UK Civil Aviation Authority

Consultation: Proposed amendments to the UK Performance-Based Navigation Regulation

CAP 3045

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List of acronyms

AAM	Advanced Air Mobility
ACP	Airspace Change Proposal
AMC	Acceptable Means of Compliance
AMS	Airspace Modernisation Strategy
ANS	Air Navigation Services
ANSP	Air Navigation Service Provider
APNT	Alternative Position, Navigation and Timing
ASBU	Aviation System Block Upgrades
ATM	Air Traffic Management
CAA	Civil Aviation Authority
CAS	Controlled Airspace
DME	Distance Measuring Equipment
EASA	European Aviation Safety Agency
EU	European Union
FASI	Future Airspace Strategy Implementation
FRA	Free Route Airspace
GM	Guidance Material
GNSS	Global Navigation Satellite System
IAA	Irish Aviation Authority
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
IRE	Instrument Runway End
LNAV	Lateral navigation
LPV	Localiser performance with vertical guidance
LSSIP	Local Single Sky ImPlementation
MON	Minimum Operating Network
NM	Nautical Miles
OBPMA	On-Board Performance Monitoring and Alerting
PBN	Performance-based Navigation
PCP	Pilot Common Project
RF	Radius to fix
RNAV	Area Navigation
RNP	Required Navigational Performance
SBAS	Satellite Based Augmentation System
SID	Standard Instrument Departure
STAR	Standard Arrival Route
TMA	Terminal Manoeuvring Area
TSE	Total System Error
VNAV	Vertical Navigation

Chapter 1
Forward

Purpose and scope

1.1 The Civil Aviation Authority (CAA) is proposing to amend and consolidate the regulations that govern performance-based navigation (PBN) in the United Kingdom (UK) in order to support the development of a systemised, sustainable, and modernised airspace that promotes economic growth, enables effective noise mitigation and helps to reduce greenhouse gasses.

1.2 The PBN concept was developed by the International Civil Aviation Organisation (ICAO). Eurocontrol has published a very helpful information note[1] that provides a clear description of PBN and the relevant navigation specifications. We encourage interested stakeholders to read this document if they are not familiar with PBN.

1.3 The changes we are proposing aim to:

- Achieve consistency in application of, and maintain interoperability with, equivalent regulations in the European Union (EU) and therefore providing industry stakeholders with consistent regulatory frameworks; and
- Contribute to the delivery of the strategic objectives set out on the Airspace Modernisation Strategy (AMS)[2]

Further detail on the need for achieving consistency in application and maintaining interoperability with the EU can be found later in this document (see Chapter 4, our proposals).

1.4 These changes will provide Air Navigation Service Providers (ANSPs) and aerodromes with the flexibility they need to determine the optimal PBN specification for an efficient use of airspace by considering the impacts these may have on local communities with respect to noise.

1.5 This consultation document explains how and why the underlying policy should be amended and sets out our proposed new navigation specifications and the dates by which we propose they should be implemented (see Appendix B).

1.6 While we welcome feedback from all interested stakeholders, this consultation is primarily aimed at ANSPs, aerodromes and aircraft operators involved in the design and use of airspace structures, who will be the most directly affected by

[1] https://www.eurocontrol.int/publication/introducing-performance-based-navigation-pbn-and-advanced-rnp-rnp

[2] https://www.caa.co.uk/commercial-industry/airspace/airspace-modernisation/airspace-modernisation-strategy/

these proposals. This is because the PBN concept is already required to be implemented in the UK by existing legislation. The proposals in this consultation are about updating the existing requirements rather than introducing PBN as a new concept in legislation.

1.7 This consultation focuses solely on proposed amendments to PBN requirements in UK legislation. It does not address specific airspace changes, or the airspace change process itself. While the proposed changes to PBN requirements may necessitate future airspace redesign (for example, updating procedures for arrivals, departures, and en-route navigation), this consultation does not cover those design changes. Any future airspace changes resulting from updated PBN requirements would be subject to the established airspace change process as outlined in CAP 1616[3].

1.8 Stakeholder feedback on the potential impacts of airspace change proposals seeking to introduce updated PBN requirements should be made under the CAP 1616 process. The CAP 1616 process has been consulted on previously and is out of scope of this consultation.

1.9 Under the CAP 1616 process, to progress an airspace change proposal to the point where a final decision is made, the change sponsor must demonstrate:

- a need for a change to airspace design;
- that relevant design principles have been designed through effective engagement with those affected and design options have been informed by those design principles;
- that the impacts of those design options have been properly assessed;
- that, where relevant, they have facilitated meaningful consultation or engagement on proposed design options and that stakeholder feedback has been taken into account; and
- that the final airspace change proposal submission contains all the information that the CAA and other stakeholders need, in the right format.

