thus, also the Option 0 would include a certain level of harmonisation. It is also stated in the text that the Option 0 holds the risk of a delayed implementation of the ICAO Assembly resolution 37-11. However, as the proposed target of 2024 in Option 1 is far beyond the ICAO objective, it is not clear how the risk of the delayed implementations was higher in the case of Option 0 compared to Option 1. Option 1 The aim of the Option 1 is told to be the acceleration of the implementation of APV procedures. However, the implementation objective of ICAO for APV procedures is by 2016 and in the proposed PBN IR the objective was 2018. The proposed target of 2024 is far beyond the ICAO objective and is not likely to accelerate the implementation as there would be many years of time before the requirement would become applicable. The statement about non-mandatory requirements is not agreed and it is suggested to modify the text accordingly. The baseline situation in Europe is rather the ATS route network based on RNAV 5 that is PBN already. Many States already publish only RNAV based ATS routes. It is then difficult to see any other direction but to continue with PBN applications in any foreseen needs for changes in the ATS route network. Thus, the proposed Option 1 effectively is a mandatory requirement to move from RNAV 5 to RNP 1. The same applies also to RNAV 1 SIDs/STARs. This must be more clearly identified and assessed in the RIA. Regarding the functionality and performance requirements the PBN concept, as described in

	ICAO Doc 9613, includes a set of well defined navigation specifications. They are the basis of both the operational approvals and the published requirements applicable for each route or a procedure. It would be more unambiguous to also use those as a reference in the regulation or associated AMC, instead of just picking up a few attributes of the navigation specifications.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to implementation dates and applicable PBN specifications.

comment	*132* comment by: *Finavia* The approach selected in Option 1 to not set any direct obligation for aircraft operators to equip with any specific PBN specifications and require provision for non-PBN applications for unlimited time period in the future shall be reassessed. With the proposed approach, the maximum performance improvement of the PBN implementation cannot be achieved. The effective implementation process requires consistent progress of both the aircraft capabilities and the procedures/routes. The cost impact of the general obligation to provide non-PBN routes and procedures has not been assessed on the appropriate level of accuracy. It is clear, that significant additional costs are incurred due to this requirement and in some cases it could even prevent the local PBN implementation as it would not be cost-effective. Even though there were existing non-PBN procedures available, continuous maintenance of the required navigation equipment imply additional costs. There are also airports having only PBN procedures available already, where the proposed requirement to also have non-PBN procedures available would only induce additional costs with no operational benefits. In the end, these additional costs are paid by the airspace users and it is disadvantageous for the airspace users already invested on their PBN capability. Regulation based requirements to provide a service level that is not justified by operational performance needs is not in line with the performance scheme objectives set for the provision of air navigation services. It is also important to note that currently, many States (for example Finland, Austria, Czech Republic, Estonia, Sweden and Norway) publish only RNAV 5 based ATS routes. There are no non-PBN routes available. In case it turns out that not all aircraft are capable for RNP 1 requirements, RNAV 5 shall be the alternative in support of PBN implementation, instead of the reliance on conventional navigation. Recent assessment of the fleet navigation capabilities in Finland, for example, indicated that less than 1 % of the civil IFR traffic was not capable for RNAV 5.
response	*Accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications. The proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request: - operational procedures or

- approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on existent non-PBN or PBN applications.

comment	*275* comment by: *EUROCONTROL*

Page 40 - 4.3 Policy options - Option 1

EUROCONTROL makes an observation that gives rise to two questions:

The mandated RNP APCH discusses some but not all of the functionalities. Why? Would it not be easier just to state RNP APCH?

Page 40 - 4.3 Policy options - Option 1 - (b)(2)

EUROCONTROL points out an inconsistency in values:

The vertical total system errors (TSEs) indicated do not appear to be correct. Reviewing against AMC20-27, it seems that these figures are the flight technical error (FTE). The vertical total system error (TSE) should be 199 ft below 5.000 ft, 238 ft between 5.000 ft and 10.000 ft and 296 ft above 10.000 ft.

Page 41 - 4.3 Policy options - Option 1 - (a) below FL 195 (2) functionality

EUROCONTROL points out an inconsistency giving rise to a question:

Contrary to content under (b)(2) on page 41, RF leg as a functionality is not mentioned here. Why?

Page 41 - 4.3 Policy options - Option 1 - (b) above FL 195 (1)

EUROCONTROL sees a typo at the end of the sentence.

response	*Noted.*
	The Agency has simplified how the applicable specification are addressed in the revised regulation. Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

comment	*303* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

The Swedish Transport Agency proposes that the appropriate PBN approval should be made

	mandatory for airline operators. The function, purpose and access rule for the non-PBN procedure in a PBN airspace must be clearly regulated.
response	*Accepted*.
	The Agency agrees that the appropriated PBN approval should be held by an operator before commencing PBN operations. This requirement does not need to be addressed in this regulation as it is an integral part of the air operators' requirements and SERA.

comment	*387* comment by: *NATS National Air Traffic Services Limited* SUBPART PBN, AUR.PBN.2005(4) + RIA 4.3 Page 41 Where it states: *(4) When implementing ATS routes using PBN to meet the network performance needs, the Network Manager, as required by Article 3(4)(a) of Regulation (EU) No 677/2011(14), shall ensure the coordinated design of the European Route Network that corresponds with the performance and functionality as defined in AUR.PBN.2015(4).* 1. 1. The role of the Network Manager (NM) in "co-ordinating implementations" is not clear. Will that function have a role in determining where the PBN ATS routes are implemented, in accordance with the ERNIP, or will it be left to the ATS provider. 2. 2. Where the NM "harmonises implementations', this suggests that the function would take on a greater leadership role in implementations. EASA is asked to more fully define and scope the role of the NM in co-ordinating ATS routes
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

comment	*425* comment by: *Rockwell Collins, Inc.* Page 40 Section 4.3 Option 1 Comment: NPA 2015-01 Option 1 Vertical TSE requirements are more stringent than and conflict with both ICAO Doc 9613 4.6.2 (in combination with ICAO Doc 9613 4.6.1) and AMC 20-27 6.3.2d. Both ICAO Doc 9613 and AMC 20-27 specify FTE (not TSE) of 150' At or below

	1500m (5000 ft) and 240' at other altitudes, as well as other conditions and other errors. Suggested Resolution: Reference instead applicable paragraphs of ICAO Doc 9613 Suggestion is Objection
response	*Accepted.*
	The regulation has been simplified and reference is now made to the appropriate navigation specification.

