International Civil Aviation Organization

THE THIRD MEETING OF PERFORMANCE BASED NAVIGATION IMPLEMENTATION COORDINATION GROUP (PBNICG/3)

Bangkok, Thailand, 08 – 10 March 2016

Agenda Item 10: Issues and Challenges regarding PBN Implementation

ICAO PBN STUDY GROUP PAPERS

(Presented by Australia)

SUMMARY

This paper presents two papers being presented to the ICAO PBN Study Group in Montreal. Issues noted are relevant to the PBNICG.

1. INTRODUCTION

1.1 The attached papers are being presented to the PBN Study Group this week.

2. DISCUSSION

PBN Implementation Issues

2.1 The two papers raised a number of issues noted by Australia during work undertaken to implement PBN in Australia and the region. Consideration of their content is recommended to the PBNICG to allow timely awareness of the issues and derive resolutions if appropriate.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this papers; and

b) discuss any relevant matters as appropriate.

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Attachments: PBNSG Papers

International Civil Aviation Organization

STUDY NOTE

PERFORMANCE-BASED NAVIGATION STUDY GROUP (PBNSG)

FIFTEENTH MEETING

Montreal, Canada 7 – 11 March 2015

Agenda Item x: xxxx

PBN Manual: RNP AR Operations

(Presented by Australia)

SUMMARY

At the PBNSG/13 and PBNSG/14 meetings, Study Notes were presented recommending that the RNP AR APCH operational approval process be simplified. In both meetings the PBNSG rejected the proposals, noting that the submitted Study Notes indicated a significant lack of understanding of the safety basis of RNP AR operations by the proponents. This Study Note recommends that the PBN Manual RNP AR Operations section be moved to a new Part in the Manual i.e. Vol II Part D, and enhanced to provide better understanding of the RNP AR safety basis.
Action by the PBNSG is in paragraph 4.

1. INTRODUCTION

1.1 PBNSG/13 SN02 and PBNSG/14 SN02 both proposed that the RNP AR operational approvals process be simplified for non-complex or terrain constrained environments. The PBNSG rejected the proposals in both cases; both Study Notes indicated a significant lack of understanding of the safety basis of RNP AR operations by the proponents.

1.2 With RNP AR there are multiple variants of the terminology and procedures in use globally. ICAO Doc 9905 provides a limited capability when compared to the proprietary/special designs. This Study Note recommends that the PBN Manual is revised to better address the range RNP AR operations in global use and the safety basis of RNP AR.

2. DISCUSSION

2.1 The Study Notes presented to PBNSG/13 and PBNSG/14 both proposed simplifying the operational approval process for RNP AR operations to little more than the aircraft has an RNP AR

airworthiness compliance statement in the Aircraft Flight Manual (AFM), the flight crew having completed the requisite training and the approach not being constrained by terrain or at an aerodrome where special conditions apply there is not further authorisation needed. The Study Notes were rejected by the PBNSG in both cases.

2.2 During the PBNSG discussion of the Study Notes, it was apparent that the proponents of Study Notes lacked understanding of the safety basis of RNP AR operations and how the removal of buffers and reduced tolerances were mitigated to achieve the required level of safety. PBNSG/13 SN02 cited the case of RNP AR approaches in Australia where there is no terrain impediment to the approach. In the Australian case, the approaches are actually proprietary designed procedures and do not comply with the requirements of ICAO Doc 9905. The PBNSG/14 SN02 proposal suggested criteria that would determine whether or not an approach procedure was 'simple'; the criteria suggested were such that Queenstown, one of the more challenging aerodromes for approach operations, could be assessed as 'simple'.

2.3 The lack of understanding of the safety basis of RNP AR operations is widespread in the aviation community. Outside the limited numbers of personnel actively involved with RNP AR approvals and operators using proprietary procedures to low RNP values, few in industry have a sound knowledge of the safety basis of RNP AR operations. With the proposal for RNP AR departures to be included into the PBN Manual plus the increasing number of operators conducting RNP AR operations, the problem of those lacking detailed RNP AR knowledge pressing for lesser standards is only going to get worse.

