International Civil Aviation Organization

The Twenty-Second Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/22)

Bangkok, Thailand, 25 – 29 June 2012

Agenda Item 4: Review outcome of relevant meetings

PBN/TF/9 OUTCOMES

(Presented by the Secretariat)

SUMMARY

This paper presents outcomes from the Ninth Meeting of the Performance-Based Navigation Task Force (PBN/TF/9, Bangkok, Thailand, 27 to 29 March 2012) and the progress of Asia/Pacific PBN implementation.

This paper relates to –

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

C: ***Environmental Protection and Sustainable Development of Air Transport*** *– Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-5 RNAV and RNP (Performance-based navigation)
GPI-11 RNP and RNAV SIDs and STARs
GPI-12 Functional integration of ground systems with airborne systems
GPI-21 Navigation systems

1. INTRODUCTION

1.1 The Ninth Meeting of the Performance-Based Navigation Task Force (PBN/TF/9) was held in Bangkok, Thailand from 27 to 29 March 2012.

1.2 The meeting was attended by 62 participants from Australia, Bangladesh, Cambodia, China, Hong Kong China, Fiji, India, Indonesia, Lao PDR, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, United States, Viet Nam, IATA, GE Aviation, Quovadis and Hughes Aerospace.

1.3 The meeting developed two (2) Draft Conclusions, and one (1) Draft Decision.

2. DISCUSSION

Relevant Meeting Outcomes

2.1 The PBN/TF/9 meeting was briefed on relevant Conclusions from the Twenty Second Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/22, Bangkok, 5 to 9 September 2011):

a) *Conclusion 22/23- Participation in the Asia/Pacific Flight Procedure Programme*;

b) *Conclusion 22/22 - GNSS minimum requirement for RNP Navigation Specification*;

c) *Conclusion 22/24 – Regional RAIM Prediction System and Minimum Technical and Operational Requirement*; and

d) *Conclusion 22/25 - Regional PBN Plan Amendment Conclusion 22/26 – Workshop on GNSS implementation*.

2.2 The meeting noted draft principles related to PBN that were presented to the First Meeting of the ICAO Asia/Pacific Seamless ATM Planning Group (APSAPG/1, Bangkok, 31 January to 3 February 2012):

a) the continued transition from ground-based aids to satellite-based PBN procedures, while maintaining a necessary redundancy and contingency network;

b) support for a Global Navigation Satellite System (GNSS)-based, integrated regional PBN approval standard;

c) regional cooperation for Space-Based Augmentation System (SBAS) in terms of interoperability and increased service areas and a GNSS ionospheric monitoring network;

d) support for PBN specifications that include GNSS 'low end' aircraft and better spacing for terminal airspace, based on empirical data;

e) universal implementation of Continuous Descent Operations (CDO) and Continuous Climb Operations (CCO) unless restricted by factors such as terrain, SUA, and noise constraints;

f) early implementation of Aeronautical Information Management (AIM), (including Systems Wide Information Management) for advanced States;

g) cooperative development and use of aeronautical databases such as the European Aeronautical Database (EAD); and

h) regulation of aeronautical data and its quality, to ensure interoperable operations.

2.3 PBN/TF/9 was apprised of the planning to measure the performance of Asia/Pacific administrations in implementing the various Aviation Safety Block Upgrade (ASBU) elements, which were a key part of the Seamless ATM planning. The PBN/TF Chairman suggested that other regions should be encouraged to use the measurement tools being developed by the Asia/Pacific.

Global PBN Update

2.4 The Secretariat presented global PBN development information. Significant matters affecting or potentially affecting the Asia/Pacific Regions were described as follows:

a) a Go Team visit (intended to improve States relatively advanced in PBN matters that could serve as regional PBN champions) to New Delhi, India, 11 to 15 June 2012;

b) a PBN Airspace design workshop was conducted during 2011 in New Delhi;

c) the development of a PBN OPS approval handbook guidance for global application with ICAO COSCAP-SEA (Cooperative Development of Operational Safety and Continuing Airworthiness Programme – Southeast Asia) and the Australian Civil Aviation Safety Authority (CASA);

d) new amendments to PANS-OPS (ICAO Doc 8168), Volume II and Annex 15 which were under review by the Air Navigation Commission (however Annex 15 amendments may be delayed);

e) a navigation specification for SBAS and its inclusion in RNP APCH;

f) an RNP 2 navigation specification for en-route application, including remote and continental use, including high and low continuity applications;

g) the inclusion of Baro-VNAV into the PBN Manual (ICAO Doc 9613);

h) application of Radius-to-Fix (RF) turn principles beyond terminal airspace as Fixed Radius Turns for all RNP applications;

i) an Advanced RNP navigation hierarchical specification applicable for en-route (RNP1), arrival, departure and approach to avoid the need for separate approvals for the different phases of flight and which includes parallel offset capability;

j) an RNP 0.3 navigation specification for helicopter operations but which can also be applied by low speed fixed wing ops; and

k) the RNP AR APCH (Required Navigation Performance Authorization Required) navigation spec was expected to be extended to departures and for one engine inoperative situations.

2.5 The forthcoming ICAO PBN Symposium (Montreal, Canada from 16 to 19 October 2012) was highlighted (http://www.icao.int/Meetings/PBN-Symposium/Pages/default.aspx).

Asia/Pacific PBN Implementation

2.6 PBN/TF/9 The meeting recalled that State PBN Plans were ranked PBN Plans into three categories based on quality:

- Robust – when 8 to 10 basic plan elements (BPE) were satisfied;
- Marginal – when 5 to 7 BPE were satisfied; and
- Incomplete – when 4 or less BPE were satisfied.

2.7 The PBN Plan Review Team had undertaken assessments of 12 plans in 2012, and as a result there has been a significant improvement in the number of administrations with a 'Robust' status plan, so one-third of administrations now had satisfactory PBN planning. States that had achieved this status in the past 12 months were: Hong Kong, China, Myanmar, Nepal, the Philippines and Sri Lanka. **Attachment A** provides a graphical representation of the status of Asia/Pacific PBN Plans. **Table 1** provides an overall summary of the status of Asia/Pacific PBN Plan changes.