1.10 Airspace design guidance for the use of PBN within terminal airspace around aerodromes for noise mitigation is published separately[4]. We plan to review this guidance to provide more clarity where appropriate. This work will also consider incorporating further information on techniques for applying PBN in conjunction

[3] CAP1616 The Process for Changing the Notified Airspace Design

[4] CAP 1378 PBN - Airspace Design Guidance: Noise mitigation considerations when designing PBN departure and arrival procedures

with optimal use of aircraft on-board systems using the ARINC path terminator concept[5]. We will engage with industry stakeholders as part of this work.

Introduction

1.11 The UK left the EU on 31st January 2020. A transition period to finalise the future UK relationship with the EU was agreed and ended on 31st December 2020. During that transition period, EU law continued to be directly applicable in the UK in the same way it had done when the UK was a Member State. This included EU Regulations governing airspace usage and air traffic management (ATM).

1.12 On 31st December 2020, at the end of the transition period, the European Union (Withdrawal) Act 2018 (the Withdrawal Act) came into force and repealed the European Communities Act 1972, which had been the legal basis for the UK's membership in the EU. This meant that EU law ceased to be directly applicable in the UK.

1.13 To ensure legal continuity and certainty, the Withdrawal Act provided that existing EU aviation safety law as it stood on 31st December 2020 would be converted into UK domestic law. This body of law became known as "retained EU law". With the Retained EU Law (Revocation and Reform) Act 2023 in force, retained EU law is now referred to as "assimilated law".

1.14 Assimilated Regulation (EU) 2018/1048[6] (the UK PBN Regulation) regarding the airspace usage requirements and operating procedures for PBN was one of the EU instruments that became part of retained EU law (now assimilated law). But the operation of the Withdrawal Act meant that this was only true for those provisions that were in force and applied in the UK on 31st December 2020. Requirements that would only come into force after that date were not brought onto the UK statute book. This approach has created some gaps and challenges for the effective delivery the AMS.

1.15 Other PBN requirements relating to the four largest UK airports were retained as part of Assimilated Regulation (EU) No.716/2014[7] relating to the Pilot Common Project (the UK PCP Regulation). Meanwhile, as part of the Future Airspace Strategy Implementation (FASI) programme started in 2019, UK aerodromes are developing new structures to facilitate an efficient system to reduce air traffic

[5] ARINC 424 path terminators form part of the navigation system database specification for aircraft flight management systems

[6] UK Reg (EU) 2018/1048 laying down airspace usage requirements and operating procedures concerning performance-based navigation

[7] UK Reg (EU) 716/2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan

delays, noise and emissions at and around aerodromes. This programme is now called the UK Airspace Change Masterplan programme.[8]

1.16 As we discuss in more detail in the next chapter, we need to update the UK PBN legislation to support modernisation of UK airspace in line with the AMS, as well as the timely and effective implementation of the UK Airspace Change Masterplan.

[8] https://www.caa.co.uk/commercial-industry/airspace/airspace-modernisation/airspace-change-masterplan/

Chapter 2

Why we need to update UK PBN legislation

The need for airspace systemisation

2.1 We urgently need to modernise the navigation architecture that underpins UK airspace and transition towards an airspace structure that is systemised, where accuracy of flight paths and aircraft trajectory is very precise and predictable, although still within set tolerances. The actual flight paths within the tolerances can still be influenced by many external factors, for example actual aircraft performance in prevailing weather conditions and operating techniques. The current UK ground-based conventional infrastructure was developed decades ago and relies on radio navigational systems to support aircraft operations. Growing demand and changing technology mean that infrastructure is no longer fit for purpose.

2.2 Air traffic is heavily dependent on aged and costly navigation aids in fixed ground locations that create inefficient flight paths, not optimised to reduce noise or track mileage. These antiquated systems can be unreliable, expensive and onerous to maintain. They are also less accurate and precise than more modern technologies such as Global Navigation Satellite System (GNSS). The use of the technology developed soon after the Second World War is no longer adequate to ensure efficient navigation, particularly in the congested terminal airspace around aerodromes, or to support growth while keeping down the overall cost of equipment maintenance.

2.3 The use of conventional navigation aids in fixed ground locations also creates airspace inefficiency for ANSPs, aircraft operators and airspace users, resulting in congestion, longer delays and environmental impact. Because some of these navigation aids are so old, they can be unreliable and must sometimes be taken out of service. It is crucial that we develop airspace structures that, during normal operations, utilise alternative means of navigation like PBN to avoid having to rely on infrastructure that is ageing, costly to maintain and can deliver unpredictable availability.

2.4 The overarching objective of systemisation is to help maximise efficient use of airspace by providing predictability of aircraft operations using precisely designed routes and vertical profiles. The use of PBN enables greater lateral navigation accuracy within a specified corridor that can result in an overall reduction in the volume of Controlled Airspace (CAS) required to support the prescribed routes. This can provide benefit to other airspace users operating outside of CAS, such as general aviation.

