INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF

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

Bangkok, Thailand

(08-10 March 2016)

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PART I – HISTORY OF THE MEETING

1. Introduction

1.1 The Third Meeting of Performance Based Navigation Implementation Coordination Group (PBNICG/3) was held at the ICAO Asia-Pacific Regional Office, Bangkok, Thailand, from 08 to 10 March 2016.

2. Attendance

2.1 The meeting was attended by 57 participants from 17 States including a Special Administration and 3 International Organizations.

2.2 The participants from States were experts in various fields related to PBN implementation such as ATM, AIS, CNS, Procedure Design, Airspace Design, Aerodrome and aircraft operations. The relevant presentations and documents are available at: http://www.icao.int/APAC/Meetings/Pages/2016-PBNICG3----------.aspx .The list of participants is placed at **Attachment 1**.

3. Opening of the Meeting

3.1 The Chairman opened the meeting and welcomed the participants of the meeting. He reminded that 2016 was the last year for PBN approach procedures for all runway ends of all international aerodromes to be completed in accordance with ICAO Assembly Resolution A37-11.

4 Officers and Secretariat

4.1 The meeting was chaired by Mr. Ian Mallett from Civil Aviation Safety Authority (CASA), Australia and served by Mr. Frederic Lecat, Regional Officer CNS of the ICAO APAC Regional Office, Bangkok, and Mr. Huho Ha, Regional Officer ATM (AOM-PBN) in the ICAO Regional Sub-Office, Beijing, with the assistance of Mr. Len Wicks, Regional Officer ATM of the ICAO APAC Regional Office.

5. Working Arrangements, Language and Documentation

5.1 The working language of the meeting was English inclusive of all documentation and this Report. 9 Working Papers (WP), 18 Information Papers (IP) and 5 Presentations were considered by the meeting. The lists of Working/Information Papers and Presentations are provided at **Attachment 2.**

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Agenda Item 1: Adoption of agenda

1.1 The provisional agenda (WP/01) was reviewed and adopted as follows:

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Global and Regional PBN Updates

Agenda Item 3: Review of related global/regional plans, priorities and targets

Agenda Item 4: Reports on relevant meetings outcomes

Agenda Item 5: States' PBN Implementation Progress

a) PBN Implementation Plans: Updates by States/Administrations

b) Review and Adoption of PBN Implementation Progress Report Results

Agenda Item 6: Report of Progress from PBNICG Tasks

Agenda Item 7: Implementations of PBN in Terminal Area

Agenda Item 8: Implementations of PBN in Domestic En-route Airspace

Agenda Item 9: Regional and Sub-regional Implementations of PBN in En-route Airspace

Agenda Item 10: Issues and challenges regarding PBN implementations

Agenda Item 11: Working Arrangements for PBN Region-wide implementations

Agenda Item 12: Review of Action List

Agenda Item 13: Any Other Business

1.2 The meeting agreed to the proposed agenda without changes.

Agenda Item 2: Global and Regional PBN Updates

IP/ 02 - Global PBN Update (Secretariat)

2.1 The Secretariat delivered a presentation regarding the latest development of PBN on behalf of the ICAO PBN Programme Manager. He reminded participants of the benefits of PBN, Global PBN implementation status, namely the development of PBN Implementation Plan, PBN approach procedures and PBN SIDs/STARs. He also highlighted that the ICAO PBN programme focusses in the areas of regional coordination and support, development of the PBN concept, providing guidance/information on PBN, products and services and promotion.

2.2 The lack of training in PBN charting materials was identified. The meeting discussed the need for training course to assist with the development of aeronautical charts for PBN procedures. The issue of ATC training for PBN procedures was also raised, especially for PBN and non PBN mixed mode operations in a non-surveillance environment. For ATC training in PBN procedures, it was agreed that the principle to train the trainers would be the most efficient way. The meeting agreed to the following action item:

ACTION 3/1: ICAO Regional Office (RO) to investigate how training in PBN procedure charting and ATC training in PBN procedures can be addressed.