Asia/Pacific PBN Plan Status	**2011 (PBN/TF/8)**	**2012 (PBN/TF/9)**
Robust	9 (21%)	14 (33%)
Marginal	4 (10%)	5 (12%)
Incomplete	8 (19%)	5 (12%)
Total Plans	**21 (50%)**	**24 (57%)**
Administrations with no plan	21	18

Table 1: Asia/Pacific PBN Plan Overall Status Changes

2.8 Notwithstanding the overall improvement, a large number of States remained as either 'Marginal' or 'Incomplete' status plans, or had no plan. States with significant aviation activity in this category were Malaysia ('Marginal'), Pakistan ('Marginal') and Indonesia ('Incomplete'). Pakistan noted that their plan would be updated in the near future. In Indonesia's case a significant amount of PBN development was currently being undertaken, with 90 PBN approaches and 50 PBN arrival/ departure procedures being planned by 2016.

2.9 Of significant interest to the Task Force was the proportion of Pacific Island administrations (14 of 18) that had not provided a PBN Plan to the Asia/Pacific Office:

- Cook Islands;
- French Polynesia and New Caledonia (France);
- Kiribati;
- Marshall Islands;
- Federated States of Micronesia;
- Nauru;
- Palau;
- Papua New Guinea;
- Samoa;
- Solomon Islands;
- Tonga;
- Vanuatu; and
- American Samoa, Guam, Johnston, Kingman, Midway, Mariana, Palmyra, Wake Islands (USA).

2.10 The meeting updated the Status of PBN Implementation Plan Table in **Attachment B**. Recalling that the ICAO Assembly Resolution A37-11 required, inter alia, States to implement approach procedures that have vertical guidance on 30% of runway ends by 31 December 20101, the vast majority of administrations that had advised the Regional Office of progress indicated achievement of the 30% implementation target.

2.11 Regarding Standard Instrument Departure and Standard Terminal Arrival Procedures (SID and STAR), only seven administrations had submitted data indicating compliance with the short-term Regional PBN Plan target (RNAV1 SIDs/STARs for 50% of international airports by 2010): Australia, Hong Kong, China, India, Japan, Maldives, New Zealand and the Republic of Korea.

2.12 Only six administrations (Hong Kong, China, India, Indonesia, Myanmar, the Republic of Korea and Sri Lanka) had provided any detail of PBN en-route procedure development, despite the implementation target of re-defining routes into PBN navigation specification by 2012 and implementing additional RNAV/RNP routes.

[1] Except where there is no local altimeter setting available and there are no aircraft suitably equipped for APV operations with a maximum certificated take-off mass of 5 700 kg or more, implementation of straight-in LNAV only procedures are acceptable.

PBN Assistance

2.13 On 30 November 2011, a Special Implementation Project (SIP) was approved for a PBN implementation Workshop that was intended to be held in the South Pacific in the third or fourth quarter of 2012 to assist small Pacific Island States to develop a PBN Plan. The PBN Workshop that would utilize the services of experts from the Asia/Pacific Region.

2.14 The PBN/TF discussed the establishment of a 'buddy' system for administrations that did not have a robust status plan. It was recognised that a simple training session was probably insufficient to develop a robust PBN response; hence the need to have a longer term relationship with States that were more advanced in PBN development. There were various means of assistance that could be used, such as ICAO Workshops, Flight Procedures Programme (FPP) training, 'champion' States that had undergone Go-team visits or who were sufficiently mature to provide advice; and assistance from International Organizations such as IATA.

2.15 A total of 30 administrations did not have a robust status PBN Plan. **Table 2** illustrates the status of these plans and possible means of individual tailored assistance:

Administration	**PBN Plan Status**	**Possible Assistance Plan**
Afghanistan	No Plan Received	ICAO HQ, Donor Nations
Bangladesh	Marginal	COSCAP SA/FPP
Bhutan	No Plan Received	COSCAP SA
Brunei Darussalam	No Plan Received	COSCAP SEA
Cambodia	Incomplete	COSCAP SA/FPP
Cook Islands	No Plan Received	PBN Workshop, NZ
Fiji	Marginal	PBN Workshop
French Polynesia	No Plan Received	PBN Workshop, France
Indonesia	Incomplete	Australia
Kiribati	No Plan Received	PBN Workshop, NZ
Korea, DPR	Marginal	COSCAP NA/FPP
Lao PDR	Incomplete	COSCAP SEA/FPP
Macao, China	No Plan Received	FPP, Hong Kong China
Malaysia	Marginal	COSCAP SEA/FPP
Maldives	Incomplete	COSCAP SA/FPP
Marshall Islands	No Plan Received	PBN Workshop, USA
Micronesia, FS	No Plan Received	PBN Workshop, USA
Nauru	No Plan Received	PBN Workshop, NZ
Niue (NZ)	No Plan Received	PBN Workshop, NZ
New Caledonia	No Plan Received	PBN Workshop, France
Pakistan	Marginal	COSCAP SA/FPP
Palau	No Plan Received	PBN Workshop, USA
Papua New Guinea	No Plan Received	PBN Workshop, Australia
Samoa	No Plan Received	PBN Workshop, NZ
Solomon Islands	No Plan Received	PBN Workshop, Australia
Timor-Leste	No Plan Received	PBN Workshop, COSCAP SEA/FPP
Tonga	No Plan Received	PBN Workshop, NZ
Vanuatu	No Plan Received	PBN Workshop, Australia
Vietnam	Incomplete	COSCAP SEA
American Samoa, Guam, Johnston, Kingman, Midway, Mariana, Palmyra, Wake Islands	No Plan Received	PBN Workshop, USA

Table 2: Administrations without Robust Status PBN Plans

Asia/Pacific Flight Procedure Programme

2.16 The meeting noted that the FPP Steering Committee had approved the extension of the FPP into Phase 2, from 2013 to 2017, although the office location was still to be advised. By the end of 2011, 23 Asia-Pacific States had become Member States of the FPP; 11 of which as Active Participating States and 12 as User Participating States. From 2011 to March 2012, the FPP had conducted 19 training courses with more than 700 training participants from 24 States.

2.17 The meeting discussed the legal framework in which the FPP operated. The FPP Manager noted that the FPP was not currently subject to any external certification or auditing, however it was mainly a training or advisory body that had been endorsed by APANPIRG.