2.5 Since PBN legislation was incorporated into UK law at the end of 2020, the EU has updated its own legislation in this area. This has led to regulatory divergence between the UK and the EU. We must now undertake a similar updating exercise to support modernisation of UK airspace in line with the AMS, achieve consistency in application and maintain interoperability with the EU, and create a navigation environment in the UK that can integrate innovative new airspace users alongside existing ones.

Chapter 3

Rationale for intervention

Connectivity and environmental benefits

3.1 The determination of relevant and appropriate navigation specifications for the provision of Air Traffic Management & Air Navigation Services (ATM/ANS) is required to achieve consistency in application and maintain interoperability between the European and UK networks. It is essential that all routes to and from the UK are directly connected to the rest of the European network to ensure the smooth flow of air traffic and to maximise the economic benefit to the UK. A high level of interdependencies between aerodromes and ANSPs is therefore expected to maintain interoperability between the UK and the airspace of adjacent states.

3.2 Aerodromes and ANSPs therefore collaborate closely with each other to identify their own navigation objectives and develop their airspace change proposals (ACPs). Without this coordination, conflicting design options could create an overall network disconnectivity that would prevent efficient management of the traffic flow.

3.3 Similar difficulties would arise should any one aerodrome or ANSP decide not to apply PBN for the airspace it is responsible for. This could be a particular problem in terminal airspace where modernisation, noise mitigation and reduction of greenhouse gas emissions depend on full network efficiency and optimised vertical and lateral navigation profiles.

3.4 Communities living close to aerodromes or under flight paths also have significant concerns about aviation noise. Airspace modernisation is expected to reduce average noise levels per flight[9], including by optimising flight paths. By using PBN, ACP sponsors could develop more accurate lateral flight paths within defined corridors to efficiently link an aerodrome to and from the airspace route network. The corridor width would depend on the navigation specification chosen by the sponsor, but appropriate application of PBN in this context can reduce the number of people exposed to certain levels of noise. This would provide a real benefit to communities.

[9] The expectation of a reduction in the average noise levels per flight does not mean that there will be a reduction in noise on every individual flight, or that there will necessarily be an overall reduction in noise, as this will be dependent on the overall number of flights.

3.5 But the total impact of modernisation on noise depends on several factors, and modernisation may lead to the redistribution of noise impacts between different areas on the ground, depending on the airspace design and the way it is used. The introduction of new PBN routes may therefore impact communities living under flightpaths in different ways, some positive and some negative. On the one hand, they could be used to reduce noise in some locations by introducing multiple flightpaths; on the other, better navigation precision could lead to greater aircraft – and therefore noise – concentration in other locations.

3.6 This means that it is crucial for individual and community stakeholders to participate in opportunities for engagement that relate to specific airspace change proposals. As we noted in Chapter 1, stakeholder feedback on the potential impacts of airspace change proposals seeking to introduce updated PBN requirements should be made under the established airspace change process as outlined in CAP 1616. The decisions that will follow from this consultation are about the technical navigation specifications that will apply to PBN routes. They are not decisions about airspace change, which is outside the scope of this consultation.

3.7 Combining appropriate PBN navigation specifications with more flexible and optimised routings can deliver several other positive outcomes on a per-flight basis: lower environmental impact, increased fuel efficiency and a commensurate reduction in CO2 emissions as a result of lower congestion. Operational flexibility in route design may also make it possible to avoid populated areas or environmentally sensitive receptors.

Chapter 4

Our proposals

Achieving consistency and maintaining interoperability

4.1 PBN is a complex concept that requires interaction between various capabilities such as avionics, navigation systems using satellites, conventional ground navigational aids, and airspace volumes. UK airspace modernisation is set to be deployed over several years in line with the International Civil Aviation Organization's (ICAO) Global Air Navigation Plan (GANP)[10].

4.2 The GANP aims to achieve an agile, safe, secure, sustainable, high performing and global air navigation system. The basis for the delivery of this plan is the Aviation System Block Upgrade (ASBU)[11] framework, a group of operational improvements and associated performance benefits organised in key feature areas or 'threads'. The deployment of these threads is set out in five-year blocks, currently to 2038, and the AMS deployment[12] is aligned to this in a 'two plus five year' outlook of the modernisation timeframe.

4.3 Our ambition is to deploy PBN in the UK within the same periods defined in the AMS plan and our proposed implementation date reflects this. We recognise that this means it will take time to implement in full.

4.4 We support the uptake of PBN as soon as possible, wherever practicable. Our proposals set out a requirement that any new ATS routes, including Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs), and instrument approach procedures based on area navigation techniques should be based on an appropriate PBN specification.