2.4 In the Study Notes referred to above, the criteria for whether or not an RNP AR operation was to be classified as 'simple' related mostly to the proximity of terrain and how easy the procedures were to fly i.e. the perspective of the Study Notes was cockpit centric and did not consider the means by which risks are mitigated within RNP AR operations. The SASP is currently working on the criteria for RNP AR approaches to closely spaced parallel runways. In this case, the aircraft must follow the defined flight path precisely otherwise the aircraft may exceed the airspace limits and encroach on the airspace of other users – terrain is not a factor. Thus the key for RNP AR operations is the precision with which the aircraft must follow the defined flight path and the probability that it may exceed the applicable total system error (TSE) limit.

2.5 During the PBNSG/14 discussion, it was suggested that more discursive material be included into the proposed RNP AR Operations chapter of the PBN Manual (Vol II Part C Chapter 6). RNP AR operations are substantially more demanding that the basic RNP APCH or RNP 1 departure; RNP AR is effectively a class of its own because of the actions need to mitigate the removal of buffers and reduced tolerances. The situation is further complicated through different variants of RNP AR procedures in use globally and the terminology used to describe them: ICAO Doc 9905 procedures are variously described as RNP AR Public, RNP AR (ICAO) or RNP AR (9905). For RNP AR procedures that are not designed to ICAO Doc 9905 criteria, the terminology in use is RNP AR Special, RNP AR Proprietary and RNP AR MVD (multi-variant design); additionally, there are RNP AR departures already in common use globally. Within the non-Doc 9905 procedures, many have one engine inoperative procedures incorporated (for both approaches and departures).

2.6 RNP AR operations are much more complex than the 'mainstream' RNAV and RNP procedures so are effectively a class of their own. It is therefore suggested that the current RNP AR APCH chapter be moved to a new PBN Manual Volume II Part D RNP AR Operations section. Within the new Part D, it is suggested that there be a discursive chapter (Chapter 1) that identifies the differing RNP AR procedures and terminology in use globally and provides an explanation of the safety basis for RNP AR operations, the means of mitigating the removal of buffers and allowing operations with low RNP values. The current RNP AR APCH chapter can then retained as a clearly defined navigation

specification (Part D Chapter 2); the option is then open as to whether or not RNP AR DP is included within a revision to the current RNP AR APCH chapter content or is added as a stand-alone chapter.

2.7 Limiting the material in the discursive chapter to ICAO standards will be counter-productive; these other procedures are in widespread use. The discursive chapter needs to clearly explain the global RNP AR situation and define the limits of the ICAO RNP AR operations addressed in the PBN Manual navigation specifications. The RNP AR navigation specification(s) will then strictly reflect the ICAO standards and criteria.

2.8 There are numerous references to the PBN Manual from within ICAO documents and in State regulatory material. To ensure that these references remain valid, it is recommended that Part C Chapter 6 remains in the Manual but with text directing the reader to the new Part D Chapter 2.

3. CONCLUSIONS & RECOMMENDATIONS

3.1 The proposals for RNP AR approvals to be simplified has highlighted that there is a lack of understanding of the safety basis for RNP AR operations in the wider aviation community. RNP AR operations are more complex than the RNAV and RNP mainstream operations. Therefore, it is recommended that RNP AR is established in class of its own within the PBN Manual and that a discursive chapter be added to identify the differing RNP AR operations in use and identify the safety basis of RNP AR operations.

3.2 It is recommended that:

a. The PBN Manual be revised to add are new Part D to Volume II titled ‘RNP AR Operations’.

b. A discursive chapter be added to provide general information on RNP AR operations.

c. The existing Volume II Part C Chapter 6 be incorporated into the new Part D as the RNP AR APCH navigation specification.

4. ACTION BY THE PBNSG

4.1 The PBNSG is invited to note the content of this paper and the recommended changes to the PBN Manual.

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International Civil Aviation Organization

STUDY NOTE

PERFORMANCE-BASED NAVIGATION STUDY GROUP (PBNSG)

FIFTEENTH MEETING

Montreal, Canada 7 – 11 March 2015

Agenda Item x: xxxx

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(Presented by Australia)

SUMMARY

Australia has mandated that all IFR aircraft be equipped with GNSS from 4 February 2016; from 26 May 2016 all continental en route operations will be RNP 2 and terminal procedures will be RNP 1. This Study Note explains the background rationale for the Australian decisions and identifies key requirements and problem areas when implementing PBN.
Action by the PBNSG is in paragraph 6.