WP/07 - APAC Flight Procedure Programme (FPP) Strategy Forward (Secretariat)

2.3 The Secretariat presented activities of ICAO Asia and Pacific Flight Procedure Programme (APAC FPP) on behalf of the APAC FPP Manager. APAC FPP activities were mainly focused on training for flight procedure designers and procedure design consultation and support. Consultation on airspace design and ATC operational issues was supported by APAC Regional Sub-Office (APAC RSO). FPP would provide two training courses, namely IFP Quality Assurance Training and Helicopter PinS Procedure Design Training in 2016 or 2017.

2.4 The Secretariat also informed the meeting that the 52nd DGCA Conference and the 7th APAC FPP Steering Committee Meeting supported the extension of APAC FPP into Phase 3 (2018-2020). The final decision on this issue would be made at the 8th APAC FPP SCM. PBNICG confirmed its support in the PBN implementation activities of APAC FPP.

2.5 The meeting was asked to discuss whether States would need assistance in addition to the one provided by the existing bodies. If the needs were identified, APAC FPP SCM would consider expanding APAC FPP's scope of activities and include it in the APAC FPP's work plan.

2.6 Considering the importance of continuing participation of States for the success of APAC FPP, the Secretariat recommended that any State not participating in the APAC FPP join the programme and support its expansion into Phase 3 (2018-2020). In this regard, the meeting agreed to the following action item for consideration by CNS/SG:

<table>
<tr><td colspan="3">Draft Conclusion 3/1 - Asia and Pacific Flight Procedure Programme (APAC FPP)</td></tr>
<tr><td colspan="2">Considering the benefits derived from APAC FPP support,

That, any State not participating in the Asia and Pacific Flight Procedure Programme (APAC FPP) consider joining the programme and if so, coordinate with the ICAO Regional Office.</td><td>Expected impact:
☒ Political / Global
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why:</td><td colspan="2">APAC FPP enhances capacity of States in PBN implementation</td></tr>
<tr><td>When:</td><td>immediately upon adoption by APANPIRG/27.</td><td>Status: Open until adoption by APANPIRG/27</td></tr>
<tr><td>Who:</td><td colspan="2">☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: APAC FPP</td></tr>
</table>

Agenda Item 3: Review of related global/regional plans, priorities and targets

WP/02 - Update on the Seamless ATM Reporting Process and Regional Picture (Secretariat)

3.1 The Secretariat presented the status of the Seamless ATM reporting process and regional picture reflecting the implementation progress of Air Navigation Improvements in APAC Region against the objectives set forth by the GANP ASBU Block 0 and Seamless ATM Plan V1. A total of 22 States/Administrations, i.e. 52% of the APAC States/Administrations, had submitted one or more report(s) on the ICAO Seamless ATM Reporting portal. Among those 22 States/Administrations, 9 updated their progress on a regular basis. Regarding designating Point of Contact (POC), 29 States/Administrations had nominated it but 13 had not reported it yet.

3.2 Regarding the regional picture, it showed the progress of implementation against the indicators as per the APAC main planning table. Furthermore the Regional Performance Dashboard showed that 21 States in APAC region have reached the 2014 objective of 70% of international runways at international aerodromes with APV or LNAV-only procedures and 16 States were still behind the target.

3.3 States were urged to cross check the reporting information between Seamless Points Of Contact (POC) and PBN POC to identify and solve discrepancies and analyze PBN statistics in the Regional Picture and dashboard for further action. The regional picture regarding optimal trajectories (portfolio of PBN-related seamless items) was reviewed and is attached at **Appendix A**.

ACTION 3/2: States to cross check reporting information between Seamless POC and PBN POC and take action on implementation gaps identified through the Regional Picture and the regional performance dashboard.

IP/03 - Asia/Pacific Seamless ATM Plan Review 2016 (Secretariat)

3.4 The Secretariat presented the proposed changes to the Asia/Pacific Seamless ATM Plan version 1 in the framework of the 2016 review cycle. The proposed changes included the extension of the expected implementation date of phase II Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ATM Service Levels (PASL) items by one year to November 2019, a new Phase III for the PARS and PASL which would be target a completion in November 2022 and new ASBU Block 1 elements which would be added to Phase II (2019).

