



International Civil Aviation Organization

**Performance Based Navigation Sub-Group
(PBN SG)**

First Meeting
(Cairo, Egypt, 1 - 3 April 2014)

Agenda Item 3: Global and Regional Developments related to PBN and GNSS

GLOBAL AND REGIONAL DEVELOPMENTS RELATED TO PBN

(Presented by the Secretariat)

SUMMARY
This paper presents the global and regional developments related to PBN.
Action by the meeting is at paragraph 3.
REFERENCES
<ul style="list-style-type: none">- DGCA-MID/2 Report- GANP DOC 9750- ICAO Assembly 38th Session- MIDANPIRG/14 Report

1. INTRODUCTION

1.1 Performance-Based Navigation (PBN) defines performance requirements for aircraft navigating on an ATS route, terminal procedure or in a designated airspace. It is ICAO's effort and objective to redefine the regional differences of various Area Navigation (RNAV) and Required Navigation Performance (RNP) specifications into a globally harmonized set of PBN applications.

1.2 PBN is helping the global aviation community reduce aviation congestion, conserve fuel, protect the environment, reduce the impact of aircraft noise and maintain reliable, all weather operations, even at the most challenging airports. It provides operators with greater flexibility and better operating returns while increasing the safety of regional and national airspace systems.

2. DISCUSSION

2.1 The Twelfth Air Navigation Conference (AN-Conf/12) held in Montreal, Canada, from 19 to 30 November 2012, acknowledged the notable work that had already been completed by ICAO and its partners to support the global implementation of PBN but also recognized that there is a shortfall in meeting Assembly Resolution A37/11 regarding production of State PBN implementation plans and instrument approach procedures with vertical guidance. Consequently, the Conference recognized that States still required assistance with PBN implementation especially in the areas of operational approvals and training of personnel. However, it was highlighted that the resources to

support PBN were extremely limited and must be managed effectively. The Conference agreed that ICAO should continue to provide support, with assistance from States, International Organizations and Industry, in order to facilitate the timely implementation of PBN. Some of the AN-Conf/12 recommendations relevant to PBN are at **Appendix A** to this working paper. More details regarding the outcome of the AN-Conf/12 are contained in DOC 10007 Report of the An-Conf/12, available on the ICAO-NET.

2.2 The ICAO 38th Assembly was held in Montreal, Canada, from 24 September to 4 October 2013, endorsed the Fourth edition of Global Air Navigation Plan (GANP).

2.3 The 38th Assembly called upon States, planning and implementation regional groups (PIRGs), and the aviation industry to:

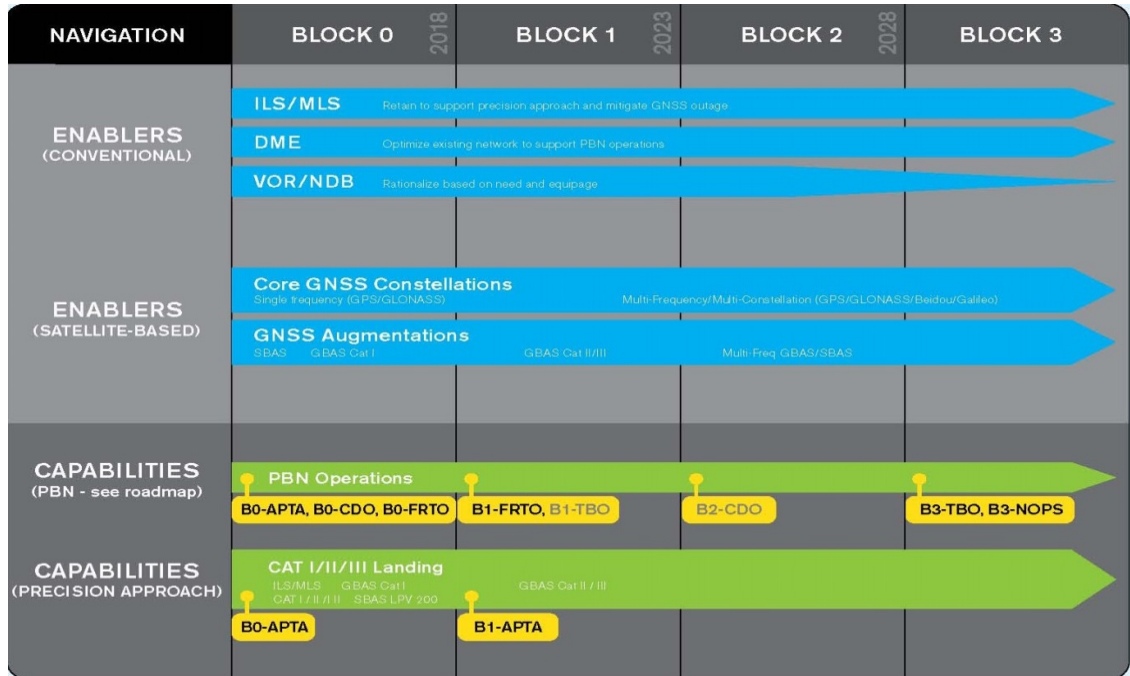
- utilize the guidance provided in the GANP for planning and implementation activities which establish priorities, targets and indicators consistent with globally-harmonized objectives, taking into account operational needs;
- provide timely information to ICAO, and to each other, regarding the implementation status of the GANP, including the lessons learned from the implementation of its provisions;