GNSS Landing System

2.18 Australia provided a presentation on PBN and GNSS global developments. The presentation included information on the Australian installation of GNSS Landing System (GLS) at Sydney. One GLS installation could deliver the equivalent of Instrument Landing System (ILS) performance to all six runways at Sydney, although only newer aircraft were equipped to fly this form of approach. IATA supported the GLS technology but would prefer an aggressive timeline and implementation plan for airline requirements.

2.19 The meeting suggested that a GLS seminar could be held in the Asia/Pacific, noting that all 'new generation' Boeing, Airbus and Bombardier aircraft already had GLS equipage. Moreover, the meeting noted that the GBAS design material in Doc 8168 was reserved. It was suggested that GLS as part of a GNSS section could be included within State PBN Plans. Moreover, information on expected GLS regional planning could form part of the Asia/Pacific Seamless ATM plan. The meeting agreed to the following Draft Conclusion for consideration by the CNS-MET Sub-group:

Draft Conclusion PBN/TF/9/1: Asia/Pacific GLS Seminar

That, ICAO plan an Asia/Pacific GNSS Landing System (GLS) Seminar to provide information on emerging GLS technology, airport and airline GLS planning, and the development of applicable standards.

PBN Overlay Procedures

2.20 The meeting was apprised of the dialogue that had been on-going in Australia regarding the requirements for a conventional instrument flight procedures flown using GNSS/RNP aircraft. IATA stated that this was a complex area with possible legal implications for ATC. The meeting noted the lack of guidance on this matter and suggested that ICAO might consider developing such material, which should include guidance for ATC. The meeting agreed to the following Draft Conclusion for consideration by the CNS-MET Sub-group:

Draft Conclusion PBN/TF/9/2: Global PBN Standards for GNSS/RNP aircraft Flying Conventional Instrument Flight Procedures

That, ICAO HQ review and further develop operational and guidance material for conventional instrument flight procedures flown using GNSS/RNP aircraft.

Instrument Flight Procedure Design Approval

2.21 The meeting noted that of the approach classifications (Non-Precision, Approach with Vertical Guidance [APV, SBAS-LPV, Baro-VNAV and RNP-AR] and Precision), there was no associated lighting and runway standards for APV. Apparently the Approach Classification Task Force (ACTF) was reviewing the APV definition. Australia was approving RNP-AR (Authorisation Required) procedures based on individual safety cases, including assessment of approach aids.

2.22 The meeting discussed the responsibilities of a third party design organization for an Instrument Flight Procedure (IFP), especially RNP-AR approaches. Australia advised that a design organization under the Australian Part 173 certification rule was responsible for IFP maintenance, and if they were not maintaining the design, this would precipitate a withdrawal of the IFP. IATA stated the use of IFP designed by third parties had led to a more complex legal relationship with airlines, which sometimes required legal agreements.

2.23 Australia noted that flight inspection and flight validation used to be within one manual, and that it required a highly equipped aircraft to do both. As flight validation was a much simpler process of design verification, this component had been moved to ICAO Doc 9906 Volume 5 and 6, which have only recently been made available on ICAO-NET. The meeting reviewed the relevant passages from Doc 9906 Volume 5, noting that it referred to the use of simulator or flight validation when appropriate, but that flight validation was required where runway or landing location infrastructure had not been previously assessed for instrument operations or when determined by the State Authority.

PBN Operational Environment

2.24 IATA noted that there was a distinct difference between the number of PBN procedures that had been designed and the number that were actually flown, apparently due to factors such as ATC preference for vectoring and pilots not requesting the IFP.

2.25 The meeting emphasised that consultation was necessary with agencies that could affect IFP development including Air Traffic Control (ATC) and airline operators at the earliest IFP design stage. It was noted that some States required dialogue with aerodrome operators for matters such as noise abatement and local authority requirements, navigation aid providers, airspace planners and ATC to ensure the design could be integrated into the operating environment.

Document Consistency

2.26 Nepal asked about apparent inconsistency of references in ICAO documents for PBN implementation. The first issue related to Annex 11, Section 7.3.1, regarding the need for active monitoring by ATC units of radio navigation aids, when this was not entirely applicable for GNSS even though GNSS was classified as a radio navigation aid in Annex 10. Australia noted that Receiver Autonomous Integrity Monitoring (RAIM) was a form of monitoring, which could be partly tactical as advisories can be issued rapidly by NOTAM. However it was recognized that this was not the same as traditional monitoring of navigation aids by ATC units.

2.27 The other issue related to the use of the current altimeter setting (reference PANS ATM paragraph 11.4.3.2.2), requiring altimetry data to be ‘extracted’ from an appropriate meteorological office source, when this was not always the case if ATC provided this information. The Secretariat would discuss these matters with ICAO HQ with a view to updating the material to reflect the specific operating environment of space-based navigation systems, and modern operating practices.

2.28 It was further noted that the US had cancelled TSO C129A. This was intended for the development of new receivers and did not invalidate their continued use.

Baro V-NAV

2.29 Australia noted some issues with the current ICAO PANS-OPS (Doc 8168) design standard for Baro-VNAV that could be taken up by the Task Force:

- the current APV design required runway alignment unlike RNAV (GNSS), which allowed an offset course by up to 15°;
- the Baro-VNAV missed approach point must be at the runway threshold; and
- the design technically required the use of 'W surfaces', even though these were intended for SBAS LNAV/VNAV designs.

2.30 The Chairman reminded the meeting that ICAO had already enacted policy that the reversion from an unserviceable ILS was a Baro V-NAV procedure, so this form of IFP should be planned wherever there was an ILS.

RNAV Visual Arrival Procedures

2.31 IATA commented that when weather conditions permit, RNAV visuals procedures were useful and asked for more ICAO guidance. The Chairman suggested that participants should research this area to see if a future recommendation was required.

PBN Implementation Process

2.32 Thailand stated that it was important to note the benefits of PBN so this information can be utilized in later studies. IATA appreciated the effort by Thailand in being a regional PBN leader, and agreed that the description of benefits was important as it had been one of the weak points in past plans submitted by Asia/Pacific States.