comment	*426* comment by: *Rockwell Collins, Inc.* Page 41 4.3 [Regulatory Impact] Option 1 (a) and (b) Comment: Discusses ATS routes above and below FL195 and ±1NM 95%TSE, which seemingly conflicts with a) aircraft equipment requirements for default en route operation of ±5NM (TSO-C115b or TSO-C129a) or ±2NM (TSO-C146AR), and b) expected requirements for scalable RNP (values other than 1NM) Suggested Resolution: Replace text with references to applicable paragraphs of ICAO Doc 9613 for RNP. Explicitly state any aircraft equipment requirements for scalable RNP, meaning RNP values other than 2NM, 1NM or 0.3NM. Comment is Suggestion
response	*Accepted.*
	The regulation has been simplified and reference is now made to the appropriate navigation specification.

comment	*518* comment by: *Thales Avionics* Comment: Option 1 -(b)(2) Vertical TSE figures are for level flight segments only. For non level flight segments, other figures are defined in AC20-138D/DO236-C: 160 ft below 5000 ft, 210 ft between 5000 and 10000 ft, to 260 ft above FL290. Proposed formulation/Recommended Change:Option 1 -(b)(2): Add the non level flight segment requirements
response	*Partially accepted.*
	The regulation has been simplified and reference is now made to the appropriate navigation specification.

comment	*519* comment by: *Thales Avionics* Comment : (b) RNAV/RNP Holding are also available above FL195. Proposed formulation/Recommended Change:(b) Add RNAV/RNP Holding above FL195
response	*Not accepted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to mixed mode operations.

comment	*641* ❖ comment by: *Virgin Atlantic Airways - Flight Technical Support* Regarding the requirement for FRT, we do not believe that the need for this functionality is proven from either an efficiency perspective or as capacity enhancment tool. An FMS hardware retrofit would be required on a large number of airframes to meet this requirement - even some that have only recently entered service. A more robust CBA should be provided to enable further assessment by operators. Additionally, this functionality would not be required to deliver the stated service provision of Free Routes/user-preferred trajectories as it would be inconsistent with the concept; the value in high density airspace is undetermined at this point.
response	*Partially accepted.*
	FRT functionalities have been removed from the revised draft rule. Please see also the response to the major concerns identified section of the Opinion regarding the proposal of navigation specifications to be adopted.

comment	*708* comment by: *UK CAA* **Page No:** 41 **Paragraph No:** 4.3 **Comment:** Within the 'Harmonised PBN implementation' document there is a minimum requirement for RNAV Holding with RNP 1 SIDs and STARs. RNAV Holding is not included as a function within the RNP 1 or RNP APCH navigation specifications in the PBN Manual and only appears as "Required" under the Advanced RNP specification. UK CAA recommends that text be added stating that RNAV holding is an additional requirement for association with RNP 1 and RNP APCH and amend AUR.PBN accordingly. **Justification:** The inconsistency between the minimum requirement for RNAV Holding and the definitions of RNP 1 and RNP APCH according to the navigation specifications in the ICAO

	PBN Manual requires reconciliation.
response	*Accepted.*
	The regulatory provisions refer to ICAO's PBN specifications plus additional functionalities when necessary.

4.5 Analysis of impacts - 4.5.1. Safety impact p. 45

comment	*45* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.1. Safety impact*** **COMMENT:** a) This section should discuss the potential risk implications of mixed PBN and non-PBN environments, particularly if both traffic volumes are of the same magnitude. b) This section seems to ignore the initial, intermediate and missed segments of approach procedures. Indeed, no sub-section addresses them. It is suggested that they be addressed in the future. c) Safety benefits of PBN ATS routes have been placed elsewhere (4.5.5.4.1). It is suggested to create a specific section in 4.5.1.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to mixed mode operations.

comment	*67* comment by: *ENAC ATM* No option is carried out about RNAV1 specification for terminal and En Route airspace. Only, the do-nothing or RNP1 specification is proposed (option 0 or 1).
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to mixed mode operations.

comment	*166* comment by: *skyguide Corporate Regulation Management* **4.5.1 Safety Impact** • The safety impact described in this document is of a high level qualitative type which focuses purely on the positive safety impact and ignores potential negative ones. • This regulation as is stands today forces mixed operations for an undetermined period of time. This increases the complexity of operations and increases the risks of errors being made by operational personnel trying to manage the mixed operations. • This indefinite period of mixed traffic needs to be urgently addressed in this regulation, and requirements need to be put on aircraft operators to ensure compliance within a certain period.
response	*Noted.*
	The regulation does not mandate mix mode to be in operation at all times and indefinitely. It should be noted that the availability of these non-PBN instrument approach procedures and routes may be limited, dependent upon operational performance objectives.

comment	*250* comment by: *ESSP-SAS* ADS-B surveillance is not necessarily lost in all cases if GNSS is lost, because an Inertial position source can be on-board feeding ADS-B data.
response	*Not accepted.*
	The comment is correct in principle that the position source for ADS-B could be derived from another source on the aircraft. However, the CS-ACNS requires the horizontal position to be derived from GNSS data and other position source needs to be equivalent to a GNSS source.

comment	*626* comment by: *GSA* **Safety impact** ADS-B surveillance is not necessarily lost in all cases if GNSS is lost, because an Inertial position source can be on-board feeding ADS-B data.
response	*Not accepted.*
	The comment is correct in principle that the position source for ADS-B could be derived from another source on the aircraft. However, the CS-ACNS requires the horizontal position to be derived from GNSS data and other position source needs to be equivalent to a GNSS source.

4.5.1.1 Final Approach Operations p. 45-46

comment *46* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
4.5.1.1 Final Approach Operations

— It must be highlighted that according to the current Agency AMC for RNP APCH (AMC 20-27), the distance from the next way point is displayed to the pilot. It is foreseen that this functional capability will be maintained when the airworthiness part of AMC 20-27 is migrated into the forthcoming update of the CS-ACNS addressing the Navigation Subpart.

— The runway threshold may not be displayed to the pilot in the cases where intermediate fixes (e.g. step down) are coded in the navigation database. This may increase the workload of the flight crew. It is foreseen that this aspect will be incorporated in the forthcoming update of the CS-ACNS.forthcoming update of the CS-ACNS addressing the Navigation Subpart.
COMMENT:

The first bullet should read:
"-It must be highlighted that according to the current Agency AMC for RNP APCH (AMC 20-27), the distance from to the next way point is displayed to the pilot. It is foreseen […]".

Regarding the second bullet, there is no general rule for coding step down fixes (there is no reference to that in the ICAO PANS-OPS Doc. 8168). When these fixes are not coded it is desirable to code the threshold instead.

response *Partially accepted.*

The comment with regards the first bullet is accepted. With regard to the second point the comments are noted. Doc 9613 requires the navigation system to be capable of altitude constraints.

comment *47* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
4.5.1.1 Final Approach Operations

Indeed, if both the approach and the missed approach procedures are based on GNSS, a GNSS failure becomes a common mode of failure for these two segments of the flight.