3.5 The meeting was informed of the significant increase in the number of busiest Asia/Pacific aerodromes (100,000 scheduled movements per annum or more) from 21 in 2012 to 51 in 2015 based on ICAO data. This meant that the baseline of seamless items to implement and report about would change once the new version would be adopted by APANPIRG. The Seamless ATM items that embark objectives for high density aerodromes are 90-CCO, 100-CDO, 110- PBN Approach and 130- PBN Visual Departure and Arrival Procedures, 150- PBN Airspace.

3.6 Considering that Baro-VNAV and SBAS procedures may concern different types of operations at any given aerodrome, it was agreed that the para 7.19 should be amended as follows:

7.19 Where practicable, all aerodromes with instrument runways serving aeroplanes should have:

a) GBAS precision approaches; or ILS/MLS approaches (with APV approach as a backup); or

b) APV, either RNP APCH with Barometric Vertical Navigation (Baro–VNAV) and/or augmented GNSS (e.g. SBAS); or

c) when an APV is not practical, straight-in RNP APCH with LNAV.

3.7 The meeting noted that PBCS (Performance Based Communications and Surveillance) could be included in the APAC Seamless ATM Plan Phase II. As a result the meeting agreed to the following action:

ACTION 3/3: ICAO Regional Office (RO) to amend the para 7.19 of the draft Seamless ATM plan and consider inclusion of PBCS

IP/ 05 - Updated Template for PBN Plan

3.8 The Secretariat introduced the updated template for State PBN Implementation Plan which was provided by ICAO Headquarters. When using the proposed template, the meeting was invited to include 11 Basic Plan Elements (BPE) which were introduced by previous APAC PBN Task Force to evaluate the State PBN implementation plan into the new or updated plan.

3.9 The meeting was reminded about the State letter AP052/15 (RSO/CNS) requesting to submit or update their State PBN Implementation Plan by end 2016. The PBN implementation plan should be in line with the Seamless ATM objectives and may consider the draft Seamless ATM plan version for further planning.

3.10 As a result the meeting agreed to the following Action Item:

ACTION 3/4 (Follow-up to ICAO State Letter, AP052-15): For those States/Administrations which did not submit their PBN implementation plan, submit it using the proposed new template (Appendix B) and for those States/Administrations which update their existing one, choose either to update their current one or to use the proposed template

Agenda Item 4: Reports on relevant meetings outcomes

IP/04 - Regional APANPIRG/26 and GLOBAL NSP/2 outcomes (Secretariat)

4.1 The Secretariat presented the outcomes of the Twenty Sixth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/26) held in September 2015 and of the Navigation System Panel /2 held in December 2015. Regarding APANPIRG/26, the Secretariat informed the meeting of the adopted conclusions related to the PBN implementation including PBN in a page, PBN procedure safety assessment checklist and record of hazard template and need for ionospheric models in the APAC region.

4.2 In relation to the NSP/2, the main information was the development of dual-frequency, multi-constellation (DFMC) SBAS standards including the completion of an initial version of the DFMC SBAS Definition Document and DFMC SBAS Interface Control Document (ICG), the development status and test results of GBAS activities from other States, information about the document regarding Concept of Operations (CONOPS) for multi-constellation GNSS, the development of the notion of GNSS monitoring and advanced receiver autonomous integrity monitoring (ARAIM) concept.

WP/04- ISTF/6 Outcomes (Secretariat)

4.3 The Secretariat presented the outcomes of the Sixth Meeting of Ionospheric Studies

Task Force (ISTF/6) which was held in Bangkok in January 2016. The ISTF/6 adopted several draft conclusions regarding guidance for SBAS safety case related to anomalous ionospheric conditions, Guidance on GBAS ionospheric Threat Model and Adoption of GBAS Ionospheric Threat Model and publication in technical journal(s). Also the ISTF meeting agreed to dissolve the task force after the review of its Terms of Reference (TOR) and the confirmation of the completion of its tasks in the TOR.