2.33 Nepal asked about the ATC training process for RNP implementation. Thailand used the PBN Manual material and added information from the development feedback process. This training was conducted prior to every implementation, which was further checked by the regulator.

2.34 The meeting emphasised the need to harmonise navigation specifications across national borders.

2.35 There was also discussion about the use of 'Continental' and 'Oceanic' terms, which had not been helpful for Hong Kong, China in formulating plans. It was recognised that the emphasis should be on the operating characteristics of communications and ATS surveillance facilities in the area, not the geographical features in the new PBN environment. The meeting agreed that these prescriptive terms should not be used. The Regional PBN Plan would need updating to reflect recent changes, which could occur at the next PBN/TF meeting.

Task Force Terms of Reference

2.36 IATA, Australia, Fiji and Thailand developed a draft amendment of the TORs to include monitoring, feedback, encouraging State PBN implementations, and coordination with the ICAO FPP and COSCAP. The meeting agreed to the following Draft Decision for the CNS-MET Sub-Group's endorsement and APANPIRG's approval, in order to reflect expected current PBN/TF activities:

Draft Decision 9/3: Revised PBN/TF Terms of Reference

That, the following amendments are made to the PBN/TF Terms of Reference:

3) Identify other issues/action items arising from the work of ICAO or for consideration by ICAO in order to facilitate regional and global harmonization of existing as well as future applications, and where appropriate, provide responses and support to the ICAO ~~RNPSOR~~ PBNSG.

4) Assist States in the preparation and review of their PBN implementation documentation and provide feedback to ensure regional harmonization and for possible inclusion in ICAO-developed model documentation.

5) Monitor the progress of State PBN implementation, identify constraints to implementation and capture information on the effectiveness (tangible benefits) of State PBN applications.

7) Address other regional PBN implementation issues, including the development of staff resources and skills, as needed by safety management. Coordinate and consult with ICAO FPP, COSCAP, industry partners and volunteering administrations who are providing support to State PBN implementation.

PBN FMS database limitation

2.37 Hong Kong, China described difficulties in establishing a new RNP AR approach for Runway 25 as most FMS only accepted six name characters (Doc 8168 Vol. II Part 1 Section 4 Chapter 9 refers). A new procedure required seven characters (such as RNVy25R). Only a few aircraft could accept seven characters such as the B777 and B748, limiting the number of users. The Doc 8168 'RNV' portion could be truncated, but this was driven by ARINC coding. The Secretariat and Chairman discussed the possibility of a coding solution with other concerned bodies[1].

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) note the draft tailored assistance plan in Table 2 (paragraph 2.26);

c) discuss and endorse as appropriate:

Draft Conclusion PBN/TF/9/1: Asia/Pacific GLS Seminar; and Draft Conclusion PBN/TF/9/2: Global PBN Standards for GNSS/RNP aircraft Flying Conventional Instrument Flight Procedures; and

d) discuss any relevant matters as appropriate.

…….

[1] The USA confirmed after the meeting that the actual characters used in the ARINC-424 title were an approach code, the runway number and letter, and the suffix. The actual title of the approach 'RNAV' was only listed in the record as 'R', but showed on the FMS display as 'RNV', so it did not use three characters, only one. Almost all FMS had the capability to display the six characters based on a procedure title with a suffix. Those that did not would only have one of each type of procedure to the runway.

Attachment A

Asia/Pacific PBN Plan Status

No PBN Plan:

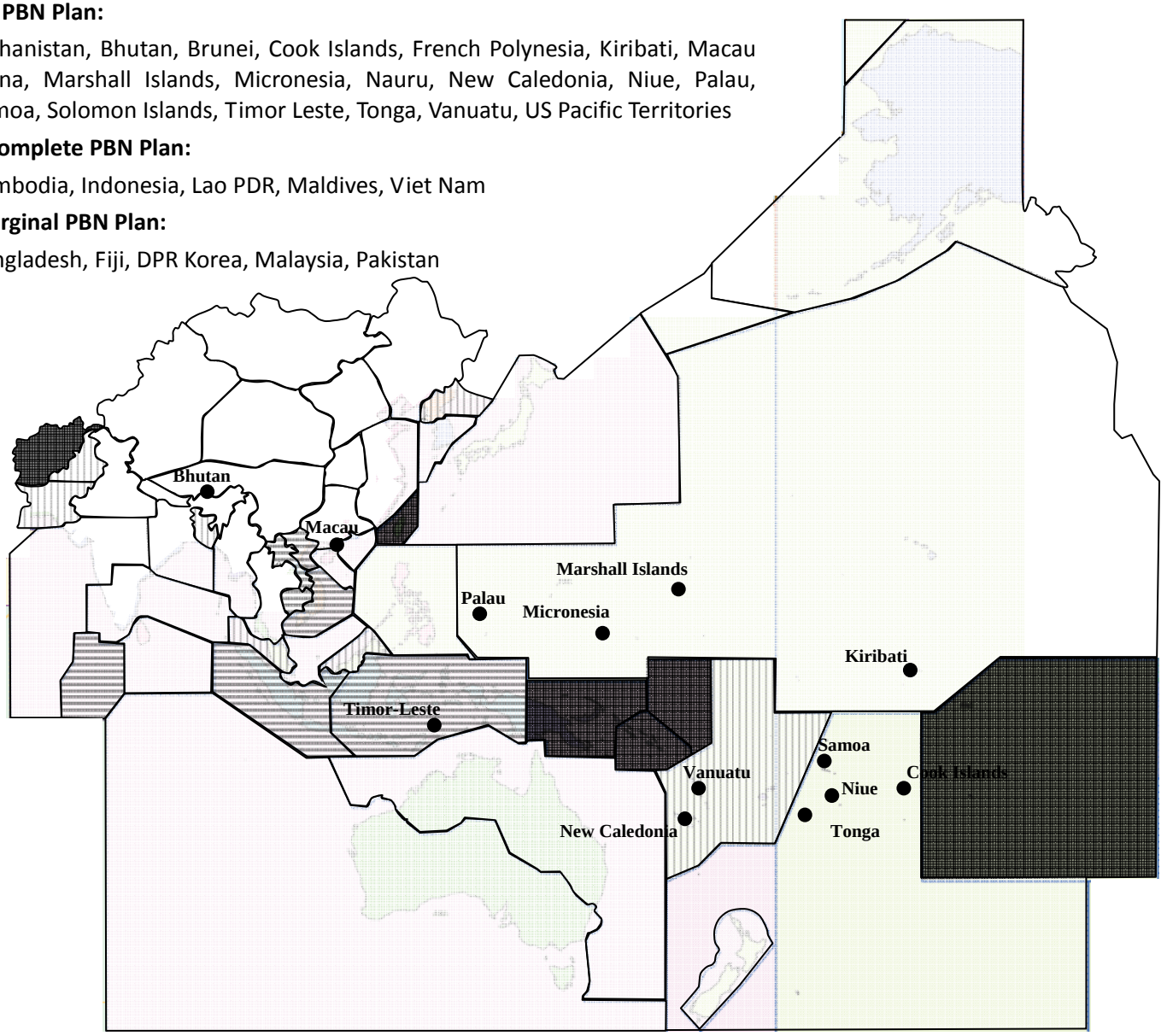
Afghanistan, Bhutan, Brunei, Cook Islands, French Polynesia, Kiribati, Macau China, Marshall Islands, Micronesia, Nauru, New Caledonia, Niue, Palau, Samoa, Solomon Islands, Timor Leste, Tonga, Vanuatu, US Pacific Territories