Should it be the case, this should be carefully studied in the frame of the associated safety case, and appropriate mitigation measures should be defined.
COMMENT:

The analysis of the common GNSS loss between final and missed approaches is found superficial and lacking in specific mitigations. It should be further developed.

Indeed, this situation admits mitigations more apt to be undertaken at European level than locally. Common guidance and/or standardisation of "extraction procedures" in case of common GNSS loss in approach seems essential.

Indeed, this situation could happen before PBN, e.g. in conventional non-precision approach procedures completely based on a single navaid. But in ENAIRE's experience, detailed safety analyses of these cases do not usually exist, owing to the fact that these procedures were introduced decades before risk analysis and mitigation became mandatory for ANSPs.

Currently, extraction procedures are left to each airspace user (AMC 20-27A / 20-28), as engine-out procedures. Significant issues concerning a) the compatibility of extraction procedures with the operational environment (among several users, between the users and SIDs/non-GNSS approaches, with ATC procedures etc) and b) the actual capacity of General Aviation users to define such extraction procedures, can be foreseen.

Local safety cases cannot provide an homogeneous solution – one of the drivers for Option 1 in this NPA.

response *Noted.*

Harmonised contingency procedures will be further developed in conjunction with stakeholders within the AMC/GM material supporting this regulation.

comment *133* comment by: *Finavia*

The statement that the introduction of APV procedures would allow a better separation from obstacles shall be reworded or deleted. APV procedures improve safety by providing the vertical guidance, but the improvement of the navigation performance is exploited in procedure design by providing lower minima that still ensure sufficient obstacle clearance.

response *Not accepted.*

The comment is noted however the text of the RIA will not be updated.

comment *134* comment by: *Finavia*

The comparison of the safety benefits between the Options 0 and 1 shall be reassessed. There are no credible arguments to justify exactly these years put in comparison here. The year 2033 is based on the assumption that the implementation rate observed during the last 3 years would define a linear trend applicable for almost 20 years of time in the future. The estimated year of the full compliance could then be whatever, depending on the assumptions made. On the other hand, the applicability date of the proposed regulation in 2024 is not effectively expediting the implementation rate in the short term.

response *Noted.*

	Please refer to the response to the major concerns identified section of the Opinion in relation to implementation dates.

comment	*251* comment by: *ESSP-SAS* Safety benefits should be translated into economic benefits and included in the overall RIA economical analysis.
response	*Noted.*
	The impact assessment highlighted the safety issues and the potential positive contribution to its reduction with the draft rules (Option 1). This qualitative analysis was found sufficient. The quantification of the impacts focussed on the economic impacts to assess if the benefits would outweigh the costs. Option 1 being clearly beneficial from an economic point of view, it is not necessary to quantify the safety benefits to justify a positive outcome for Option 1.

4.5.1.2 Operations within SIDs and STARs p. 46

comment	*48* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.1.2 Operations within SIDs and STARs*** *The PBN aircraft performance and capabilities on the basis of which SIDs and STARs will be designed will lead to a significant improvement in operations, including a better adherence to the ATS route centreline in turns, allowing the reduction of the route spacing on straight line segments as well as on around turns. Moreover, the introduction of VNAV will increase the predictability of the vertical profiles and will allow strategic deconflicting of the routes. The introduction of the PBN SIDs and STARs will potentially allow the complete deconflicting of the arrival and departure traffic flow, increasing the capacity in the terminal area whilst maintaining an acceptable level of safety* **COMMENT:** It must be noted that the PBN concept does not consider yet the altimetry performance (VNAV) as equivalent to "vertical RNP", even though some navigation specifications do include requirements for vertical guidance based on augmented GNSS or Baro VNAV. Deconflicting will be achievable by a combination of adequate procedures and operational measures (ATM/ATC measures), not just by procedures design.

response	*Accepted.*
	The use of VNAV outside of the RNP APCH procedure at present is just advisory.

comment	*49* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.1.2 Operations within SIDs and STARs*** *The coding of the vertical profile in the Flight Management System (FMS) will result in a reduction of the pilot workload and an improvement of the consistency of the way the routes are flown.* **COMMENT:** This sentence should be reformulated, since the coding of the vertical profile is not a RNP 1 functional requirement. In fact, the vertical profile is calculated by each FMS taking into account two waypoints, the distance between them, the path terminator defined and the speed and altitude constraints, apart from considering the aircraft performances as well.
response	*Partially accepted.*
	VNAV outside of the RNP APCH procedure at present is just advisory; however its use will reduce crew workload.

comment	*50* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.1.2 Operations within SIDs and STARs*** *In this RIA, it is assumed that the implementation of the outcome of the Agency rulemaking task RMT.0477 ('Technical requirements and operational procedures for aeronautical information services (AIS) and aeronautical information management (AIM)') will ensure the required level of data integrity and accuracy needed, allowing a safe implementation of PBN SIDs and STARs procedures and routes.* **COMMENT:** a) Suggest to add RMT.0593 and RMT.0594 (*Technical requirements and operational procedures for the provision of data for airspace users for the purpose of air navigation*). RMT .0477 by itself does not guarantee the integrity of the full PBN data chain. b) Data integrity is relevant for all PBN applications. It is particularly critical for SBAS-based RNP approaches. However, the relevance of this subject is only mentioned in 4.5.1.2 and in 4.5.5.4.1 (en-route). Some reference should be added in 4.5.1.1.

response | *Accepted.*

The integrity of the data used in PBN is highly important for safe operations. Both the Technical requirements and operational procedures for aeronautical information services (AIS) and aeronautical information management (AIM) and Technical requirements and operational procedures for the provision of data for airspace users for the purpose of air navigation are required to ensure this integrity.

comment | *51* comment by: *ENAIRE*

NPA 2015-01 REFERENCE:
4.5.1.2 Operations within SIDs and STARs

Option 0

In the context of Option 0, these safety benefits may be achieved if the selected PBN functionality and performance are the same as those required in the draft IR. However, the safety impact will be negligible if another set of PBN functionality and performance (e.g. RNAV 1) is only selected.
[...]
Option 1

Option 1 will ensure that the safety benefits described above will be provided when PBN SIDs and STARs are designed in accordance with the required PBN functionality and performance.
COMMENT:

The risks associated to mixed traffic environments (PBN/non PBN, as well as among different PBN applications in option 0) do not seem assessed by this section. However, some reference is made to them in 4.5.5.1, “Airspace disharmonisation”. It is suggested to tackle this issue in 4.5.1 as well- and with more detail.