2.4 The 38th Assembly urged States:

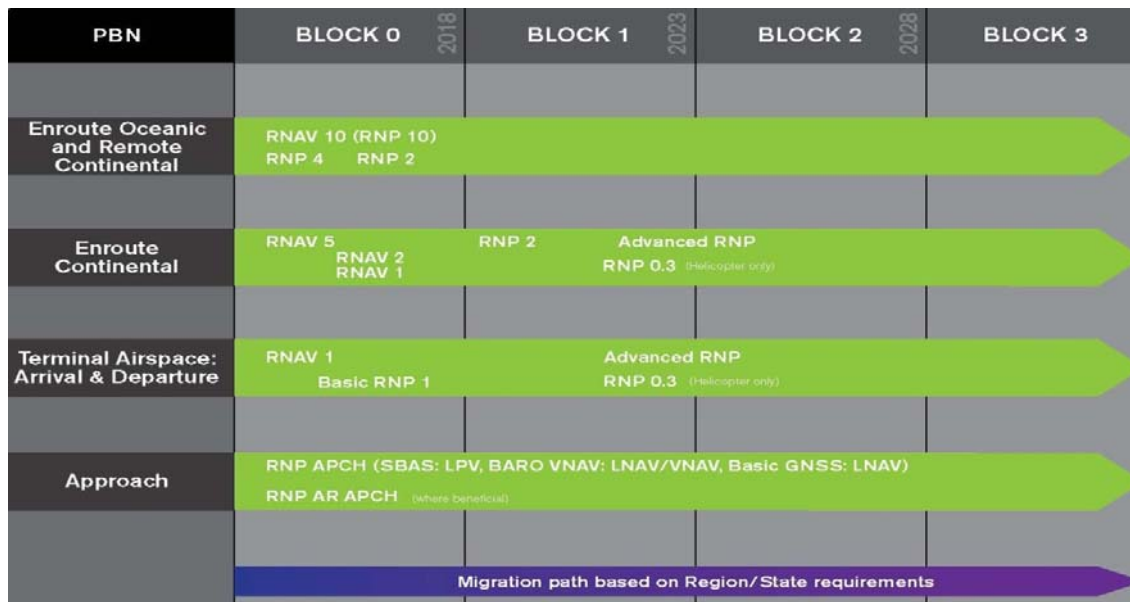
- to take into consideration the GANP guidelines as an efficient operational measure for environmental protection;
- that are developing new generation plans for their own air navigation modernization to coordinate with ICAO and align their plans so as to ensure global compatibility and harmonization
- to utilize the Flight Procedures Programme, where available, for PBN implementation
- Members of the AFI Region to support the establishment of the AFI Flight Procedure Programme (FPP) Office with seconded personnel and financial assistance as a matter of urgency to expedite the implementation of PBN.

2.5 The meeting may wish to note that, at global level, PBN is considered as the highest priority for air navigation, in addition to the Continuous Descent Operations (CDO), and Continuous Climb Operations (CCO).

2.6 The GANP includes the below Roadmaps (5 and 6), which depict migration paths for the implementation of PBN levels and precision approaches for the following operations: en-route oceanic and remote continental, en-route continental, TMA arrival/departure, and approach. There is no attempt to show detailed timelines because Regions and States will have different requirements; some may need to move quickly to the most demanding PBN specification while others will be able to satisfy airspace users' requirements with a basic specification. The figures do not imply that States/Regions have to implement each step along the path to the most demanding specification. The PBN Manual (Doc 9613) provides the background and detailed technical information required for operational implementation planning.



