International Civil Aviation Organization

The First Meeting of ICAO Asia/Pacific Performance based Navigation Implementation Coordination Group (PBNICG/1)

Beijing, China, 10-12 March 2015

Agenda Item 3: Global and Regional PBN Updates and States' PBN Implementation Progress
Agenda Item 4 Review of related global/regional plans, priorities and targets and relevant meetings outcomes

STATUS OF DEVELOPMENT OF STATE PBN IMPLEMENTATION PLANS

(Presented by Secretariat)

SUMMARY

This working paper presents the status of State's PBN Implementation Plan development and raises issues of assisting States who haven't develop the State plan.

1. INTRODUCTION

1.1 In the Resolution A37-11 of the 37th Session of the ICAO General Assembly which superseded Resolution A36-23, the Assembly urged all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN Manual (Doc 9613). Also the Assembly resolved that States complete a PBN implementation plan to achieve the implementation of RNAV and RNP operations for en-route and terminal areas according to established timelines and intermediate milestones. Especially for the implementation of approach procedures with vertical guidance (APV) including LNAV-only minima, the Assembly proposed to complete the implementation for all instrument runways by 2016 with intermediate milestones, i.e. 30% by 2010 and 70% by 2014 (see **Appendix A**).

1.2 In line with this, Asia and Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) adopted Regional PBN Implementation Plan to provide appropriate guidance for air navigation service providers, airspace operators and users, regulating agencies, and international organizations on the evolution of navigation capabilities as one of the key systems supporting air traffic management. The plan describes the RNAV and RNP navigation applications that should be implemented in the short, medium and long term in the APAC Region (see **Appendix B**).

2. DISCUSSION

State PBN Implementation Plan

2.1 In the ICAO Assembly Resolution A36-23, States and Planning and Implementation Regional Groups (PIRGs) are asked to complete a PBN implementation plan by 2009. In line with this, Asia and Pacific PBN Task Force (APAC PBN/TF) developed APAC Regional PBN Implementation Plan which was adopted as an interim edition by the APANPIRG/19 in September 2008. Since 2008, the APAC Regional PBN plan may be used as a guidance material for the

development of State PBN implementation plan. Following the initial adoption, the APAC Regional PBN plan was finally adopted by APANPIRG/20 in September 2009 and was updated by APANPIRG/21 and APANPIRG/22.

2.2 Since the development of the APAC Regional PBN Implementation Plan, APAC PBN/TF had assisted States in developing State PBN Implementation Plan through workshops and Seminars until the year of 2012. However, after the dissolution of PBN/TF in 2013, there was no entity to assist the development of the State PBN implementation plan. As a result, 14 out of 42 States including Special Administration Region and Territories have not submitted their PBN implementation plan yet. Among the 14 States who haven't submitted the State plan, 10 States are Pacific Islands States (see **Appendix C**).

2.3 Considering the first development of State PBN Implementation Plan was in 2009, now may be an appropriate time to review the State PBN plan because Short-term (2008~2012) which was proposed in the APAC Regional PBN Plan has already passed and Mid-term (2013~2016) is coming to the end.

2.4 In addition, as the APAC Seamless ATM Plan was approved by APANPIRG/24 in 2013, new timelines were proposed for ATM Plan including PBN related tasks, i.e. Phase I and Phase II being effective 12 November 2015 and 09 November 2018 respectively.

2.5 Therefore, the PBNICG is invited to discuss which entity or group will support States who haven't developed the State PBN implementation plan. A possible entity may be the cooperation between ICAO APAC RSO and Champion States. The PBNICG is also invited to consider whether the update of the State PBN plans is needed and, if so, which timelines will be proposed to States in the Region.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss the supporting method for developing and updating State's PBN implementation plan development support and its update; and

c) consider requesting States who have developed and submitted their State PBN Plans to update their State PBN Plan by the end of 2016; and

d) urge States who have not developed or submitted their State PBN Plans to do so as the matter of urgency in order to fulfill the requirement in A37-11.