It is probable that in Option 0, lack of aircraft capability awareness by ATS personnel, due to excessive PBN specifications being present in a single scenario, would increase risks with regard to option 1.

response | *Noted.*

comment | *252* comment by: *ESSP-SAS*

	Fuel burn savings should be included into the overall economic benefits of the RIA analysis.
response	*Noted.*
	Fuel savings are addressed as an important factor in the RIA.

comment	*276* comment by: *EUROCONTROL*
	Page 46 - 4.5.1.2 Operations within SIDs and STARs EUROCONTROL sees a typo on 1st line: It should be STARs. EUROCONTROL makes a comment: It can be confirmed that safety levels of option 1 (even if spacing between SIDs and STARs is reduced with respect to option 0) are acceptable. However, suggesting that option 1 is safer than option 0 seems a bit biased. Additionally, option 1 would imply a higher percentage of mix mode operations/traffic (different fleet equipment operating in RNP 1 SIDs and STARs, or conventional SIDs and STARs in the same TMA). This mix mode operations/traffic would imply additional workload for ATCOs and potentially could have a negative impact on safety. **Page 46 - 4.5.1.2 Operations within SIDs and STARs - Option 0** EUROCONTROL makes a comment: Surely, safety will not be impacted. However, PBN does not allow RF to be associated with RNAV and there is no on board performance monitoring and alerting (OPMA).
response	*Noted.*

4.5.1.3 Overall safety impact p. 47

comment	*277* comment by: *EUROCONTROL*
	Page 47 - 4.5.1.3 Overall safety impact

	EUROCONTROL makes a comment: Option 1 shows "+", meaning benefits. Without mandating carriage of RNP1 with RF surely this would just be status quo or even negative due to the percentage of aircraft which would need to be managed conventionally.
response	*Noted.*
	The overall benefit are positive when operators are capable of ensuring that type of operation.

comment	*579* comment by: *CAA-N* P 47 4.5.1.3 Overall Safety impact When comparing Option 0 with option 1 on the Final approach segment, it is hard to understand how a 8 year delay of implementing APV could represent a plus on overall safety impact? Option 0 represents a pressure for Aerodromes and ATSP towards the ICAO A37-11, hence implementing APV as soon as possible to relevant IRE, and a potential reduction of CFITs.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to implementation dates.

4.5.2. Environmental impact - 4.5.2.1 Final Approach Operations p. 47

comment	*52* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.2. Environmental impact*** **COMMENT:** Please clarify why noise reduction, due to more flexible PBN SID/STAR/approach procedure design criteria, has not been included in this section.
response	*Noted.*
	The noise issue is not easy to address because it depends on the context. On the one hand, more accurate routes (improved track keeping performance) could help avoid the overflight of certain areas and reduce noise impact on them. On the other hand, lack of route dispersion could have the opposite effect and increase noise under the new PBN routes.

4.5.2.2 Operations within SIDs and STARs p. 48

comment	*253* comment by: *ESSP-SAS* A lot of envoronmental analysis on conventional vs.PBN/CDO have been conducted under SESAR AIRE projects. These shall be used within the figures of the environmental analysis.
response	*Noted.*
	SESAR projects are not always publically available to reference.

comment	*325* comment by: *Airbus Helicopters* It is not clear why Option 1 will provide the same environmental benefits as Option 0. In Option 0, environmental benefits depend on the willingness of stakeholders. Consequently, there is no guarantee in Option 0 that these benefits will be achieved. In Option 1, because of the PBN implementation mandate, it is more likely significant environmental benefits will be achieved. Impact of Options 0 and 1 on environmental benefits should be reconsidered.
response	*Noted.*
	It is not intended to review this part of the analysis.

4.5.2.3 Operations along ATS routes (En route or terminal operations) p. 48-49

comment	*326* comment by: *Airbus Helicopters* It is not clear why Option 1 will provide the same environmental benefits as Option 0. In Option 0, environmental benefits depend on the willingness of stakeholders. Consequently, there is no guarantee in Option 0 that these benefits will be achieved. In Option 1, because of the PBN implementation mandate, it is more likely significant environmental benefits will be achieved. Impact of Options 0 and 1 on environmental benefits should be reconsidered.
response	*Noted.*

It is not intended to review this part of the analysis.

4.5.2.4 Overall environmental impacts p. 49

comment	*278* comment by: *EUROCONTROL* **Page 49 - 4.5.2.4 Overall environmental impact** EUROCONTROL makes a comment that should give rise to an adaptation of text: The analysis is limited to the reduction of CO2 emissions without considering the benefit on noise reduction that has a social impact. This benefit is also not mentioned in 4.5.4. Social impact (page 50).
response	*Noted.*
	The noise issue is not easy to address because it depends on the context. On the one hand, more accurate routes (improved track keeping performance) could help avoid the overflight of certain areas and reduce noise impact on them. On the other hand, lack of route dispersion could have the opposite effect and increase noise under the new PBN routes.

4.5.4. Social impact p. 50

comment	*53* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.4. Social impact*** **COMMENT:** a) Please clarify why the social benefits derived from noise avoidance over populated areas, due to more flexible PBN SID/STAR/approach procedure design criteria have not been included in this section. In fact, this subject is not mentioned in the whole RIA. b) Editorial – there is no section 4.5.3.
response	*Noted.*

The noise issue is not easy to address because it depends on the context. On the one hand, more accurate routes could (improved track keeping performance) help avoid the overflight of certain areas and reduce noise impact on them. On the other hand, lack of route dispersion could have the opposite effect and increase noise under the new PBN routes.

comment *107* comment by: *Heathrow Airport Limited*

This is absolutely wrong.
What evidence has been used to make this statement? Heathrow has witnessed a huge social impact of concentrating routes through PBN - suggest you intelligence gather in the UK and look at the impact the PBN trials across the country have had and complete further research.

response *Noted.*

The social impact is due to the noise issue which is not easy to address because it depends on the context. On the one hand, more accurate routes could (improved track keeping performance) help avoid the overflight of certain areas and reduce noise impact on them. On the other hand, lack of route dispersion could have the opposite effect and increase noise under the new PBN routes.