Roadmap 5



Roadmap 6

2.7 The meeting may wish to recall that the 38th Assembly approved the Regional Performance Dashboards. These Dashboards aim to provide a glance of both Safety and Air Navigation Capacity and Efficiency strategic objectives, using a set of indicators and targets based on the regional implementation of the Global Aviation Safety Plan (GASP) and the Global Air Navigation Plan (GANP). The Dashboards are available on the ICAO website and can be accessed through the following link: <http://www.icao.int/safety/Pages/Regional-Targets.aspx>

2.8 The purpose of these Dashboards is to show targeted performance at the regional level and, initially, contain graphics and maps with a planned expansion to include the Aviation System Block upgrades (ASBU) Block 0 Modules. The ICAO website will allow the visualization of the status of implementation through dynamic and interactive charts. This system will generate ad-hoc reports and enable an easy transformation of the dataset into the Regional Performance Dashboard and the annual Global Air Navigation Report.

2.9 The Air Navigation Dashboard (V 1.0) contains the following Metrics:

- a) Implementation of PBN Approaches at International Aerodromes Runways;
- b) Utilizing of Air Traffic Flow Management (ATFM) Systems;
- c) Implementation of Aeronautical Information Management (AIM);
- d) Implementation of Ground-Ground Digital Coordination / transfer; and
- e) Application of Fuel Savings/CO2 Emissions Reduction.

2.10 The following represents an initial set of Indicators related to PBN:

- a) Number of Runways at International aerodromes with APV;
- b) Number of PBN Runways at International aerodromes with Lateral Navigation (LNAV);
- c) Number of PBN Runways at International aerodromes with Lateral and vertical Navigation (LNAV/VNAV);
- d) Number of PBN Runways at International aerodromes with Localizer performance with Vertical guidance (LPV);
- e) Number of PBN Runways at International aerodromes with navigation performance Authorization Required (RNP AR); and
- f) Number of PBN Runways at International aerodromes whose data cannot be refined to associate what the minimum label is (UNNOWN).

2.11 The meeting may wish to note that the ICAO Asia-Pacific Flight Procedure Programme (FPP) was established in October 2009. The Programme objective is to assist States to develop sustainable capability in the Instrument Flight Procedure (IFP) domain so as to meet their commitments under Assembly Resolution A36-23 (superseded by Assembly Resolution A37-11) for PBN implementation and their obligations for the quality of their IFP's. This will be accomplished through training, assistance with quality assurance, procedure design and access to IFP-related automation solutions.

2.12 In the same line, a Seminar/Workshop was organised in the ICAO West and Central Africa (WACAF) Regional Office, 26-28 March 2014, to support the establishment of the AFI Flight Procedure Programme (AFI-FPP) Office with seconded personnel and financial assistance as a matter of urgency to expedite the implementation of PBN in the AFI Region.

2.13 The ICAO Eastern and Southern African (ESAF) Regional Office will convene the Performance-Based Navigation Route Network Development Working Group Workshop and Meeting (PRND WG/4) in Nairobi, Kenya, 1-3 April 2014 and the PBN Airspace Design and Training Workshop also in Nairobi, 8-19 September 2014.

2.14 The ICAO NACC Regional Office will organize a Design and Publishing of PBN Approach Procedure Course, Mexico, 17-28, November 2014.

2.15 The ICAO European and North Atlantic (EUR/NAT) Regional Office is scheduling the following PBN activities in 2014:

- a) PBN task Force, Paris, France, 9-11 September 2014;
- b) PBN Airspace Design Workshop/PBN Go Team, Bucharest, Romania, 15-19 September 2014; and
- c) PBN Airspace Design Workshop, Istanbul, Turkey, 15-19 December 2014.

2.16 The ICAO South America (SAM) Regional Office is planning to organize the following PBN Workshops in 2014:

- a) First Workshop on Design of PBN Airspace, Lima, Peru, 12-23 May 2014; and
- b) Second Workshop on Design of PBN Airspace, Lima, Peru, 7-11 July 2014.

2.17 The meeting may wish to note that two PBN Workshops on the use of PBN in the airspace design were successfully organized for the MID Region. The first one was held in Abu Dhabi, UAE, 19-30 January 2014 and the second one in Tunis, jointly with ICAO EUR/NAT Regional Office, 24-28 February 2014.