4.4 As requested by ISTF, the meeting reviewed the draft tables of contents of SBAS safety case related to anomalous ionospheric conditions and Guidance on GBAS ionospheric Threat Model with the following comments:

- SBAS guidance: 3a, ii: the title should be more specifically describing the intent
- GBAS guidance 2e: remove "Role"
- GBAS guidance: Change "localities" to "locations"

ACTION 3/5: ICAO RO to convey the reviewed Tables of Contents (Appendices D and E) to the ISTF

WP/06 - Review of the Terms of Reference of PBNICG as a Contribution to APANPIRG Reorganization (Secretariat)

4.5 The Secretariat introduced the updated PBNICG terms of reference as a follow-up to Decision APANPIRG/26/66, and proposed the considerations about PBN-related Seamless ATM items and project management principles.

4.6 The meeting reviewed the draft TOR of PBNICG and project management principles and agreed to adopt following Draft Decision and action item:

<table>
<tr><td colspan="3">Draft Decision 3/1 - Updated Terms of Reference for PBNICG</td></tr>
<tr><td colspan="2">That, as a follow-up to Decision APANPIRG/26/66 regarding the Review of Terms of Reference of Contributory Bodies under the APANPIRG Sub Groups, the updated PBNICG TOR as per Appendix C be adopted.</td><td>Expected impact:
☐ Political / Global
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td colspan="3">Why: follow-up to Decision APANPIRG/26/66</td></tr>
<tr><td>When: immediately upon adoption by APANPIRG/27.</td><td colspan="2">Status: Open until adoption by APANPIRG/27</td></tr>
<tr><td colspan="3">Who: ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:</td></tr>
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Agenda Item 5: States' PBN Implementation Progress

a) PBN Implementation plans : updates by States/Administrations

WP/05 - Review of the PBN Implementation Progress in APAC (Secretariat)

5.1 The Secretariat reviewed the status of PBN plans/updates submission as provided in **Appendix F**.

5.2 27 States/Administrations have submitted so far their PBN Implementation Plan. No new initial PBN plan was submitted. Only one State had submitted an update to the PBN implementation plan (France/French Polynesia), and another State had submitted new annexes to its future PBN plan (India).

b) Review and Adoption of PBN Implementation progress Report Results

5.3 As of 11 March 2016, 15 States/Administrations had submitted their PBN Implementation Progress Report:

- French Polynesia (Nov. 2015)
- India (Nov. 2015)
- China, Hong Kong (Dec. 2015)
- China, Macao (Dec. 2015)
- Maldives (Dec. 2015)
- Mongolia (Dec. 2015)
- Philippines (Dec. 2015)
- Republic of Korea (Dec. 2015)
- Singapore (Dec. 2015)
- Malaysia (Jan. 2016)
- Thailand (Jan. 2016)
- US territories (Jan. 2016)
- Lao PDR (Feb. 2016)
- Pakistan (Mar. 2016); and
- Fiji (Mar. 2016);

5.4 The meeting encouraged all the other States/Administrations to send their PBN detailed reports and share issues and challenges through PBNICG.

5.5 Noting prior APANPIRG Conclusions regarding the submission of State PBN Plans, the meeting discussed the possibility of recommending air navigation deficiencies in the PBN field to APANPIRG for States at the next PBNICG (2017). The meeting noted that many States that had not submitted a PBN Plan did not attend ICAO meetings, and that even when States did submit a plan, those which were deemed to be an 'incomplete' status were not very useful. Therefore it was considered that if the updated TORs of PBNICG were adopted, the next PBNICG meeting in 2017 could consider ANS deficiencies which had not submitted a PBN Plan, or had not updated their plan to at least 'robust' or 'marginal' status.

IP/08 - PBN Implementation in the Maldives (Maldives)

5.6 Maldives presented an update on the PBN Implementation efforts and progress made. Maldives achieved the Short Term goals (2008-2012) in its PBN implementation plan and is working to achieve the Medium Term goals (2013-2016) such as RNP 1 domestic routes and RNP APCH LNAV for 5 domestic airports. Also as Long Term Goals, Maldives will develop PBN City Pair between Male and Colombo, RNAV-ILS Connection , and segregated SIDs and STARs.