As PBN is to be implemented based on a performance objective, it is part of the local assessment and social impact could also be taken into consideration.

comment *254* comment by: *ESSP-SAS*

Noise abatement, avoided disruptions and higher aerodrome accessibility should be included as social benefits (e.g. emergency services).

response *Noted.*

The noise issue is not easy to address because it depends on the context. On the one hand, more accurate routes (improved track keeping performance) could help avoid the overflight of certain areas and reduce noise impact on them. On the other hand, lack of route dispersion could have the opposite effect and increase noise under the new PBN routes.

comment *709* comment by: *UK CAA*

Page No: 50

Paragraph No: 4.5.4

Comment: Contrary to the statement that no social impacts are expected from the

application of the proposed regulatory provisions, the UK experience is that any IFP changes arising from the implementation of PBN are likely to encounter opposition on environmental impact grounds and that this could limit the ability of an airport or ANSP to meet local performance objectives. If the regulation is to become a measure of how PBN is deployed throughout the EATMN, the social impact of airspace change should be acknowledged, even if only as a local consideration. Concentration of traffic is a feature of PBN operations (through better track keeping performance) and, at lower altitudes, this negates the positive impact of noise dispersion on effected communities. The potential for legal challenge against IFP changes may limit the ability of the ATSP to implement PBN procedures either at all, or in the required timescale.

The regulation should identify the potential adverse environmental impact associated with implementation of PBN and in particular, from changed tracks over the ground.

Justification: To allow ANSPs to gain an accurate perspective of the impact of PBN.

Proposed Text: Amend paragraph 4.5.4 to read:

"There is potential for local opposition to any IFP on environmental impact grounds arising from the introduction of PBN routes. Consideration is to be given to these issues during the consultation and planning phases of any airspace change."

response | *Not accepted*.

The comment is noted however the text of the RIA will not be updated. As PBN is to be implemented based on a performance objective, it is part of the local assessment and social impact could also be taken into consideration.

4.5.5. Economic impact - 4.5.5.1 Network perspective p. 50

comment | *83* comment by: *CANSO*

4.5.5.1 Network perspective:

- The risk reported in the paragraph, related to fragmented PBN application among neighbouring Member States, does not exist because the PBN Manual ensures uniformity of navigation specification, but the date too close for the implementation (even if reformulated in terms of A-RNP) is likely to generate fragmentation of application with the real possibility of having contiguous airspaces with 3 different specifications (A-RNP, RNAV 1 and conventional).
- Whenever benefits are mentioned against non-precision procedures the latter should be specified as "Conventional NPAs";
- There is the need to uniform the concept of runway. Inside the IR is mentioned alternatively runway and instrumental runway. The implications of these uses may be different and so it needs to be clarified.

response	*Noted.*
	It is important to note that PBN Manual does not prevent fragmentation or dis-harmonisation because ICAO's technical manuals provide guidance and information. They do not constitute applicable standards, therefore, it is important to address this in the proposed regulatory initiative. The concept used not only takes account of conventional procedures, but also PBN approaches without vertical guidance.

comment	*135* comment by: *Finavia* Argumentation of the economic impact assessment is not fully agreed and that might require the results being reassessed accordingly. Regarding the discussion about airspace disharmonisation, for ATS route network in Europe the PBN navigation specification RNAV 5 is already implemented. Thus, there is no huge variety of available PBN navigation specifications to choose from. In any case, operators need to prepare for the possibility of other navigation specifications for operations outside Europe. Regarding the discussion about airspace connectivity, it is only relevant in Europe to the very limited extent. For the ATS route network the PBN is already implemented as RNAV 5. For the introduction of RNP 1 requirement, it is important to ensure a controlled transition process to avoid the foreseen situation with mixed RNAV 5 and RNP 1 requirements in the route network. Otherwise it is specifically the Option 1 that would result in more problems in airspace connectivity in the short term future.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to applicable PBN specifications for en-route phases of flight. Certainly, RNAV 5 will remain applicable in Europe and Free Route is also contemplated above flight level 310 in the ICAO EUR region by the PCP IR.

comment	*198* comment by: *ENAV* - 4.5.5.1 Network perspective: The risk reported in the paragraph, related to fragmented PBN application among neighboring member States, does not exist because the PBN Manual ensures uniformity of navigation specification, but the date too close for the implementation (even if reformulated in terms of A-RNP) is likely to generate fragmentation of application with the real possibility of having contiguous airspaces with 3 different specifications (A-RNP, RNAV 1 and conventional);
response	*Noted.*

	It is important to note that PBN Manual does not prevent fragmentation or dis-harmonization because ICAO's technical manuals just provide guidance and information. They do not constitute applicable standards, therefore it is important to address the present regulatory initiative.
comment	*279* comment by: *EUROCONTROL* **Page 50 - 4.5.5.1 Airspace connectivity - 4th bullet** EUROCONTROL makes several observations that give rise to the raising of an issue: Without a mandate there will be a mixed fleet capability. Therefore, connectivity will be based on the awareness of aircraft capability. This may be provided from the flight plan (if PBN codes are developed for the functionalities) or via Direct Controller Pilot Communications (DCPC). The important issue is controller workload as it will be the ATCO to identify who can/can't operate on the RNP1 routes.
response	*Not accepted.*
	The Agency recognises the importance of making available timely information on PBN capabilities to ATCOs. Please refer to the response to the major concerns identified section of the Opinion in relation to mixed operational environment and aircraft equipage. It is also operator's responsibility to conform to applicable approvals before performing PBN operations.
comment	*573* comment by: *HungaroControl* 4.5.5.1 Network perspective: • The risk reported in the paragraph, related to fragmented PBN application among neighbouring Member States, does not exist because the PBN Manual ensures uniformity of navigation specification, but the date too close for the implementation (even if reformulated in terms of A-RNP) is likely to generate fragmentation of application with the real possibility of having contiguous airspaces with 3 different specifications (A-RNP, RNAV 1 and conventional). • Whenever benefits are mentioned against non-precision procedures the latter should be specified as "Conventional NPAs"; • There is the need to uniform the concept of runway. Inside the IR is mentioned alternatively runway and instrumental runway. The implications of these uses may be different and so it needs to be clarified.
response	*Noted.*

It is important to note that PBN Manual does not prevent fragmentation or dis-harmonisation because ICAO's technical manuals just provide guidance and information. They do not constitute applicable standards, therefore it is important to address the present regulatory initiative. The concept used not only takes account of conventional procedures, but also PBN approaches without vertical guidance.