1. INTRODUCTION

1.1 Australia was among the first States (circa 1995) to widely implement GNSS (GPS); initially for en route operations and then for non-precision approach (NPA) operations. With the advent of the TSO C145 and C146 GPS equipment, Australia completed a safety study and determined that this equipment was acceptable to allow IFR operations as the only required navigation equipment installed in the aircraft i.e. is the primary means of navigation.

1.2 With Performance-based Navigation (PBN) standardised, Australia made an early decision to implement PBN and take advantage of the benefits that would accrue. The initial rules were implemented in 2012 requiring all aircraft operating IFR to be equipped with GNSS (GPS) from 4 February 2016. This Study Note discusses the rationale for the decisions made and identifies key requirements and problem areas when implementing PBN.

2. DISCUSSION

2.1 The Australian Context

2.1.1 The aviation operational conditions in Australia are diverse and quite different to most other places. Australia is a large sparsely populated country, except near the coasts, with a climate that ranges from tropical/equatorial through desert to temperate. Figure 1 shows the size of Australia relative to North America; Table 1 compares the demographics of the United States and Australia.

Figure 1: Australia versus North America

Table 1: US versus Australia Demographics.

Item	United States	Australia	Comments
Land area	2,954,842 sq miles 7,653,006 sq km	2,988,901 sq miles 7,741,220 sq km	Australia = 1.2% larger that the lower 48 US
Population	322 million	23,979,000	Australia = 7.5% US
Aircraft Fleet	205,000	15,000	Australia = 7.3% US
Radio NAVAIDs	1000's	415	181 decommissioned
Surveillance radars	c480	23	
Airports (paved / unpaved)	5,194/9,885	326/139/304	2010 data
GPS Approaches / airports	3,712/1,856	625/304	Jan 2016 data

2.1.2 The landmass of Australia is commensurate with that of contiguous US but the population is less than 7.5% that of the US. The US population is concentrated mostly in the eastern half of the country but with population concentrations on the northern and southern west coast regions. The Australian population is concentrated in the south – eastern coastal region where there is a temperate climate. Over 80% of the population lives within 200 km of the coast; central Australia has a very low population density with much of the area being mostly desert.

2.1.3 The registered aircraft numbers are in similar proportions to the population. Hence the aviation infrastructure is vastly different: Australia has 23 surveillance radars and 415 NAVAIDs to cover approximately the same land area as the US. This lack of infrastructure for navigation and surveillance, with the increased collision risk due to increasing traffic was the reason Australia adopted area navigation for continental operations in the 1970s and mandated ADS-B in the upper airspace from December 2013.

2.1.4 The Australian continent has a diverse airspace structure with some areas being remote with little aviation activity but others having some of the highest global traffic densities. The Sydney – Melbourne route has the third highest traffic density in the world. The advent of long-range jets means that there are substantial numbers of aircraft operating transcontinental routes internally and from the east coast to Asia, the Middle East and Africa.

2.1.5 General aviation (GA) is a key element of life in the remote areas of Australia providing the quickest, and often the only, connection to the services offered in the larger communities. Services such as low capacity regular passenger transport and the Royal Flying Doctor Service are part of an essential infrastructure needed to support the remote communities. Additionally there are numerous aerial work operations carrying out a broad range of operations using both fixed wing aircraft and helicopters in support of farming, mining and land management.

3. WHY GNSS BASED PBN?

3.1 The large continental land mass that is sparsely populated also means that many locations are remote. These remote locations mean that NAVAIDs, when installed, rely on on-site power supplies, have significant physical security risks and are not readily accessible for maintenance. The tropical north has an equatorial monsoon climate so that ‘in the wet’, it can take days or weeks to access a failed NAVAID; maintenance is problematic and costly.

3.2 The advent of GPS provided a navigation capability to GA that had once been the sole preserve of transport aircraft. To have an accurate navigation capability that was reliable and widely available made the many remote communities in Australia more accessible. This accessibility was further enhanced when GPS approaches were introduced. GPS alone provided year-round access to communities where it would otherwise have been impractical to provide the infrastructure needed.

3.3 The advent of the TSO C146 GPS is a key development for PBN in Australia. The improved performance of these systems, despite there being no SBAS in the region, soon showed the capabilities of GPS as a primary means of navigation. For over 70 years the minimum equipment required in an aircraft for IFR operations was a single ADF, relying on the NDB at the destination. There are numerous historical cases where aircraft arrived at their destination only to find that the NDB had failed!