IP/09 - Update on Lao PDR PBN Implementation (LAO PDR)

5.7 Lao PDR provided information on the latest progress of PBN implementation. Lao PDR implemented City-pair RNAV5 route between Vientiane-Luang Phabang and other RNAV 5 routes would be implemented. RNP APCH and SIDs & STARs for Vientiane and Pakse internation airport had been implemented and PBN procedures for Luangphabang international airport would be implemented in 2016 after flight validation.

5.8 ICAO asked why the PBN route network was being planned as RNAV 5 (spaced at 18 NM) when the airspace of Lao PDR was ATS surveillance airspace. ICAO recalled that according to

the Seamless ATM Plan RNAV 2 was the primary navigation specification in category S (surveilled) airspace and there was no need to space routes procedurally within surveillance airspace. Moreover, the meeting noted that the ROK had successfully demonstrated route spacing at close as 8NM within surveillance airspace.

IP/10 - Thailand PBN Implementation Progress (Thailand)

5.9 Thailand provided information on latest Thailand PBN Implementation plan realigned to reflect the APAC Regional Seamless ATM Plan, the operations of PBN procedures at terminal airspaces, and the operations of PBN routes. The meeting was informed that Thailand is designing RNP APCH procedures at six airports, addition Baro-VNAV procedures at one airport and RNP AR procedures at four airports. For en-route airspace, five additional unidirectional RNAV-5 routes connecting Bangkok with southern destinations were established in 2014. Among them, two routes were upgraded to international routes, M769 and M757, connecting between Bangkok FIR and Kuala Lumpur.

IP/11 – PBN Implementation in Pakistan (Pakistan)

5.10 Pakistan presented the current status and plans for PBN implementation. The meeting was informed that Pakistan implemented RNAV 5 and RNAV 10 routes for en-route phase to support regional harmonization. Also Pakistan implemented RNP1 STARs and RNP APCH procedures for 10 runway ends out of 16 runway ends listed in ICAO Regional Air Navigation Plan and would implement the other 6 runway ends in 2016. Currently 21 runway ends of 11 airports in Pakistan have RNP APCH procedures. In terms of RNAV SIDs, they were under consideration with a view to restructuring the airspace in accordance with PBN airspace designing guidelines.

IP/12 – PBN Implementation in Singapore (Singapore)

5.11 Singapore provided information on the latest progress of PBN implementation. The meeting was informed that through the cooperation with the Republic of Singapore Air Force (RSAF), Singapore would implement RNP APCH LNAV/VNAV procedures at Paya Lebar Airport (WSAP) airport which is civil-military joint use aerodrome listed in ICAO Regional Air Navigation Plan by 2016. In terms of en-route implementation of PBN, Singapore introduced the ADS-B enhancing surveillance capability in some portion of Singapore FIR.

5.12 ICAO thanked Singapore for its planning of PBN to include RNP 2 but noted that Singapore's planning included RNAV 5 post 2018. ICAO recalled that the Seamless ATM Plan Phase 2 (which was being recommended to be amended to commence from 2019) did not recognise RNAV 5 as an appropriate specification.

IP/13 - Update on Hong Kong, China PBN Implementation (Hong Kong, China)

5.13 Hong Kong, China presented information on the latest progress of PBN implementation. The meeting was informed that Hong Kong International Airport (HKIA) has 2 RNP AR approaches for each runway.

IP/06 - Update on Indonesia PBN Implementation (Indonesia)

5.14 Indonesia presented an update on the progress on PBN Implementation and the work plan for 2016 and beyond. The meeting was informed that Indonesia developed RNP APCH procedures at 15 airports, RNP AR procedures at 3 airports and RNAV 1 SIDs/STARs at 3 airports and completed the RNP APCH design for 9 airports by 2015. For 2016 and afterward, 88 airports would have RNP APCH procedures and 22 airports would have PBN SIDs/STARs. For this purpose, DGCA Indonesia would establish two groups, PBN Task Force and PBN Working Group with the cooperation with civil aviation stake holders and would be supported by international projects such as

ICAO TCB Project INS13801 (Environmental Measures in Civil Aviation) and APEC-funded Enhancing Aviation Connectivity and Emissions Reduction via Implementation of PBN Assistance Program (TPT 05 2015A).