[10] https://www4.icao.int/ganpportal/

[11] https://www4.icao.int/ganpportal/ASBU

[12] CAP1711b: Airspace Modernisation Strategy 2023–2040 Part 3: Deployment plan | Civil Aviation Authority (caa.co.uk)

4.5 We intend to amend the UK PBN Regulation to reflect navigation specifications applicable to each flight phase as recommended by ICAO in their PBN Manual[13], These minimum specifications are replicated for information in the tables below, while the actual specifications we are proposing for the UK in future are set out in Appendix B.

4.6 Each of the following 3 tables set out the Navigation specification relative to a selection of navigation applications, flight phases and RNAV/RNP values in nautical miles (NM) specified as a number or range of numbers. These numbers refer to the lateral navigation accuracy in NM, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route, or procedure. The numbers in each column indicate which navigation specifications, as defined in column 1 of each table, ICAO recommends for each flight phase.

Table 1 – ATS or user defined routeing

Navigation Specification - ATS or user defined routeing	**En-route Oceanic**	**En-route Continental**
RNAV 10 (RNP 10)	10	Not applicable
RNAV 5	Not applicable	5
RNAV 2	Not applicable	2
RNAV 1	Not applicable	1
RNP 4	4	Not applicable
RNP 2	2	2
Advanced RNP*	2	2 or 1
RNP 0.3	Not applicable	0.3

[13] ICAO Doc 9613 Fifth Edition, 2023

Table 2 – Arrival and departure

Navigation Specification – Arrival and Departure	Arrival	Departure
RNAV 5	5	Not applicable
RNAV 2	2	2
RNAV 1	1	1
RNP 1	1	1
Advanced RNP*	1	1
RNP AR	Not applicable	1–0.3
RNP 0.3	0.3	0.3

Table 3 – Approach

Navigation Specification - Approach	Initial	Intermed	Final	Missed
RNAV 1	1	1	Not applicable	1
RNP 1	1	1	Not applicable	1
Advanced RNP*	1	2	0.3	1
RNP APCH	1	1	0.3	1
RNP AR	1–0.1	1–0.1	0.3–0.1	1–0.1
RNP 0.3	0.3	0.3	Not applicable	0.3

* Note that the Advanced RNP Specification also includes advanced functionalities such as Radius-to-Fix (RF) referred to in the following sections of the consultation

4.7 Adoption of specifications based on ICAO will help to maintain interoperability with EU regulation for simplification and to ensure that airspace users do not have to meet divergent requirements between the EU and UK unless absolutely necessary. Any difference in requirements could potentially increase equipment costs by requiring changes to aircraft/avionics certification. In some circumstances this could be difficult to achieve, and it is not our intent that any amendment to regulation introduces such complexity.

4.8 The proposals include increasing the scope of the UK PBN Regulation to providers of Air Traffic Management/Air Navigation Services (ATM/ANS) at all Instrument Runway End (IREs) in the UK. Currently, it applies only to providers of ATM/ANS at IREs not served by precision-approach procedures. It also means that the requirements for the deployment of PBN at the four largest UK airports in the UK PCP Regulation will be subsumed under the amended UK PBN Regulation and continued to be delivered under that framework.

4.9 We are aware that the European Aviation Safety Agency (EASA) are proposing to review the EU PBN Implementing Regulation during 2025. We will maintain dialogue with EASA with the aim of avoiding significant divergence between the two jurisdictions on how PBN is regulated. Additionally, we are working with our partners at the Irish Aviation Authority both with respect to this and the existing PBN policy between the UK and the Republic of Ireland[14].

4.10 If it becomes clear that there are significant differences between the EASA proposals and the UK PBN Regulation and that these differences could affect interoperability with the European network, we will want to consider the affected elements and whether further changes to the UK PBN Regulation should be proposed and consulted on.

[14] Policy for the application of Performance-based Navigation in UK/Irish airspace (2011)

Mandating specific navigation specifications

4.11 Navigation specifications have preferred usage based upon the airspace structures they are used in. For example, in oceanic airspace the use of area navigation (RNAV) 10 or required navigation performance (RNP) 4 are better suited to the definition of separation standards.

4.12 In domestic airspace, particularly in terminal manoeuvring areas (TMA), more precise navigation standards are required to address the specific challenges associated with these volumes of airspace. Therefore, we propose to amend the UK PBN Regulation so that the minimum navigation specifications are defined based upon the volume of airspaces and flight phases that they will be used for, as recommended by ICAO.

4.13 It is also our view that sponsors should define their own needs based on local circumstances, traffic density and complexity of operations. For example, we do not propose to mandate the use of RNP 1 with Radius to Fix (RF) path terminator[15] for all PBN arrivals (STAR), transitions or SIDs. We recognise that although this navigation specification can be a good way to maintain a predictable and constantly repeatable lateral path across the ground and unlocks the opportunity to maximise airspace capacity in design and mitigate noise for certain elements of the community, it can also be of legitimate concern to others because it can concentrate traffic over a specific area.