3.4 A safety case was developed to determine the likelihood of GPS failing when an aircraft was en route to its destination. The TSO C129 system failed to meet the requirements because a single satellite failure caused the loss to the navigation function. However, the TSO C146 system was shown to

exceed the requirements, based on the RTCA DO-229 test constellation – in reality the actual GPS reliability is three times better than the nominal performance. As a consequence of the safety analysis, since 2006 it has been legal to fly IFR for private or aerial work operations in Australia with a single TSO C146 GPS as the only navigation aid installed in the aircraft. Aircraft equipped with TSO C129 can still operate but require TSO approved ADF and or VOR equipment to provide an alternate means of navigation; aircraft must plan to use the ADF/VOR for navigation and approach to alternate (when required).

3.5 Australia's local considerations for PBN include a large and sparsely populated geography of a remote island and the consequent long standing and increasing reliance on aviation to connect the island with the world, and the interior and corners of the island with the rest of the island. Sparse population means limited financial revenues. The GNSS and PBN initiatives bring many direct benefits per the ICAO documentation and a much decreased spend on ground based NAVAIDs. The overall economic benefits to operators and reduced ground infrastructure needed for GNSS based PBN are substantial.

3.6 The advent of PBN, the ICAO Global Air Navigation Plan, the Global Aviation Safety Plan and the Asia Pacific (APAC) Seamless ATM Plan all had PBN as the navigation cornerstone. Within the APAC region, there is a diversity of capability within States, thus oceanic operations will remain as defined in ICAO Doc 7030 Regional procedures. Doing PBN was a global initiative that sooner or later, Australia was going to have to implement. The widespread use of GPS meant that Australia was already doing PBN, but not under that name. The overall economic benefits to operators and reduced ground infrastructure needed for GNSS based PBN made that an obvious choice.

3.7 The decision to implement RNP 2 for continental en route operations went through several iterations. In the beginning Australia looked at implementing RNAV 5 as an easy start but found that the route design of many routes did not support the design criteria of RNAV 5 without substantial redesign. The re-design would have increased the applicable LSALT by 100 – 200 feet in most cases but for routes crossing the eastern Great Dividing Range the LSALT increase would often be 1,000 – 2,000 feet. RNAV 2 based on radio updating is not supported over large tracts of Australia so is impractical for use as a common national standard. Since Australia has mandated GNSS, the logical choice for an en route navigation specification is RNP 2 since this is the en route performance of TSO approved stand-alone GPS systems, is the simplest continental en route navigation specification that meets Australian needs, and importantly, the stand-alone GPS navigators in widespread GA use already meet.

3.8 By adopting RNP 2, RNP 1 and RNP APCH–LNAV as the core triad for IFR operations within continental Australia, with ADS-B, Australia established the need for a single upgrade package to aircraft that will not change for a substantial period of time. Aircraft on the Australian register already have a very high degree of compliance with the requirements (98.5% of IFR aircraft are GNSS equipped). By having this common standard across all aircraft, Australia now has the capability to refine airspace, routes and procedures to take advantage of PBN without causing further disruption, upgrades or cost to the operators. The 26 May 2016 PBN implementation is the point where Australia can start developing airspace, applying the PBN capabilities and getting the efficiencies and benefits that accrue through PBN. To get the real benefits, a high proportion of equipage across the fleet is needed (at least 80%); adopting RNP 2, RNP 1 and RNP APCH–LNAV gives Australia that essential infrastructure.

3.9 With the pending transition to PBN, Airservices has reviewed the low level conventional route structure and found that there were 188 underutilised routes. Under utilisation was defined as the average being less than 4 movements per day or less than 16 movements per week. 101 of the 188 underutilised routes will be withdrawn since point to point operations using RNP 2 will be more efficient and remove the overhead cost of their maintenance.

4. IMPLEMENTATION EXPERIENCE

4.1 The PBN implementation experience in Australia has lessons for those implementing PBN. The sections below identify the Australian experience.

4.2 Transition Planning

4.2.1 Creating the PBN rules was about 20% of the overall task. By far, the greatest task was transition planning and implementation. This work needs to be continuous from the time the initial regulatory change was proposed until PBN has been implemented and a post implementation review has been completed. The team needed for this work is diverse: technical specialists dealing with technical matters, aviation safety advisors working with operators, education and training personnel, and corporate communications.