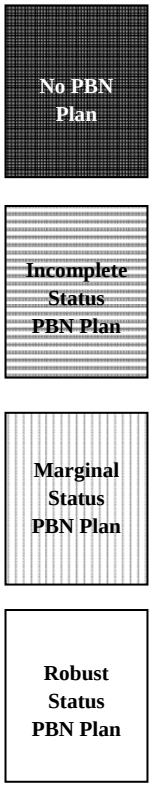
Incomplete PBN Plan:

Cambodia, Indonesia, Lao PDR, Maldives, Viet Nam

Marginal PBN Plan:

Bangladesh, Fiji, DPR Korea, Malaysia, Pakistan





Status of PBN Implementation Plan

State/Administration	Date Versions Received
Australia	July 2009, 6 May 2010
Bangladesh	13 July 2009, 17 April 2011
Cambodia	01 September 2011 (copy of older version)
China	23 December 2008, 26 December 2009
Fiji	21 Feb 2010
French Polynesia	17 May 2012 (high level plan only)
Hong Kong, China	10 July 2008, July 2009, 16 January 2011
India	07 Sep 2010, 30 May 2011
Indonesia	29 June 2009, 26 April 2011
Japan	11 July 2008, July 1009
Korea, DPR	30 December 2010
Korea, Republic of	11 July 2008, 18 Jan 2010, 08 April 2011
Lao PDR	11 July 2008, 3 August 2011
Malaysia	08 July 2008, 15 Jan 2010, 11 April 2011
Maldives	09 July 2008, 1 May 2011
Mongolia	11 August 2010, 3 March 2011
Myanmar	27 April 2011
Nepal	21 July 2011
New Zealand	18 December 2009
Pakistan	19 May 2009
Papua New Guinea	Informal Plan 11 April 2011
Philippines	29 June 2009, 18 Feb 2010, 10 May 2011
Singapore	07 July 2008, 2 October 2009
Sri Lanka	4 Feb 2010, 20 Jun 2011
Thailand	08 July 2008, 13 July 2009

Summary	Focal Point / Member	State Plan
Information Submitted	1. Australia 2. Bangladesh 3. Bhutan 4. Cambodia 5. China 6. China, Hong Kong 7. China, Macao 8. Fiji 9. India 10. Indonesia 11. Japan 12. Korea DPR 13. Korea Republic of 14. Lao PDR 15. Malaysia 16. Maldives 17. Mongolia 18. Myanmar 19. Nepal 20. New Zealand 21. Pakistan 22. Papua New Guinea 23. Philippines 24. Samoa 25. Singapore 26. Sri Lanka 27. Thailand 28. Viet Nam	1. Australia 2. Bangladesh 3. Cambodia 4. China 5. China, Hong Kong 6. Fiji 7. India 8. Indonesia 9. Japan 10. Korea DPR 11. Korea Republic of 12. Lao PDR 13. Malaysia 14. Maldives 15. Mongolia 16. Myanmar 17. Nepal 18. New Zealand 19. Pakistan 20. Papua New Guinea 21. Philippines 22. Singapore 23. Sri Lanka 24. Thailand 25. Viet Nam
NOT Submitted	1. Afghanistan 2. Brunei Darussalam 3. Cook Islands 4. French Polynesia 5. Kiribati 6. Marshall Islands 7. Micronesia 8. Nauru 9. Palau 10. Solomon Islands 11. Timor-Leste 12. Tonga 13. Vanuatu 14. US territories	1. Afghanistan 2. Bhutan 3. Brunei Darussalam 4. Cook Islands 5. French Polynesia 6. Kiribati 7. Macao, China 8. Marshall Islands 9. Micronesia 10. Nauru 11. Palau 12. Samoa 13. Solomon Islands 14. Timor-Leste 15. Tonga 16. Vanuatu 17. US territories