4.14 Mandating a navigation specification of RNP1 + RF in all, or even some, of UK terminal airspace, would be a disproportionate approach in the development of airspace design. The design should be driven by the overarching goal of a defined airspace concept from the outset. We would need additional and more granular data on operator aircraft capabilities and RF approval status before mandating this specification in widespread terminal airspace design in the UK.

4.15 We recognise that aircraft and operator capabilities will evolve over time and that one size will not fit all. For this reason, we believe that it is more appropriate to scale the use of RNP1 + RF to meet the objectives of individual design, where need and associated operator capability can be specifically demonstrated in local context, not as a minimum standard that may reduce overall flexibility in different scenarios.

4.16 Therefore, we propose only to mandate the use of RNAV 1 as the minimum for all standard departures and standard arrivals. We propose that the minimum for all ATS routes and Free-Route airspace (FRA) within UK en-route continental (domestic) airspace should be RNAV 5.

[15] Radius-to-fix (RF) is a path terminator in ARINC specification 424 navigation system database for aircraft flight management systems providing a constant radius turn around a fix or waypoint.

Implementation of RNP approaches at instrument runway ends

4.17 We propose to amend the UK PBN Regulation so that RNP approaches are implemented at all IREs, in line with ICAO assembly resolution A37-11[16]. This will create an environment where both conventional and PBN approaches are available, providing different opportunities and options for airspace users while improving resilience. We propose that ATM/ANS providers be required to implement RNP approaches with all lines of minima (LNAV, LNAV/VNAV and LPV) to provide users with both two dimensional and three-dimensional approaches.

4.18 We recognise that an SBAS service, which is necessary to enable RNP down to LPV minima, is not currently available in the UK. We believe it is important to make it clear as early as possible what requirements will apply when SBAS is introduced in due course. But considering the uncertainty as to timing, the transitional period in the existing Regulation[17] of 18 months from the date on which SBAS capability becomes available to implement RNP approaches with LPV minima will remain and will apply to providers of ATM/ANS services at all IREs.

Helicopter operations

4.19 We propose to add RNP(AR) as an additional specification that providers of ATM/ANS will eventually be able to utilise when implementing ATS routes, standard departures or arrivals for rotorcraft operations, provided such use is informed by appropriate safety considerations. The use of the more accurate RNP(AR) specification, once the design criteria for this have been established by ICAO, could provide additional flexibility when designing procedures in complex operational environments, by using the most accurate lateral navigation available. This could help limit the impact to other airspace users and local communities.

Contingencies

4.20 Within the PBN concept, the use of RNAV is predicated on GNSS as the primary sensor (and the sole sensor for RNP). We must therefore prepare for scenarios where GNSS is unavailable. The current regulation contains a requirement on providers of ATM/ANS to retain a network of conventional navigation aids for this purpose[18]. We do not propose any changes to this article of the regulation currently.

[16] ICAO Assembly Resolution A37-11 — Performance-based navigation global goals, November 2010

[17] UK Reg (EU) 2018/1048 Annex I Subpart PBN para 1 (3)

[18] UK Reg (EU) 2018/1048 Article 6

4.21 We recognise that more clarity is needed on what the framework requirements should be to ensure a defined level of GNSS resilience to support PBN and the wider UK ATM network in situations of degradation or denial of service. This is widely referred to as the Minimum Operational Network (MON).

4.22 We are collaborating with the Military Aviation Authority, EASA, Eurocontrol and providers of ATM/ANS to define the MON and we will be engaging with a wider group of aviation stakeholders as these requirements continue to be developed.

Transition Plan

4.23 The current regulation requires providers of ATM/ANS to establish and implement a PBN transition plan and keep it up to date[19]. We recognise that many providers have already outlined their PBN intentions when submitting a Statement of Need for an ACP. Our proposals for the revised regulation have widened applicability of certain PBN requirements to include some providers of ATM/ANS not previously in scope.

4.24 Additionally, we are obligated as a Eurocontrol member state to report specific details of UK PBN plans under the Local Single Sky ImPlementation(LSSIP) process[20] and to track progress on an ongoing basis. For these reasons, we intended to introduce a standard mechanism and timeline for providers to produce initial plans, submit to us and to keep them updated on an ongoing basis. Guidance on the enhanced process for the reporting and monitoring of PBN transition plans will be communicated at a later date.

[19] UK Reg (EU) 2018/1048 Article 4

[20] Local Single Sky implementation monitoring (LSSIP) | EUROCONTROL

Chapter 5

Responding to this consultation and next steps

How to respond to this consultation

5.1 Responses to this consultation should be submitted electronically using the CAA online consultation tool Citizen Space, no later than 16th January 2025. We cannot commit to considering comments received after this date.

5.2 A summary of the consultation questions is presented in Appendix C. Any enquiries regarding the consultation content or clarification requests can be sent to us at pbnconsultation@caa.co.uk.