4.2.2 Training, apart from flight crew training, is a significant problem. Few operators understand or recognise the requirement for personnel outside flight crew to have specific training on PBN; there are safety implications through lack of training of personnel. The PBNSG/14 training workshop was a good start; as part of the ICAO PBN training development activity, it is recommended that the PBNSG identify topics that should be addressed for non-flight crew personnel and that this information is included in the PBN Manual guidance.

4.2.3 It was not until the GNSS, ADS-B and PBN mandates were very close that many operators took action to comply with the requirements despite corporate communications campaigns and website information. As part of the implementation plan, a strong multi-media communications strategy is needed that covers general information and specific information for targeted audiences. Monitoring of compliance and both engaging directly with non-compliant operators proved to be beneficial for the GNSS and ADS-B mandates; this activity also allowed accurate prediction of compliance with the mandates. When operators equip early, they should be able to take advantage and accrue the benefits of their investment to encourage early compliance.

4.3 ICAO Transition Guidance

4.3.1 The Australian ADS-B, GNSS and PBN implementation programmes have been running in parallel for several years. In reality, the transition planning and implementation requirements are mostly common between all the projects; outside the specific technical areas, much of the communications and implementation work that affected the operating industry was combined to provide a single consistent messaging theme.

4.3.2 Since transition planning and implementation constitutes about 80% of the work for implementation, it is recommended that implementation guidance be incorporated into the PBN Manual to provide States with information on the areas in which focus is needed.

4.3.3 Global transition guidance and coordination is needed for success. In the 1990s the RNP RNAV MASPS were developed and adopted by ICAO to establish common standards. However, this work did little to establish common standards globally – 20 years on and over 10 years since the PBN concept was developed, we still have B-RNAV, P-RNAV and US RNAV. The key to implementation is the transition plan. The beginning and end states are relatively easy – it is the transition that is the hard part that takes the real effort.

4.3.4 Since the transition plan is the key to PBN implementation, it is recommended that transition planning guidance be included with the PBN Manual implementation guidance.

4.4 NAA Capability to Issue Navigation Authorisations

4.4.1 The most significant late stage problem that affected the Australian implementation was the inability of States to issue navigation authorisations to their operators to enable operations in Australian airspace. The PBN Manual needs to provide clear guidance to States that even though the State may never implement a specific navigation specification in its own airspace, they need the capability to issue these authorisations for use by their operators in foreign airspace. In the Australian implementation, an exemption enabled a temporary alternate means of compliance by allowing operators holding a GNSS based RNAV 1 & RNAV 2 authorisation to operate on the Australian RNP 2 routes and RNP 1 terminal procedures. The impact of this is that while the exemption is in force, Australia cannot use the optional capabilities of the intended primary navigation specifications.

4.4.2 The cause of States not being able to issue navigation authorisations for their operators were:

a. States had not published the airworthiness requirements for the navigation specifications, preventing aircraft manufacturers including airworthiness compliance statements within the aircraft flight manual; or

b. The issuing State would not issue an authorisation unless there was airworthiness compliance statement for the navigation specification in the AFM – this situation was common where States did not have high levels of technical expertise; or

c. The State did not have rules allowing an authorisation to be issued for the particular navigation specification(s).

4.4.3 If the alternate means of compliance option had not been available, Australia would have had to either utilise navigation specifications that did not fully meet the intended airspace development requirements or limit the access of foreign operators to Australian airspace. Neither option is appealing for obvious reasons! Therefore it is recommended that in the implementation guidance provided in the PBN Manual, there should be a clear recommendation that States ensure that they have the ability to issue authorisations to their operators so that operations in foreign States are not impeded.

4.5 Stakeholder Communications

4.5.1 Arguably the largest and most consistent part of the GNSS/PBN implementation project was stakeholder communications. A communications plan was developed early in the project and used most media forms: brochures, magazine advertisements, email (general and targeted), Facebook, Twitter, Aeronautical Information Circulars, CASA and Airservices Australia websites, et al. A large part of the communications was coordinated with Airservices Australia so that the recipient lists were the combination of CASA and Airservices lists. A further benefit of the combined communications strategy was a unified message from both the regulator and the ANSP.