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Appendix A. Assembly Resolution A37-11: Performance-based navigation global goals

Whereas a primary objective of ICAO is that of ensuring the safe and efficient performance of the global Air Navigation System;

Whereas the improvement of the performance of the air navigation system on a harmonized, worldwide basis requires the active collaboration of all stakeholders;

Whereas the Eleventh Air Navigation Conference recommended that ICAO, as a matter of urgency, address and progress the issues associated with the introduction of area navigation (RNAV) and required navigation performance (RNP);

Whereas the Eleventh Air Navigation Conference recommended that ICAO develop RNAV procedures supported by global navigation satellite system (GNSS) for fixed-wing aircraft, providing high track and velocity-keeping accuracy to maintain separation through curves and enable flexible approach line-ups;

Whereas the Eleventh Air Navigation Conference recommended that ICAO develop RNAV procedures supported by GNSS for both fixed- and rotary-wing aircraft, enabling lower operating minima in obstacle-rich or otherwise constrained environments;

Whereas Resolution A33-16 requested the Council to develop a programme to encourage States to implement approach procedures with vertical guidance (APV) utilizing such inputs as GNSS or distance-measuring equipment (DME)/DME, in accordance with ICAO provisions;

Recognizing that not all airports have the infrastructure to support APV operations and not all aircraft are currently capable of APV; Recognizing that many States already have the requisite infrastructure and aircraft capable of performing straight-in approaches with lateral guidance (LNAV approaches) based on the RNP specifications and that straight-in approaches provide demonstrated and significant safety enhancements over circling approaches;

Recognizing that the Global Aviation Safety Plan has identified Global Safety Initiatives (GSIs) to concentrate on developing a safety strategy for the future that includes the effective use of technology to enhance safety, consistent adoption of industry best practices, alignment of global industry safety strategies and consistent regulatory oversight;

Recognizing that the Global Air Navigation Plan has identified Global Plan Initiatives (GPIs) to concentrate on the incorporation of advanced aircraft navigation capabilities into the air navigation system infrastructure, the optimization of the terminal control area through improved design and management techniques, the optimization of the terminal control area through implementation of RNP and RNAV SIDs and STARs and the optimization of terminal control area to provide for more fuel efficient aircraft operations through FMS-based arrival procedures; and

Recognizing that the continuing development of diverging navigation specifications would result in safety and efficiency impacts and penalties to States and industry;

Noting with satisfaction that planning and implementation regional groups (PIRGs) have completed regional PBN implementation plans; and

Recognizing that not all States have developed a PBN implementation plan by the target date of 2009;

The Assembly:

1. *Urges* all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept laid down in the *Performance-based Navigation (PBN) Manual* (Doc 9613);

2. *Resolves* that:

a) States complete a PBN implementation plan as a matter of urgency to achieve:

1) implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones;

2) implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS), including LNAV-only minima, for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014; and

3) implementation of straight-in LNAV-only procedures, as an exception to 2) above, for instrument runways at aerodromes where there is no local altimeter setting available and where there are no aircraft suitably equipped for APV operations with a maximum certificated take-off mass of 5 700 kg or more;

b) ICAO develop a coordinated action plan to assist States in the implementation of PBN and to ensure development and/or maintenance of globally harmonized SARPs, Procedures for Air Navigation Services (PANS) and guidance material including a global harmonized safety assessment methodology to keep pace with operational demands

3. *Urges* that States include in their PBN implementation plan provisions for implementation of approach procedures with vertical guidance (APV) to all runway ends serving aircraft with a maximum certificated take-off mass of 5 700 kg or more, according to established timelines and intermediate milestones;

4. *Instructs* the Council to provide a progress report on PBN implementation to the next ordinary session of the Assembly, as necessary;

5. *Requests* the Planning and Implementation Regional Groups (PIRGs) to include in their work programme the review of status of implementation of PBN by States according to the defined implementation plans and report annually to ICAO any deficiencies that may occur; and

6. *Declares* that this resolution supersedes Resolution A36-23.