5.3 Our strong preference is that you complete the online consultation. We understand that some stakeholders prefer not to be constrained by the questions alone and will want to send a self-contained response. While we will accept these submissions to the same email address stated above, we do ask that they are structured around our questions. Otherwise, we will not be able to analyse the submissions in the same way that we analyse the online responses.

Next steps

5.4 At the end of the response period, we will review each comment and submission received. Your feedback will be used to refine the policy, implementation timeline and proposed changes to PBN legislation. We will publish a consultation response document that summarises the feedback we received, explains how we took your views and suggestions into account and sets out our policy decisions.

Appendix A

Current UK PBN regulation and UK PCP Regulation navigation specifications and requirements

The following requirements of the PBN and PCP Regulations have been in force since 31 December 2020 and are presented as a combined policy summary rather than the full legislative text:

(1) ATM/ANS providers must implement the following PBN specifications (note: these are presented by applicable ICAO flight phase terminology as described in paragraph 4.6 above):

- **Approach**:
  - RNP APCH with 3 lines of minima (LNAV, LNAV/VNAV and LPV) and RF legs where required by traffic density or complexity, at all IREs excluding those IREs with Precision Approach procedures and the 4 UK airports covered under the separate requirements of the UK PCP Regulation (PBN Regulation Annex 1 Subpart PBN AUR.PBN.2005 para 1)
  - *Derogations*:
    - At IREs where implementation of 3D approach is too difficult, RNP APCH with 2 lines of minima, with option also to implement RNP AR APCH with 3 lines of minima. (PBN Regulation Annex 1 Subpart PBN AUR.PBN.2005 para 2)
    - At IREs without appropriate SBAS coverage, RNP APCH with 2 lines of minima (LNAV and LNAV/VNAV), with LPV minima to be implemented no later than 18 months after SBAS coverage is available (PBN Regulation Annex 1 Subpart: PBN AUR.PBN.2005 para 3)
- **En-route continental**: RNAV5 on ATS routes at or above FL150

  (PBN Regulation Annex 1 Subpart PBN AUR.PBN.2005 para 6)
- **ATS or user-defined routeing, arrival and departure (SID and STAR) for rotorcraft operations**: RNP 0.3, RNAV 1 or RNP 1 specifications as the service provider considers most appropriate for the specified procedure design

  (PBN Regulation Annex 1 Subpart PBN AUR.PBN.2005 para 7)
- At London-Heathrow, London-Gatwick, London-Stansted and Manchester Ringway:
  - **Approach:** RNP APCH with 3 lines of minima (LNAV/VNAV and LPV)
  - **Arrival and departure:** SIDs, STARs and transitions using RNP 1 with RF attachment

- **System requirements:**
  - On-board performance monitoring, alerting capability and high integrity navigation databases
  - Lateral and Longitudinal Total System Error (TSE)

    For RNP 1: within +/- 1 nautical mile for at least 95% of flight time

    For RNP APCH: within +/- 0.3 nautical mile for at least 95% of flight time for Final Approach Segment
  - GNSS SBAS or barometric altitude sensors for vertical navigation in support of APV

(PCP Regulation Annex 1 para 1.1.2)

(2) ATM/ANS providers must ensure a smooth and safe transition to implementation of the PBN specifications listed above, including by:

- Establishing, implementing, and keeping up to date a PBN transition plan;
- Consulting on the draft transition plan (and any significant update);
- Submitting the consultation responses and draft transition plan (or update) to the CAA for approval;
- Only establishing and implementing the transition plan (or update) after it has been approved by the CAA. (PBN Regulation Article 4)

(3) ATM/ANS providers must have contingency measures in place for continued operations in the event that GNSS unavailability makes it impossible to provide services in line with PBN specifications listed above. (PBN Regulation Article 6)

Appendix B

Proposed navigation specifications and requirements

The following requirements will apply if the PBN and PCP Regulations are consolidated and amended as we propose. The proposal is presented as a policy summary rather than the exhaustive legislative text, but does indicate, where applicable, specific text adjustments in the following format:

(a) ~~Text to be deleted is shown struck through~~;
(b) New text is highlighted in grey;
(c) ~~Text to be deleted is shown struck through~~ followed by the replacement text which is highlighted in grey

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(1) ATM/ANS providers must implement the following specifications by 31 December 2030 (this means by this date a full PBN environment to the applicable specifications must be deployed and operational):