Administration	Status Date	Focal Point	PBN Plan Review (BPEs = Basic Planning Elements, Robust/Needs Improvement/Non-Existent)	En-Route Operations	Approach Operations								Arrival & Departure Operations (SID and STAR)							
					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
Afghanistan																				
Australia	**ROBUST**	Ian Mallett, Section Head CNS/ATM CASA, Level 4, 16 Furzer St., Phillip, ACT, 2601, Australia Email: ian.mallett@casa.gov.au	PBN TF/5 approved. Review conducted by CASA and in letter of 24 Nov 2010 and advised plan improvements in areas of international fleet readiness and APV terminal operations		30 LNAV 36 Baro	30 LNAV 20 Baro	30 LNAV 20 Baro	444	36	30	20	Caveats: 1.Baro-VNAV training is being provided. 2. Industry/Government consultation on Baro-VNAV deployment program and funding not yet competed	6	8	8	10	8	0	•	
Bangladesh	**MARGINAL**	Mr. Ratan Kumar Saha Deputy Director (Aerodromes) Civil Aviation Authority of Bangladesh Headquarters, Kurmitola Dhaka-1229 Tel/Fax: +88-02-8919002 Email: aiscaab@bracnet.net	BPEs 6/2/2		Nil	70	100%	Nil	Nil	Nil	Nil	Nil	Nil	70%	100 %	Nil	Nil	Nil	Nil	1. Co-ordinates of Critical points on all the Airports in Bangladesh, concerned Navigation Aids, Approach & Landing Aids and High-rise Buildings of Dhaka City has already been converted to WGS-84 by CAA, Bangladesh. These are awaiting further checks and certification by the Survey General of Bangladesh. 2. At present, CAA, Bangladesh does not have any trained personnel on basic PANS-OPS designing. Two Officers are nominated to attend the ICAO PBN Airspace Design Workshop at ICAO APAC Office, Bangkok in April 2010. 3. Bangladesh was behind the short term PBN implementation plan of Asia Pacific region. But CAA, Bangladesh hopes that to comply with the requirements by mid-term schedule, as Bangladesh involves very few Air Routes & approach procedures to be redesigned with the new concept.
Bhutan		Mr. Karma Wangchuk Communication & Navigation Engineer Communication & Navigation Section Department of Civil Aviation Paro International Airport Paro, Bhutan Tel: +975-8-272-511 Fax +975-8-271-407 H/P: +975-17-686-446 Email: karmawangchu@druknet.bt																		
Brunei Darussalam																				
Cambodia	**INCOMPLETE**	Mr. Chhun Sivorn Deputy Director Operation and Air Safety of SSCA	BPEs 2/1/7																	

Administration	Status Date	Focal Point	PBN Plan Review (BPEs = Basic Planning Elements, Robust/Needs Improvement/Non-Existent)	En-Route Operations	Approach Operations								Arrival & Departure Operations (SID and STAR)							
					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
China	**ROBUST**	Mr. Yang, Honghai Civil Aviation Administration of China, Flight Standards Department 155 Dongsi Street, West Beijing, China 100710 Tel: +86-10-6409-1406 Fax: +86-10-6409-2458 H/P: +86-139-1073-6500 Email: hh_yang@caac.gov.cn Mr. Liu Song Engineer of Air Space Management Division of ATMB CAAC Tel: 86-10-8778-6835 Fax: 86-10-8778-6830 e-mail: Liusong@atmb.net.cn; Liusong73@hotmail.com	NEEDS REVIEW DATA																	
Cook Islands																				
Fiji	**MARGINAL**	Mr. Petero Kaveni Delai General Manager Engineering & Infrastructure Airports Fiji Limited Private Mail Bag Nadi Airport, Fiji Island Tel: +679-6731707 Email: peterod@afl.com.fj	BPEs: 7/3/0																	
French Polynesia		Charles Peretti Chef Division Circulation Aérienne, SEAC-PF Tel : 86 10 41 - 78 24 40 Fax : 86 13 29 PERETTI_Charles@seac.pf	High level PBN Plan for France received 17 May 2012																	PBN plan (French Polynesia) will come after the PBN plan for France
Hong Kong, China	**ROBUST**	Mr. H. K. Chung Chief Air Traffic Control Officer 4/F, ATCX, Hong Kong International Airport Hong Kong Tel: +852-2910-6432 Fax +852-2910-0186 Email: hkchung@cad.gov.hk	BPEs: 8/2/0	Completed: RNAV10 routes-5. In progress: RNP4 routes-2. Hong Kong has implemented 1 RNAV 10 route, Q1, within Hong Kong FIR on 1 April 2011 for connecting PBN routes M771/M772 and STAR for Hong Kong International Airport.	2	2	-	-	2	-	2	Hong Kong implemented RNP AR APCH to 2 runway ends on 3 June 2010. Hong Kong plans to implement RNP AR APCH to the other 2 runways ends by 2012.	-	-	1	0	1	1	-	Hong Kong implemented RNAV SID in 2005. Hong Kong plans to implement RNP 1 STAR by 2013. A website site for PBN implementation in Hong Kong has been developed and the Hong Kong plan is available in the website. www.pbninfo.gov.hk

Administration	Status Date	Focal Point	PBN Plan Review (BPEs = Basic Planning Elements, Robust/Needs Improvement/Non-Existent)	En-Route Operations	Approach Operations								Arrival & Departure Operations (SID and STAR)							
					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
India	**ROBUST**	Mr. N. V. Atale Joint General Manager (ATM) Airports Authority of India Rajiv Gandhi Bhavan, New Delhi Tel: +91-11-2461-0523 Fax: 91-11-2461-0528 Email: nvatale@aai.aero; nvatale@gmail.com	PBN Implementation Roadmap of India was published in Jan 2009 and reviewed by ICAO APAC PBN TF	Routes In progress: RNAV 10 – 33 RNAV5 – 6	28	42	38	1	1	16	16	-	6	15	-	9	8	5	5	Update ATS/AIS/SAR SG IP28 RNP AR procedure has been developed at Mumbai with a simulator trial.
Indonesia	**INCOMPLETE**	1. Mr. Novie Riyanto Rahardjo Directorate of Air Navgation, Gedung Katya It 23, novieranto@yahoo.com Tel: 62-21350-6451 Fax: 62-35-350-7569 2. Agus Karya It 22, agusas@indo.net.id Tel: 62-21350-6664 Fax: 62-35-350-6663	BPEs: 1/3/6	RNAV10 Completed: 7 In progress: 4	11	40	90	9	2	0	16	Already published (LNAV): Pekanbaru, Palembang, Lombok, Banjarmasin and Kupang Airports On going progress: (LNAV/VNAV): Surabaya, Denpasar, Bandung, Medan, Padang, Balikpapan, (RNP-AR): Ambon, Manado, Jayapura	0	20	50	1	0	9	1	Short-term Target: 10 international airports Medium-term target: completion for 15 international airports and domestic airport with high-density traffic **Progress:** Implementation RNAV-1 STAR for Jakarta International Airports, published by AIP Supp Nr : 06 / 12 08 MAR 12 On going for Surabaya, Denpasar, Medan, Manado, Ambon, Padang, Palembang, Pekanbaru and Lombok Airports CDO's are designed for Ambon and Manado
Japan	**ROBUST**	Mr. Koichiro Kubo JCAB 2-1-3 Kasumigaseki, Chiyoda-ku, Tokyo, Japan Tel: +81-3-5253-8739 Fax: +81-3-5253-1664 Email: kubo-k2iy@mlit.go.jp		.	42	154	163	13	12	2	18	Runway End Data Chart	14	14	14	12	11	2	3	PBN Implementation Progress Report dated 01 May 2011. 25 Jan 2010 Adopted by Civil Aviation Bureau (JCAB
Kiribati																				
Korea, DPR	**MARGINAL**	An Kyong Hwa Head of AIS, ATM GACA, DPR Korea Pyongyang International Airport Sunan District, Pyongyang City DPR Korea Tel: +850-2-18111-999 ext. 8108, Fax: +850-2-381-4410 ext. 4625 Email: gaca@silibank.com	BPEs: 7/2/1		-	X	-	-	-	-	-		-	X (2014)	-	-	-	-	-	-
Korea, Republic of	**ROBUST**	Mr. Huho Ha Assistant Director of Air Traffic Management Division, 1-8 Byulyang-Dong, Gwacheoun-Si, Gyeonggi-Do, 427-801, Republic of Korea Tel: +82-2-2669-6425, Fax: +82-2-6342-7289 Email: hooho_ha@korea.kr,	PBN BPEs: 10/0/0	RNAV5: 7 completed, 2 in progress, RNAV2: 2 in progress	2	23	35	10	10	23	23	RNP APCH with Baro-VNAV procedures for Gimpo International Airport Runway 32L/R will be developed in 2010 to gain operational experience. Runway End Data Chart	2	6	8	2	2	6	6	PBN approached were developed at all runways in Incheon and Gimpo airports and will be effective on 3 May 2012. Point merge methods were incorporated in STARs at Incheon Airport and will be effective on 3 May 2012. The ROK considered CDO while developing most procedures but used a conventional approach procedures to be able to use CDFA STARs at Gimpo and Incheon Airports, effective 3 May 2012.