4.5.5.2 Final Approach Operations - 4.5.5.2.1 Benefits of RNP approach implementation (avoided flight diversions) p. 51-53

comment	*108* comment by: *Heathrow Airport Limited* These benefits will not be realised at aerodromes that already have precision approaches - we need to see the benefits for Heathrow weighed against the cost of consultation to actually get a true benefit picture. In addition there should be a section on risks assocciated with introduction.
response	*Noted.*
	APV are not contemplated at runway ends where there are instrument approach procedures in place.

comment	*136* comment by: *Finavia* The basis for the estimation of the overall maximum benefit of the APV implementation shall be reassessed. There are no credible arguments to justify exactly these years put in comparison here. The year 2033 is based on the assumption that the implementation rate observed during the last 3 years would define a linear trend applicable for almost 20 years of time in the future. The estimated year of the full compliance could then be whatever, depending on the assumptions made.
response	*Noted.*
	The data is always changing and the projection was based on the 2013 data; subsequent data may show different results.

comment	*199* comment by: *ENAV* • - Whenever benefits are mentioned against non-precision procedures the latter should be specified as "Conventional NPAs";

	• - There is the need to uniform the concept of runway. Inside the IR is mentioned alternatively runway and instrumental runway. The implications of these uses may be different and so it needs to be clarified.
response	*Noted.*
	The concept used not only takes account of conventional procedures, but also PBN approaches without vertical guidance.

comment	*255* comment by: *ESSP-SAS* '"In general, the combination of Baro with BAS (Scenario 2 in the study)". There is a typo, it should be "SBAS" instead of "BAS".
response	*Noted.*

comment	*256* comment by: *ESSP-SAS* The rationalization of navaids is a major economic benefit which is missing in this RIA assessment.
response	*Noted.*
	ATS routes and procedures based on conventional NAVAIDS are less efficient and constrained by the positioning of the supporting infrastructure; however, market mechanisms and performance needs in the short to medium term are anticipated to lead to the rationalisation of the conventional procedures and infrastructure.

comment	*257* comment by: *ESSP-SAS* The text reads: "This aspect is assumed to be neutral at EATMN level, as the aerodrome charges will in any case be paid by the aircraft operator either at the original destination aerodrome or at the aerodrome to which the flight has been diverted." This is true except for flight cancellations, which should be looked at.
response	*Noted.*

comment	*280* comment by: *EUROCONTROL* **Page 51 - 4.5.5.2.1 Benefits of RNP approach implementation (avoided flight diversions) - 1st paragraph** EUROCONTROL makes an observation that should give rise to an adaptation of text: "….avoiding flight diversions….". Diversions will still occur; therefore "reducing flight diversions" would be a better statement. EUROCONTROL sees a typo in 6th line: non-precision **Page 51 - 4.5.5.2.1 Benefits of RNP approach implementation (avoided flight diversions) - 5th paragraph** EUROCONTROL makes a comment that needs to give rise to an explanation: It is not possible to understand/know what BAS stands for in line 8.
response	*Noted.*
	Certainly APV would reduce flight diversions, but the possibility to divert from the aerodrome cannot be dismissed. There is a typographic error, it should say "SBAS" instead of "BAS".

comment	*327* comment by: *Airbus Helicopters* The statement that, in 2014, all runway ends have either an APV or PA procedure seems inconsistent with Fig.5 on Page 38. Fig.5 page 38 mentions that, in 2013, there was 399 runway ends without 3D approach and without PBN approach implementation plan. It is suggested to check consistency between Fig.5 and 4.5.5.2.1.
response	*Noted.*
	Table 2 (page. 42, 43) presents a summary of the different scenarios.

comment	*734* comment by: *AOPA Sweden* AOPA Sweden agrees that the pace of implementing PBN approaches must be accelerated

	and promoted. From a GA standpoint, the benefit is clear wether the approach is LNAV or PBN. Today the cost for establishing an RNP approach at an airfield is unproportionally high. Measures for lowering the this cost should be further examined. For small private/municipal airports the cost for establishing RNP approaches and airspace could cause them to cease IFR operations, even though the long term benfits are clear. This means that there is a dysfunctionallity in terms of financing the system that should be adressed. One way of adressing it is to keep a mechanism that promotes the cost efficient creation of RNP approach procedures. The present cost (given in the RIA and probly close to the cost) is an effective obstacle for establishing RNAV approaches into presently VFR airports. For instance, in Sweden there are appx 20 airports that used to be IFR but now limited to VFR operation. These airports could by easy means and an RNAV approach be upgraded to RNAV and IFR again if the cost is the right.
response	*Noted.*
	Any potential funding mechanisms are outside the scope of this task.

4.5.5.2.2 Cost of RNP approach implementation p. 53-55

comment	*109* comment by: *Heathrow Airport Limited* You have not included the cost of consultation so the total is incorrect
response	*Noted.*
	This cost is very difficult to estimate and will be part of determining the performance objectives.

comment	*258* comment by: *ESSP-SAS* It is stated that "Adaptation of ATC supporting tools may be needed but this is not expected to involve incremental costs for the ANSPs", which should be reevaluated. ATC tools are software based and with SES Regulation in place any change in the software component of the EATMN implies costs higher due to Software Assurance Levels and evidences which must be produced.
response	*Noted.*

However, this regulation is not imposing any additional software requirements.

4.5.5.2.3 Conclusion on the costs and benefits of the implementation of RNP approaches p. 55-56

comment *137* comment by: *Finavia*

Cost impact of the obligation in Option 1 to maintain the non-PBN procedures and facilities is not considered on the appropriate level of accuracy. It is clear that significant additional costs are incurred. There are many airports having only PBN procedures available (currently 7 airports in Finland, for example) and for them the requirement would mean an obligation to implement new non-PBN procedures. Even though there were existing non-PBN procedures available, continuous maintenance of the required navigation equipment imply continuous additional costs. In the end, these costs are paid by the airspace users and it is disadvantageous for the airspace users already invested on their PBN capability. Regulation based requirements to provide a service level that is not justified by operational performance needs is not in line with the performance scheme objectives set for the provision of air navigation services.

response *Partially accepted.*

The proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request:

- operational procedures or

- approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on non-PBN or PBN applications

comment *259* comment by: *ESSP-SAS*

"...it can be assumed that in most cases, the current existing procedure [non-PBN] may be used in that context". This sentence is not supported by evidences. In addition as recognised in the document, if redesign of the conventional was necessary, it would imply additional costs for ANSP, The NPA shall evaluate the costs of re-designing the conventional approach procedure/s (it includes the initial, intermediate, final and MISSED APPROACH segments) within the economic analysis.

response *Noted.*

The statement only refers to the possibility of usage of the current existing procedures by non-PBN-equipped traffic. This is part of the local performance assessment.

4.5.5.3 Operations within SIDs and STARs - 4.5.5.3.1 Benefits of implementing PBN in SIDs and STARs p. 56-57

comment *710* comment by: *UK CAA*

Page No: 56

Paragraph No: 4.5.5.3

Comment: It is not clear from the NPA whether or not EASA considered the comparative costs and benefits associated with implementing both RNAV 1 and RNP 1.

The UK CAA view is that the majority of airspace efficiency, safety and capacity benefits can be realised through implementation of RNAV 1. The UK CAA view is formed from its own impact assessment conducted for London airports before mandating RNAV 1 from November 2017 in support of airspace changes in winter 2019 (see UK Aeronautical Information Circular (Y) 092/2014 'Introduction of RNAV 1 Mandate at London Airports' dated 18 December 2014.