4.5.2 Australia already had a widespread GNSS user community that already met the mandate requirements however, this was not the case for the ADS-B mandate. For the ADS-B mandate, to improve awareness of the mandate and encourage equipage, non-equipped operators were contacted and asked to provide their plans for equipping their aircraft. This increased operator awareness of the mandate and provided information that allowed the compliance rate to be monitored and predict the equipage rate at the time of the mandate.

4.6 Regulation, Business Systems and Operator Oversight

4.6.1 While a relatively small part of the overall implementation task, establishing the regulations, guidance material, business systems to manage approvals and establish operator oversight form a critical segment of the overall project. The need for national regulations is straightforward but is governed largely by the State regulatory structures.

4.6.2 When developing the regulations, establishing a forward-fit requirement is an important preparatory step to minimise the equipage time and the number of cases where aircraft are updated only to be modified again a short time later. The three years forward-fit requirements established in Australia appear to have been successful.

4.6.3 The only area where there were significant problems, and then primarily an ADS-B problem, related to aircraft with integrated avionics systems installed under the aircraft type certificate. In these cases, manufacturers were not responsive to the Australian requirements and the cost of implementation is about three times that for discrete installations. The aircraft OEMs were focussed on the US 2020 ADS-B implementation, thus global operators had difficulty meeting the Australian requirements. The original Australian ADS-B implementation timeline remains unchanged where other States have delayed their implementation schedule and changed the requirements. The impact of these changes has been significant. While States are free to manage their own affairs, the States developing technology can have significant impact on other State's implementation plans. It is therefore suggested that ICAO needs to take a leading role in transition planning coordination so that there is a stable global transition.

4.6.4 A clear lesson from the Australian PBN regulatory material is that ICAO needs to make the statements in Doc 9613 Vol II Part A Section 1.2.9 much clearer and prominent. With the Australian regulations, the technical requirements for the navigation specifications refer to the PBN Manual i.e. the Manual has been incorporated into the regulations by reference. There are two distinct disadvantages to this:

a. National legislation is determined by foreign persons unknown over which there is no State control; and

b. Users of the regulatory material have to acquire a copy of the PBN Manual (at some cost) in order to determine the State requirements.

4.6.5 A key part of the regulatory process is that the regulators must have efficient business processes to process authorisations, particularly in the earlier phases where the number of application are high. Without simple and efficient business processes, unnecessary costs are imposed on operators.

4.6.6 When new requirements are implemented, such as PBN, the regulatory oversight of operators increases. Thus the regulatory authorities need to include this additional tasking into their plans, along with the training of the regulatory inspectorate. Regulator training is a significant task because of the need to develop a substantial level of technical expertise within the inspectorate. Further, the inspectorate training needs to be broad to cover the range of operations; operator training on the other hand can be narrower and specific to the operations being conducted.

5. CONCLUSIONS & RECOMMENDATIONS

5.1 The key lesson of the Australian GNSS/PBN implementation project is that strong project management procedures are needed from initial inception until implementation is complete and a post implementation review has been completed. Much of the work associated with this is best accomplished as coordinated parallel activities; serial activities invariably lead to discontinuities in the project.

5.2 For the whole project it is essential that there is a group of subject matter experts, representing the various PBN affected areas, including flight operations, airworthiness engineering, airspace planning and design, and air traffic management, needs to be assembled to provide coordinated expert advice to the project.

5.3 The most difficult part of the PBN implementation is the transition from the old regime to the new regime. Planning the actual transition to the new regime and managing that plan carefully is a key element for success. Without good planning and consistent management of the plan, problems are not detected and corrected early.

5.4 To help small States implement PBN, the PBN Manual should contain clear guidance on the implementation tasks that need to be accomplished.

5.5 It is recommended that:

a. The PBNSG note the contents of this paper;

b. The PBN Manual be revised to provide better implementation guidance for States.

c. ICAO highlights the need for State regulators to have the ability to issue navigation authorisations to their operators for all navigation specifications and so enable them to readily operate in foreign airspace compliant with the requirements of that airspace.

d. For significant technical changes that affect global aviation operations, ICAO establishes a global transition plan to coordinate implementation.

6. ACTION BY THE PBNSG

6.1 The PBNSG is invited to note the content of this paper and the recommended changes into the PBN Manual.

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