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					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
Lao PDR	**INCOMPLETE**	Mr. Bounteng Symoon Director of Air Navigation Service Division, Department of Civil Aviation Tel/Fax: +856-21-512-091 +856-21-512-216 Email: bounteng@yahoo.com Mr. Khine Simvongsa Chief, Aeronautical Information Service Air Navigation Division Department of Civil Aviation Lao PDR Tel/Fax: +856-21-512-164 +856-21-520-237 Email: ksimvongsa@yahoo.com	BPEs: 4/2/4									Runway End Data Chart								
Macao, China	18 Jan 2010 Adopted by Macao, China	Mr. Bryan, K.H. Chiu Safety Officer (ATC) Civil Aviation Authority - Macao, China Alameda Dr. Carlos D'Assumpcao, 336-342 Centro Comercial Cheng Feng, 18 andar, Macao Tel: +853-8796-4142 Fax: +853-2833-8089 Email: bryanchiu@aacm.gov.mo;	Not submitted. To be reviewed by ICAO APAC PBN TF.		1	2	-	0	0	0	1	-	0	1	0	0	0	1	0	-
Malaysia	**MARGINAL**	Mr. Nordian Ibrahim Assistant Director Air Traffic Management Sector Department Civil Aviation Malaysia No. 27, Persiaran Perdana Level 4, Block Podium B, precinct 4 62618 Putrajaya, Malaysia Tel: +603 8871 4230 Fax: +603 8881 0530 Email: nordian@dca.gov.my	BPEs: 7/2/1		4	16	24	-	-	-	-	Currently published RNAV Non-Precision Approaches are pre-PBN approach procedures. Runway End Data Chart	2	4	4	-	-	-	-	Currently published RNAV arrival (STAR) are pre-PBN procedures.
Maldives	**INCOMPLETE**	Ms. Fathimath Ramiza Director Air Navigation and Aerodromes Civil Aviation Department Ministry of Civil Aviation and Communication PA Complex, Male' 20307, Maldives Tel: +960-334-2984 Fax: +960-332-3039 Email: ramiza@aviainfo.gov.mv	BPEs: 3/5/2		2	14	0	2	2	0	12	RNP APCH with Baro-VNAV for Male' International Airport published since 2010. RNP APCH without only LNAV published for one of the domestic airports in February 2012. Further planning will be based on development of any new airport.	2	2	0	2	2	0	0	RNAV 1 (GNSS) SIDs and STARs published for Male International Airport since 2010.

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					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
Marshall Islands																				
Micronesia, FS																				
Mongolia	**ROBUST**	Mr. J. Bayarsaikhan, Director of Flight Inspection & Procedure Design Service Division, Chinggis Khaan Int'l Airport, Buyant-Ukhaa, Ulaanbaatar-17120, Mongolia, Tel: (976-11) 282040, Fax: (976-10) 282-108 Email: bayarsaikhan.j@mcaa.gov.mn bayarsaikhan.mcaa@yahoo.com	BPEs: 8/1/1		2	6	-	-	-	-	-	8 aerodromes with paved runway including ZMBH, ZMCD, ZMDZ, ZMDN, ZMKD, ZMMN, ZMUB and ZMUG have been included.	1	5	-	-	-	1	-	Currently, only one international aerodrome. However, 6 international aerodromes were recorded considering Muran, Choibalsan, Khovd, Ulgii and "Gurvansaikhan" airports shall obtain international status between 2010 and 2013.
Myanmar	**ROBUST**	Mr. Tike Aung Director (Air Navigation Services) Department of Civil Aviation Yangon International Airport Mingaladon, Yangon 11021 Tel: 951-533008 Fax: 951-533016 Email: ats@dca.gov.mm	BPEs: 9/1/0	RNAV5 : 4 (continental, by 2012) RNP4: 5 (oceanic, by 2012)	6 (by 2013)	5	7					Approach procedures with LNAV/VNAV have already been developed for Yangon, Mandalay and Nay Pyi Taw airports. Awaiting for flight validation and ATC knowledge training.	3 (by 2012)							
Nauru																				
Nepal	**ROBUST**	Mr. Mahesh Kumar Basnet Deputy Director, ATM Department Civil Aviation Authority of Nepal Babar Mahal, Kathmandu Tel: +977-1-426-2923 Fax: +977-1-426-2516 Email: atsdr@caanepal.org.np; cnsatm@mos.com.np	BPEs: 8/2/0		RNP APCH at TIA	-	-	-	-	-	-	Nil	1?	-	-	-	-	-	-	RNAV 1 based on GNSS in KT TMA
New Caledonia																				
New Zealand	**ROBUST**	Mike Haines, Manager Aeronautical Services, Civil Aviation Authority of New Zealand, PO Box 31 441, Lower Hutt 5040, New Zealand; Email: mike_haines@caa.govt.nz	Reviewed by ICAO APAC PBN TF		18	42	58	32	18	-	1	Nil	3	5	6	3	2	-	1	Nil