Justification: Given current widespread aircraft fleet compliance to RNAV 1 standard, benefits can be achieved through application of this PBN specification. The majority of airspace efficiency, safety and capacity benefits can be realised through implementation of RNAV 1. Whilst recognising that RNP 1 and RF offers benefits at certain locations and especially at high density airports, the cost to operators in the short term (i.e., before 2020) has to be factored in any terminal airspace design.

response *Noted.*

Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

4.5.5.3.2 Cost of implementing PBN in SIDs and STARs p. 57

comment *138* comment by: *Finavia*

Cost impact of the different options are not considered on the appropriate level of accuracy and they should be reassessed.
It is clear that significant additional costs are incurred from maintaining the non-PBN procedures and facilities. In the end, these costs are paid by the airspace users and it is disadvantageous for the airspace users already invested on their PBN capability.
Cost-efficiency is one of the performance objectives and in certain cases, the main driver for the PBN implementation may be the possibility to cease the provision of the non-PBN applications. In this way of thinking, the proposed obligation to maintain the conventional navaids may actually prevent the PBN implementation at certain aerodromes while the

	objective of the proposed regulation is to ensure an efficient implementation of PBN.
response	*Noted.*
	The proposal promotes the increased usage of PBN requirements (in particular space-based infrastructure) but with no direct obligation to remove existing procedures based on traditional technology. However, market mechanisms and performance needs in the short to medium term are anticipated to lead to the rationalisation of the conventional procedures and infrastructure.

comment	*711* comment by: *UK CAA* **Page No:** 57 **Paragraph No:** 4.5.5.3.2 **Comment:** The UK CAA disagrees with the NPA statement that non-harmonised PBN implementation is more costly. What is more costly is the requirement to support Mixed operations, retain conventional navaids and fail to meet local performance objectives from sub-optimal airspace structures. Within the UK it has been estimated that redesign work needed to render the NATS LAMP project compliant with the NPA's RNP requirements would increase design costs by approximately 33% to just under £1m. Not included in this estimate are the costs of procedure flight validation, any additional NATS adaptation requirements, aircraft equipage and flight crew training. The UK CAA offers the above cost information to highlight that without changing the local performance objectives in the London area in the 2015 to 2019 timeframe, there are considerable costs to the ANSP. Costs for aircraft equipment retrofit will dominate the overall cost benefit analysis and reference should be made to the EUROCONTROL RAD E. It is recommended that EASA take account of these costs in their RIA. **Justification:** Additional cost of changing from current planned RNAV 1 implementation to RNP 1 is considerable and in any case, redesign may not be practicable within the proposed timescales, given limited procedure design resource throughout Europe.
response	*Noted.*
	Please see the response in the response to the major concerns identified section of the Opinion that should address UK CAA's concerns with respect to the LAMP project.

4.5.5.3.3 Conclusion on costs and benefits of the implementation of PBN in SIDs and STARs p. 57

comment	*110* comment by: *Heathrow Airport Limited* Obviously not accurate due to my previous comments
response	*Noted.*

comment	*138* ❖ comment by: *Finavia* Cost impact of the different options are not considered on the appropriate level of accuracy and they should be reassessed. It is clear that significant additional costs are incurred from maintaining the non-PBN procedures and facilities. In the end, these costs are paid by the airspace users and it is disadvantageous for the airspace users already invested on their PBN capability. Cost-efficiency is one of the performance objectives and in certain cases, the main driver for the PBN implementation may be the possibility to cease the provision of the non-PBN applications. In this way of thinking, the proposed obligation to maintain the conventional navaids may actually prevent the PBN implementation at certain aerodromes while the objective of the proposed regulation is to ensure an efficient implementation of PBN.
response	*Noted.*
	The proposal promotes the increased usage of PBN requirements (in particular space-based infrastructure) but with no direct obligation to remove existing procedures based on traditional technology. However, market mechanisms and performance needs in the short to medium term are anticipated to lead to the rationalisation of the conventional procedures and infrastructure.

4.5.5.4 Operations along ATS Routes (en route or terminal operations) - 4.5.5.4.1 Benefits of implementing ATS PBN routes p. 57-58

comment	*54* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.5.4.1 Benefits of implementing ATS PBN Routes*** **COMMENT:** This section on economy contains safety benefits of en-route PBN which would fit better into the safety impact chapter (4.5.1), where only approaches and SID/STAR are discussed. Suggest relocating them to a new “4.5.1.3” section.
response	*Noted.*

comment	*55* comment by: *ENAIRE* **NPA 2015-01 REFERENCE:** ***4.5.5.4.1 Benefits of implementing ATS PBN Routes*** *As already stated in 4.5.1.2, it is assumed that the implementation of the outcome of RMT.0477 ('Technical requirements and operational procedures for aeronautical information services (AIS) and aeronautical information management (AIM)') will ensure the required level of data integrity and accuracy needed allowing for a safe implementation of PBN routes.* **COMMENT:** See previous ENAIRE comment about data integrity and RMT.0593/RMT.0594. This paragraph is part of the contents to be relocated to 4.5.1 according to another ENAIRE comment.
response	*Accepted.*
	The integrity of the data used in PBN is highly important for safe operations. Both the Technical requirements and operational procedures for aeronautical information services (AIS) and aeronautical information management (AIM) and Technical requirements and operational procedures for the provision of data for airspace users for the purpose of air navigation are required to ensure this integrity.

comment	*68* comment by: *ENAC ATM* As far as "ATC working method will be impacted by the reduction of route spacing", no training plan is proposed or suggested. How do we imagine ATC population will be aware of new hazards? Phraseology carried out
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

comment	*282* comment by: *EUROCONTROL* **Page 58 - 4.5.5.4.1 Benefits of implementing ATS PBN routes - 4th paragraph - 1st bullet** EUROCONTROL makes a comment that gives rise to two questions, the latter one under the form of an assumption:

	The impact on the working methods of ATC of implementing ATS PBN routes remains unclear. The only major question is the following: how will the controller know whether the aircraft has the correct functionality to operate on the route or not? Or does ATC accept that it is the pilot's responsibility?
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications. The Agency recognises the importance of making available timely information on PBN capabilities to ATCOs. Besides, it is also the operator's responsibility to conform to applicable approvals before performing PBN operations.