Appendix B. PBN Implementation Targets of APAC Regional PBN Implementation Plan

(Asia/Pacific Regional Performance-based navigation Implementation Plan Version 3.0 adopted by APANPIRG/22 in September 2011)

- **Short Term (2008-2012)**

Short Term (2008-2012)*		
Airspace	**Preferred Nav. Specifications**	**Acceptable Nav. Specifications**
Route – Oceanic	RNP 4	RNAV 10
Route – Remote continental	RNP 4	RNAV 10
Route – Continental en-route	RNAV 2, RNAV 5	
TMA – Arrival	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
TMA – Departure	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
Approach	RNP APCH with Baro-VNAV in most possible airports RNP AR APCH in airport where there are obvious operational benefits.	
Implementation Targets • RNP APCH (with Baro-VNAV) in 30% of instrument runways by 2010 and 50% by 2012 and priority should be given to airports with operational benefits • RNAV 1 SID/STAR for 50% of international airports by 2010 and 75% by 2012 and priority should be given to airports with RNP Approach • Re-defining existing RNAV/RNP routes into PBN navigation specification by 2012 • Implementation of additional RNAV/RNP routes		

* **Note:** Early completion of an implementation is encouraged within the timeframe on the basis of coordination between affected States and airspace users.

- **Mid Term (2013-2016)**

Medium Term (2013-2016)*		
Airspace	**Preferred Nav. Specification**	**Acceptable Nav. Specification**
Route – Oceanic	RNP 2**, RNP 4	RNAV 10
Route – Remote continental	RNP 2	RNAV 2, RNP 4, RNAV 10
Route – Continental en-route	RNAV 1, RNP 2	RNAV 2, RNAV 5
TMA – Arrival	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
TMA – Departure	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
Approach	Expansion of RNP APCH (with Baro-VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations	
Implementation Targets • RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016 • RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016 • RNAV 1 or RNP 1 SID/STAR for 70% of busy domestic airports where there are operational benefits • Implementation of additional RNAV/RNP routes		

* **Note 1:** In circumstances where affected States are agreeable to completing an implementation in advance of the timeline, early implementation is encouraged on the basis of coordination between affected States and airspace users.

** **Note 2:** Related CNS requirements and operational procedures for RNP 2 application in Oceanic Airspace are yet to be determined.

*** **Note 3:** When establishing the implementation targets in accordance with Assembly Resolution A37-11, the States should first conduct an analysis of the instrument RWY eligibility for APV approach. This analysis should include the feasibility of the APV at a particular location, the presence of regular commercial operations and the current or projected user fleet capability for APV. Locations where APV approach is either not feasible or where the regular operators cannot realize the benefit of APV within the set implementation timeline, need not be included. Where APV is not implemented, States should consider implementation of RNP APCH with LNAV minima instead of APV to provide the safety benefits of straight-in approach procedures.

- **Long Term (2016 and beyond)**

7.19 In this phase, GNSS is expected to be a primary navigation infrastructure for PBN implementation. States should work co-operatively on a multinational basis to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated research and development programmes on GNSS implementation and operation.

7.20 Moreover, during this phase, States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance.

7.21 With the expectation that precision approach capability using GNSS and its augmentation systems will become available, States are encouraged to explore the use of such capability where there are operational and financial benefits.

Appendix C. Status of State PBN Implementation Plan

UN State Name	Territory	State/Territory	Implementation Plan
Afghanistan		State	No
Australia		State	Yes
Bangladesh		State	Yes
Bhutan		State	No
Brunei Darussalam		State	No
Cambodia		State	Yes
China		State	Yes
China	Hong Kong	Territory	Yes
China	Macao	Territory	No
Cook Islands		State	No
Democratic People's Republic of Korea		State	Yes
Fiji		State	Yes
France	French Polynesia	Territory	Yes
France	New Caledonia	Territory	Yes
India		State	Yes
Indonesia		State	Yes
Japan		State	Yes
Kiribati		State	No
Lao People's Democratic Republic		State	Yes
Malaysia		State	Yes
Maldives		State	Yes
Marshall Islands		State	No
Micronesia (Federated States of)		State	No
Mongolia		State	Yes
Myanmar		State	Yes
Nauru		State	No
Nepal		State	Yes
New Zealand		State	Yes
Pakistan		State	Yes
Palau		State	No
Papua New Guinea		State	Yes
Philippines		State	Yes
Republic of Korea		State	Yes
Samoa		State	No
Singapore		State	Yes
Solomon Islands		State	No
Sri Lanka		State	Yes
Thailand		State	Yes
Timor-Leste		State	No
Tonga		State	Yes
Vanuatu		State	No
Viet Nam		State	Yes

State PBN Implementation Plan	28	66.7%
No State PBN Implementation Plan	14	33.3%
Total	42	100.0%

Reference : http://www.icao.int/safety/pbn/Pages/pbn-plans.aspx