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					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
Pakistan	**MARGINAL**	Mr. Syed Yousuf Abbas Director Operations Headquarters Civil Aviation Authority Terminal-1 JIAP Karachi, Pakistan Tel: +92-21-9924-2742 Cell: +92-301-825-8525 Fax: +92-21-3460-4323 Email: dops@caapakistan.com.pk	Implementation plan submitted to APAC Regional office in May, 2009, reviewed by ICAO APAC PBN TF, not in accordance with Regional Plan format		8	13	8	-	-	3	1	Runway End Data Chart	14	24	8	-	-	-	-	Nil
Palau																				
Papua New Guinea		David K. Tawae Executive Manager Future Directors PNB Air Services Ltd. ATS Tower Level 1, 7 Mile, Jacksons Airport P.O. Box 273, BOROKO, NCD 111 Papua New Guinea Tel: +675 3121522, Fax: +675 3250749, Mob: ++711-764-05/ 76950424 Email: dtawae@pngairservices.com.pg	Plan received from Jeff Bollard (email 5 Mar 2010), informal plan received from web site dated April 2011																	
Philippines	**ROBUST**	Mr. Zerubbabel N. Cadiz ATC/Technical Officer, Airspace and Traffic Management Division Air Traffic Service, 4th Floor, Main Building, Civil Aviation Authority of the Philippines, MIA Road, Pasay City 1300 Tel/Fax: +63-2-8799-260 zncadiz@atmd.caap.gov.ph	BPEs: 8/2/0		8	To follow	To follow	2	2	17	17	Runway End Data Chart	4	To follow	To follow	-	-	12	12	
Samoa		Magele Hoe Viali Ministry of Works, Transport & Infrastructure Private Bag Savalalo, SAMOA Tel: +685 21-611 Fax: +685 28-687 Email: hoe@mwti.gov.ws																		
Singapore	**ROBUST**	Mr. Michael Shee Air Traffic Control Manager (Air Traffic Management) Civil Aviation Authority of Singapore Singapore Changi Airport, P.O. Box 1 Singapore 918141 Tel. +65-6541-2454, Fax: +65-6545-6516 Email: michael_shee@caas.gov.sg,	Plan submitted but originally not in accordance with Regional Plan format. Reviewed by ICAO APAC PBN TF	RNAV10: 8 (1 in progress), RNAV5: 0 (2 in progress)	-	2	1	-	2	-	-	Runway End Data Chart	-	1	1	-	-	-	-	Singapore has implemented CDO on 8 STARs since March 2012.

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					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
Solomon Islands																				
Sri Lanka	**ROBUST**	Atula Jayawickrama Director/Aeronautical Services Civil Aviation Authority, No.4, Hunupitiya Road, Colombo 2, Sri Lanka Tel. +94112304687 Fax. +94112358876 Email: das@caa.lk	BPEs: 9/1/0	(2008 – 2012) - RNP10 Routes in oceanic airspace, RNAV5 Continental Routes (2013– 2016 & beyond); RNP10 FIR above FL225, RNP4 routes in oceanic airspace	30%	70%	100%	Nil	Nil	-	6	Two RNP APCH (APV) for each of the following: 1. Bandaranaike International airport 2. Hambanatota International Airport (New) 3. Colombo City Airport, Ratmalana.	30%	100 %	100 %	Nil	Nil	2	2	RNAV 1 SID/STAR are planned for following; 1. Bandaranaike International airport 2. Hambanatota International Airport (New)
Thailand	**ROBUST**	Mr. Noppadol Pringvanich Director Procedure Design for Air Navigation Service Tel. +66 (0) 81207-8822 Fax. +66 (2) 2287-8639 npringvanich@gmail.com; noppadol@stanfordalumni.org	PBN Implementation was approved by the National Working Group on PBN and GNSS in June 2009. Thailand PBN Plan was then submitted to ICAO PBN TF/5 Meeting in July 2009	RNAV5: 1	18	-	-	8	-	20	4	1. Phuket International Airport - two RNP APCH procedures were published on 1 January 2009. 2. Hat Yai International Airport - two RNP APCH procedures were published on 17 December 2009. 3. Samui Airport - two RNP APCH procedures were published on 25 March 2010. 4. Chiang Mai International Airport - two RNP APCH procedures were published in September 2011.	13	-	-	-	-	-	16	
Timor-Leste																				
Tonga																				
Vanuatu																				
Vietnam	**INCOMPLETE**	Mr. Bui Van Vo Director of Air Navigation Department Civil Aviation Administration of Viet Nam Gialam Airport Hanoi, Viet Nam Tel: +84-4-827-4191 Fax: +84-4-827-4194 Email: buivanvo@caa.gov.vn																		
USA (American Samoa, Guam, Johnston, Kingman, Midway,																				

Attachment B

Administration	Status Date	Focal Point	PBN Plan Review (BPEs = Basic Planning Elements, Robust/Needs Improvement/Non-Existent)	En-Route Operations	Approach Operations								Arrival & Departure Operations (SID and STAR)							
					Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		In Progress (# of RWY Ends)		Note(s)	Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airport)		In Progress (# of Int'l Airports)		Note(s)
					2010	2014	2016	LNAV	LNAV/ VNAV	LNAV	LNAV/ VNAV		2010	2014	2016	ARR	DEP	ARR	DEP	
Mariana, Palmyra, Wake Islands)																				

Basic Planning Elements (BPEs): Robust/Needs Improvement/Non-Existent