4.5.5.4.2 Cost of implementing ATS PBN routes p. 58

comment	*139* comment by: *Finavia* Cost impact of the different options are not considered on the appropriate level of accuracy and they should be reassessed. It is not clear, how the Option 0 would induce additional costs. There is already the requirement for the application of RNAV 5 for the ATS routes in Europe. Thus, many States in Europe have only PBN based ATS routes available. The proposed approach in Option 1 would in practice mean the implementation of new ATS route network based on conventional navigation that would have a very significant cost impact. It is now totally ignored in the assessment of the economic impact. Those additional costs are also having impact on aircraft operators already invested on their PBN capability.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to applicable PBN specifications for en-route phases of flight. Certainly, RNAV 5 will remain applicable in Europe and Free Route is also contemplated above flight level 310 in the ICAO EUR region by the PCP IR.

comment	*712* comment by: *UK CAA* **Page No:** 58 **Paragraph No:** 4.5.5.4.2 **Comment:** It is unclear whether any costs for retrofit have been factored, especially considering fleet capability regarding Advanced RNP and FRT in December 2018. Costs for aircraft equipment retrofit will dominate the overall cost benefit analysis and

	reference should be made to the EUROCONTROL RAD ANNEX E. It is recommended that EASA take account of these costs in their Regulatory Impact Assessment (RIA). **Justification:** The UK CAA notes that RNAV 5 has been required across European ATS routes since 1998 and therefore the need to make available to airspace users ATS routes based on conventional navigation is unnecessary.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion in relation to applicable PBN specifications.

4.5.5.4.3 Conclusion on costs and benefits of implementation of PBN ATS routes p. 58-59

comment	*140* comment by: *Finavia* Cost impact of the different options are not considered on the appropriate level of accuracy and they should be reassessed. The justification given in the last paragraph of 4.5.5.4.3 on page 59 is not agreed. The baseline situation in Europe is rather the ATS route network based on RNAV 5 that is PBN already. Many States publish only RNAV based ATS routes. It is then difficult to see any other direction but to continue with PBN applications in any foreseen needs for changes in the ATS route network. Thus, the proposed option 1 effectively is a mandatory requirement to move from RNAV 5 to RNP 1. Costs incurred from implementing new non-PBN routes are not directly linked to a decision to implement new routes, but is a significant additional cost that is not taken into account on the appropriate level in the assessment of the economical impact.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the applicable PBN specifications for en-route phases of flight. Certainly, RNAV 5 will remain applicable in Europe and Free Route is also contemplated above flight level 310 in the ICAO EUR region by the PCP IR.

4.5.5.5 Overall economic impact p. 59

comment	*141* comment by: *Finavia* Results of the economic impact assessment are not agreed. Additional costs due to the obligation to maintain and even implement new non-PBN routes and procedures are significant in States having large geographical area and many airports. In the assessment,

	they are not considered on the appropriate level of accuracy. It may change the results of the overall impact assessment and even prevent the PBN implementation at all in some cases.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the applicable PBN specifications and mixed operations.

comment	*283* comment by: *EUROCONTROL*
	Page 59 - 4.5.5.5 Overall economic impact - Table 11 on page 59 and previous supporting text from paragraph 4.5.5.3. onwards give rise to two comments and a recommendation from EUROCONTROL: The cost benefit assessment (CBA) reported for SIDs/STARs and ATS routes in support of the overall economic impact is almost empty. The economic assessment between option 0 and option 1 is quite disappointing. Each particular implementation (e.g. in TMA) should make its own CBA.
response	*Noted.*
	Implementation is a local decision based on local factors including a CBA.

4.5.6. Proportionality issues - 4.5.6.1 Proportionality analysis from an ATSP's/aerodrome operator's perspective p. 59

comment	*142* comment by: *Finavia*
	The significant additional costs incurred from the general obligation of the Option 1 to provide non-PBN routes and procedures are not even mentioned in this context. Thus, the results of the proportionality impact should be reassessed.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the applicable PBN specifications. Also, the proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements to request: - operational procedures or

- approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on existent non-PBN or PBN applications

4.5.7. Impact on 'Better regulation' and harmonisation p. 60-61

comment	*143* comment by: *Finavia* Regarding the last paragraph (on top of the page 61), it is agreed that significant airspace re-designs must be announced sufficiently in advance. However, the proposed AUR.PBN.3010 is not making reference to airspace re-design, but to the implementation of PBN SID, STAR or ATS routes with no defined exceptions. As such, it would make it difficult to implement small additions to the existing routes, for example. Thus, it is proposed to change AUR.PBN.3010 to make reference to significant airspace re-designs. Regarding the discussion about Option 1, it is not recognized that currently the ATS route network in Europe is mainly based on RNAV 5, being PBN already. More advanced PBN navigation specifications need to be implemented as needed, but the obligation for conventional ATS routes would mean a need to re-implement them.
response	*Noted.*
	Please refer to the response to the major concerns identified section of the Opinion related to the applicable PBN specifications. Also, the proposed text has been revised whenever aircraft operations cannot conform to AUR.PBN.2005 requirements. to request: - operational procedures or - approach procedures, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs) based on existent non-PBN or PBN applications

4.6.2. Sensitivity analysis p. 61-63

comment	*260* comment by: *ESSP-SAS* High and low ranges make sense, when they are considered independent (which seems the case), if they pair in the form (low cost+high benefit) and (high cost+low benefit). Otherwise, the baseline scenario could not be within the low and high ranges, like in the figure!

response	*Noted.*

comment	*261* comment by: *ESSP-SAS* Incorrect references: 4.5.5.2.2, 4.5.5.2.1 instead of 4.5.4.2.2, 4.5.4.2.1
response	*Accepted.*

comment	*262* comment by: *ESSP-SAS* In the sentence "If the benefits would be 10 times lower than expected, the break-even points would be from 0.3 to 5.8 avoided flight diversion, far less than the 16.7", the word "lower" should be changed by "higher".
response	*Accepted.*

comment	*263* comment by: *ESSP-SAS* The break even point calculated as the number of avoided flight diversions to compensate the implementation costs is based on one single year, when it could cover a longer period than that.
response	*Noted.*

comment	*656* comment by: *CAA-NL* We wonder on the consistency of the number of avoided flight diversion to compensate the costs related to the sensitivity analyses. If the benefits would be 10 times lower 'per avoided flight diversion', then the number of flight diversions to reach the brake even point on investment would be 10 times higher and the return on investment per annum would be much lower. In table 15 last colon this is in our opinion wrongly represented related to the brake even number of avoided diversions, while in figure 9 the lower return on investment is correctly

	reprecented as lower.
response	*Accepted.*
	If the benefits would be 10 times higher than expected, the break-even points would be from 0.3 to 5.8 avoided flight diversion.

4. Appendix A — Attachments

07.pdf

Attachment #1 to comment #599

GAMA12-83 ENPRM 2012-04 PBN Regulatory Approach Document 11162012.pdf

Attachment #2 to comment #612

SatNavNews_Winter-Spring_2015.pdf

Attachment #3 to comment #732