- **Approach**:
  - RNP APCH with 3 lines of minima (LNAV, LNAV/VNAV and LPV)~~, and RF legs where required by traffic density or complexity,~~ at all IREs~~ excluding those IREs with Precision Approach procedures and the 4 UK airports covered under the separate requirements of the UK PCP Regulation~~
  - Derogations:
    - At IREs where implementation of 3D approach ~~is too difficult~~ not possible due to safety or operational reasons, RNP APCH with 2 lines of minima (with option also to implement RNP AR APCH with 3 lines of minima)
    - At IREs without appropriate SBAS ~~coverage~~ availability, RNP APCH with 2 lines of minima (LNAV and LNAV/VNAV), with LPV minima to be implemented no later than 18 months after SBAS ~~coverage~~ service is available
- **En-route continental**: On ATS routes at~~ or above FL150~~ all flight levels and in Free Route Airspace (FRA), RNAV5 minimum and RNAV1 where the needs and objectives of airspace design require a more precise specification
- **En-route oceanic**: RNAV10 or RNP4
- **Arrival and departure**: RNAV1 minimum for all SID/STAR where established, including STAR transitions. Additionally, RNP1 + RF path terminator can be used where safety and operational requirements necessitate
- **ATS or user-defined routeing, arrival and departure (SID and STAR) for rotorcraft operations**: RNP 0.3, RNAV1,~~ or~~ RNP1 or RNP AR specifications as the service provider considers appropriate for the specified procedure design

- ~~At London-Heathrow, London-Gatwick, London-Stansted and Manchester Ringway:~~
  - ~~**Approach:** RNP APCH with 2 lines of minima (LNAV/VNAV and LPV)~~
  - ~~**ATS or user-defined routeing, arrival and departure (SID, STAR and transitions):** RNP 1 with RF attachment~~
  - ~~System requirements:~~
    - ~~On-board performance monitoring, alerting capability and high integrity navigation databases~~
    - ~~Lateral and Longitudinal Total System Error (TSE)~~
      - ~~For RNP 1: within +/- 1 nautical mile for at least 95% of flight time~~
      - ~~For RNP APCH: within +/- 0.3 nautical mile for at least 95% of flight time for Final Approach Segment~~
    - ~~GNSS SBAS or barometric altitude sensors for vertical navigation in support of APV~~

(note: The presentation of 'System requirements' is removed as these are standard PBN requirements relevant to the applicable specification as defined by ICAO)

(2) ATM/ANS providers required to implement the specifications listed above must ensure a smooth and safe transition to use of PBN, including by:

- Establishing, implementing, and keeping up to date a PBN transition plan;
- Consulting on the draft transition plan (and any significant update);
- Reporting progress to the CAA and submitting the consultation responses and draft transition plan (or update) to the CAA for approval in the form and manner determined by the CAA;
- Only establishing and implementing the transition plan (or update) after it has been approved by the CAA

(Note: This duty will continue to apply to ATM/ANS providers already subject to the requirements in the PBN Regulation. It will also apply to those brought in scope of the requirements for the first time because of the proposed amendments.)

(3) ATM/ANS providers must have contingency measures in place for continued operations in the event that GNSS unavailability makes it impossible to provide services in line with PBN specifications listed above

Appendix C

Consultation questions

Q1. What is your name? (required)

Please advise if you wish your response to be published anonymously, otherwise your name and organisation will be published alongside your response.

Q2. What is your email address? (required)

If you enter your email address, you will automatically receive an acknowledgement email when you submit your response.

Q3. Do your views officially represent those of an organisation? (required)

□ **Yes, I am authorised to submit feedback on behalf of an organisation.**
(please specify name of Organisation)

□ **No, these are my personal views**

Q4. Which of the following best describes the group you represent?

Please select only one item

□ Aircraft owner / operator

□ Aerodrome owner / operator

□ Air navigation service provider

□ Business or trade association

□ Community organisation

□ Member of the public

□ Other (please specify if selected)

Q5. Do you agree with the case we have made for amending and consolidating UK Reg (EU) 2018/1048 (the UK PBN Regulation) and the PBN elements of UK Reg (EU) 716/2014 (the UK PCP Regulation)?

Yes No

If you answered no, please explain why

Q6. **Do you believe that the proposals to amend and consolidate the UK PBN Regulation and the PBN elements of the UK PCP Regulation will support the development of a systemised, sustainable, and modernised airspace network in line with the AMS?**

Yes No

If you answered no, please explain (1) why you think our proposals would not support this ambition and (2) what alternative changes you think would need to be made to the PBN legislation to achieve these goals.

Proposed policy to be included in consolidated UK PBN Regulation, Annex I Subpart PBN, AUR.PBN.2005 applicable to 'Approach' flight phase.

Providers of ATM/ANS will be required to implement:

- at all instrument runway ends (IREs) for all aerodromes;
- RNP approach (RNP APCH) specification with 3 lines of minima, including—
- Lateral Navigation (LNAV),
- Lateral Navigation/Vertical Navigation (LNAV/VNAV), and
- Localiser Performance with Vertical guidance (LPV) minima;
- no later than 31 December 2030.

Derogations:

- At IREs where implementation of 3D approach is not possible due to safety or operational reasons, RNP APCH with 2 lines of minima (with option also to implement RNP AR APCH with 3 lines of minima)
- At IREs without appropriate SBAS availability, RNP APCH with 2 lines of minima (LNAV and LNAV/VNAV), with LPV minima to be implemented no later than 18 months after SBAS service is available

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Q7. **Do you agree that RNP APCH 3 lines of minima should apply at all IREs for all aerodromes?**

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative aerodrome criteria you would propose and why.