2.18 The meeting may wish to note that MIDANPIRG/14 underlined that the lack of procedure designers is one of the PBN implementation challenges. It was emphasized that cooperative efforts were necessary to overcome this challenge. In this respect, the meeting noted that the DGCA-MID/2 meeting, through Conclusion 2/5 agreed that a study related to the establishment of a MID Region Flight Procedure Programme (FPP) be carried out within the framework of the PBN Sub-Group, taking into consideration similar programmes in other ICAO Regions. The meeting noted that the task related to the study for the establishment of the MID FPP was included in the Terms of Reference (TOR) of the PBN Sub-Group.

2.19 In the same vein, it was highlighted that the PBN Sub-Group will be responsible for PBN implementation for Terminal and Approach, while the ATM Sub-Group will be responsible for PBN implementation for Enroute.

2.20 It is to be highlighted that the provisions, guidelines and computer based training courses related to PBN are available on the ICAO website accessible through the following link: <http://www.icao.int/safety/pbn/Pages/default.aspx>

3. ACTION BY THE MEETING

The meeting is invited to note the information contained in this working paper and take into consideration the regional and global developments related to PBN when addressing the PBN implementation in the MID Region .

APPENDIX A

AN-Conf/12 Recommendations relevant to PBN

Recommendation 2/5 – Performance-based navigation for terminal and approach operations implementation

That States and stakeholders:

- a) urgently implement, where appropriate, performance-based navigation for terminal and approach operations in accordance with Assembly Resolution A37-11;
- b) urgently adopt efficient operations approval procedures and support the mutual recognition of other States' operational approvals;
- c) share their best practices including required navigation performance-authorization required (RNP-AR) implementation initiatives as well as relevant flight operational safety assessment documentation with other States;
- d) determine operational requirements in support of their airspace concept in accordance with the processes described in the Performance-based Navigation (PBN) Manual (Doc 9613) in order to select the appropriate PBN specification;
- e) including regulators, airport authorities, air navigation service providers, commercial operators, general aviation and the military, work together at all levels and in close coordination to ensure successful performance-based navigation implementation;

That:

- f) international organizations and industry continue to provide resources to support ICAO with the development of provisions, guidance and training material in support of performance-based navigation implementation; and
- g) States, when considering performance-based navigation routes arriving at and departing from airports, should ensure that air navigation service providers and aircraft operators involve airport operators from the outset so that they may consult fully with local communities in order to avoid adverse noise impact on those communities.

Recommendation 2/6 – Development of ICAO provisions for performance-based navigation for en-route terminal and approach operations

That ICAO study and make appropriate additions where required to the ICAO provisions, including:

- a) required navigation performance-authorization required departure navigation specification;
- b) the application of performance-based navigation standard terminal arrival routes for en-route independent simultaneous approaches;

- c) assessment of the need for ICAO provisions on the use of a ground-based augmentation system to support standard instrument arrival and standard instrument departure procedures to approach and landing trajectory;
- d) development of separation minima to support all performance-based navigation specifications and which will also allow for operations where mixed performance requirements are in effect;
- e) advanced use of performance-based navigation to support aviation system block upgrade modules;
- f) continued development of provisions, guidance and training material in support of performance-based navigation implementation; and
- g) development and availability of the minimum qualification requirements for personnel to attend performance-based navigation procedure design training.

Recommendation 5/1 – Improved operations through enhanced airspace organization and routing

Considering that performance-based navigation (PBN) is one of ICAO's highest air navigation priorities and the potential benefits achievable through creation of additional capacity with PBN:

That States:

- a) implement performance-based navigation in the en-route environment;
- b) fully assess the operational, safety, performance and cost implications of a harmonization of transition altitude and, if the benefits are proven to be appropriate, undertake further action on a national and (sub) regional basis as a first step towards a globally harmonized transition altitude;
- c) take advantage of improved models for interregional coordination and collaboration to achieve seamless air traffic management and more optimum routes through the airspace;
- d) through the planning and implementation regional groups improve their methods of coordination to increase implementation of en-route performance-based navigation in order to achieve more optimum routes through the airspace;

That ICAO:

- e) encourage the planning and implementation regional groups to support the early deployment of performance-based navigation in accordance with Assembly Resolution A37-11;
- f) support, through development of a framework that capitalizes, builds on, and promotes demonstration activities which confirm the benefits of performance-based navigation as an enabler of more efficient operations in the en-route phase of flight; and
- g) invite industry to ensure that avionics incorporate fixed radius transition functionality to support closer spacing of performance-based navigation routes and improve airspace capacity.