Q8. **Do you agree that the date by which RNP APCH 3 lines of minima will have to be implemented is realistic?**

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative date you would propose and why.

Q9. For implementation of RNP APCH with LPV line of minima at all IREs, do you agree that retaining the same transitional period of 18 months from when SBAS service becomes available remains realistic?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Proposed policy to be included in consolidated UK PBN Regulation, Annex I Subpart PBN, AUR.PBN.2005 applicable to each flight phase

Providers of ATM/ANS will be required to implement:

- **En-route continental**: On ATS routes at all flight levels and in Free Route Airspace (FRA), RNAV5 minimum and RNAV1 where the needs and objectives of airspace design require a more precise specification
- **En-route oceanic**: RNAV10 or RNP4
- **Arrival and departure**: RNAV1 minimum for all SID/STAR where established, including STAR transitions. Additionally, RNP1 + RF path terminator can be used where safety and operational requirements necessitate
- **ATS or user-defined routeing, arrival, and departure (SID and STAR) for rotorcraft operations**: RNP 0.3, RNAV1, RNP1 or RNP AR specifications the service provider considers appropriate for the specified procedure design
- no later than 31 December 2030

Q10. Do you agree with the proposed navigation specifications for en-route continental operations?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q11. Do you agree with the proposed navigation specifications for en-route continental operations being applicable to all flight levels on ATS routes and FRA?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q12. Do you agree that the proposed implementation date for en-route continental navigation specifications is realistic?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q13. Do you agree with the proposed navigation specifications for en-route oceanic operations?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q14. Do you agree that the proposed implementation date for en-route oceanic navigation specifications is realistic?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q15. Do you agree with the proposed navigation specifications for arrival and departure procedures, including STAR transitions?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q16. Do you agree that the specific use of RNP1 + RF path terminator should only be an optional minimum navigation specification for arrival and departure procedures, including STAR transitions?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q17. Do you agree that the proposed implementation date for arrival and departure procedures navigation specifications is realistic?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q18. Do you agree with the additional option for the use of RNP AR navigation specification for rotorcraft operations?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q19. Do you agree that the proposed implementation date for the additional RNP AR navigation specification for rotorcraft operations is realistic?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q20. Do you agree that it would be appropriate to extend the applicability of the proposed rotorcraft operations navigation specifications to include new airspace users such as eVTOL?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q21. Do you agree that applicability of the proposed implementation date for rotorcraft operations navigation specifications to new airspace users such as eVTOL is viable?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Proposed policy to be included in consolidated UK PBN Regulation Article 4, Transitional Measures:

ATM/ANS providers required to implement the specifications listed above must ensure a smooth and safe transition to use of PBN, including by:

- Establishing, implementing, and keeping up to date a PBN transition plan;
- Consulting on the draft transition plan (and any significant update);
- Reporting progress to the CAA and submitting the consultation responses and draft transition plan (or update) to the CAA for approval in the form and manner determined by the CAA;
- Only establishing and implementing the transition plan (or update) after it has been approved by the CAA

(Note: This duty will continue to apply to ATM/ANS providers already subject to the requirements in the PBN Regulation. It will also apply to those brought in scope of the requirements for the first time because of the proposed amendments.)

Q22. Do you agree with the revised requirements proposed under Article 4 Transitional measures?

Yes No

If you answered no, please explain (1) why you disagree and (2) what alternative you would propose and why

Q23. Do you have any further comments related to our proposals?

Article 1 of UK Regulation (EU) 2018/1139 and section 149 of the Equality Act 2010 require the CAA to comply with several duties in the exercise of its functions.

To help us to satisfy these duties, and to help us ascertain the impacts of the changes being proposed, we invite stakeholders to describe the effects they envisage the proposals might reasonably have in 6 specific areas:

o Safety. What impact might the proposal have on civil aviation safety?

o Efficiency. What impact might the proposal have on the efficiency of the ATM system, either locally or nationally?

o Finance. What financial impact might the proposal have? Will implementation have a financial cost?

o Security. What impact might the proposal have on civil aviation security?

o Environment. What impact might the proposal have on the environment – for example, increased fuel burn, increased CO2 emissions?

o Equality. Do you consider that this proposal may disadvantage people who have one or more protected characteristics under the Equality Act 2010? The Equality Act provides that the following are protected characteristics: age; disability; gender reassignment; marriage and civil partnership; pregnancy and maternity; race; religion and belief; sex and sexual orientation.

For each of the 6 specific areas, select the type of impact that you consider the proposal could reasonably have from one of the four options listed. Please provide detail on why you have selected that answer for each area.

o Positive impact

o Negligible impact

o No impact

o Negative impact