IP/15 – PBN Implementation in Fiji (Fiji)

5.15 Fiji presented its update on PBN progress with changes in their Focal Persons with inclusion of Mr. Ivan Wong and Mrs. Sereima Bolanavatu with further update on their review of an updated Fiji PBN Plan to be completed before the end of April 2016. A summary of Fiji's PBN scope of works and deployment work-plan which has revised the initial dates in 2015 was also presented with Fiji's PBN implementation progress report form indicating a fair amount of PBN tasks targeted for completion in 2016.

IP/17 – PBN Implementation Process in Mongolia (Mongolia)

5.16 Mongolia provided information on the latest progress of PBN implementation. The meeting was informed that Mongolia implemented RNP APCH procedures at Chingis Khaan International Airport and 3 RNAV 5 domestic routes in 2015. Mongolia informed that initial design of PBN SIDs and STARs for Chingis Khaan International Airport was developed through PBN Airspace Design Workshop conducted by ICAO APAC RSO and would be implemented by September 2016. Also PBN SIDs/STARs and approach procedures would be implemented for new Ulaanbaatar International Airport by the end of 2016.

5.17 ICAO noted that the use of RNAV 5 as planned may not be appropriate as the ground navigation aid infrastructure (VOR and DME) needed to support RNAV 5 along the entire route segment. It was also noted that the modern equipage of the aircraft fleet crossing Mongolian airspace would probably have a high percentage of RNAV 2 approvals. As RNAV 2 required GNSS (the primary navigation system expected by APANPIRG), RNAV 2 was recommended after a review of the aircraft equipage.

IP/18 - PBN Implementation Status of Viet Nam (Viet Nam)

5.18 Vietnam presented information on the latest progress of PBN implementation. The meeting was informed that WGS84 survey for 15 airports was completed and 6 airports would be conducted in 2016. Furthermore, Vietnam informed that RNP 1 SIDs/STARs for 5 airports had been developed and RNAV 5 parallel routes between Hanoi and Ho Chi Minh would be implemented in the second quarter of 2016.

SP/05 – PBN Status and Development (New Zealand)

5.19 New Zealand presented its PBN Implementation Plan. Main contents were GNSS development work which was completed in 2015, navigation specification for en-route (RNAV2), terminal (RNP1/ RNAV1) and approach (RNP APCH LNAV, LNAV/VNAV, RNP AR APCH) and future PBN development plan (RNP2, RNP 0.3 and Advanced RNP).

SP/04 - Australian CNS/ATM Transition (Australia)

5.20 Australia presented its CNS/ATM transition plan. The meeting was informed that RNP2 for en-route and RNP 1for terminal would be implemented from February 2016 and 181 of 415 navigation aids would be decommissioned in May 2016. Also Australia informed all IFR aircraft must be equipped with GNSS receiver from 4 February 2016 and TSO C166 ADS-B (RTCA DO-260) from 2 February 2017 with issues related to the mandate of GNSS and ADS-B.

5.21 ICAO thanked Australia for its innovative approach and use of work-arounds for its implementation of RNP 2. Noting the equivalence for RNP 2 recognised by Australia (RNAV 2, RNP 1 GNSS) and the issue with the flight plan not directly recognizing RNP 2 (note: RNP 2 could be indirectly indicated by use of the designator 'Z' in item 10 and 'NAV/RNP 2' in item 18), the meeting agreed to a Draft Conclusion that provided guidance to Asia/Pacific State:

<table>
<tr><td colspan="2">Draft Conclusion PBNICG 3/2 - RNP 2 Implementation Guidance</td></tr>
<tr><td>That, for the implementation of RNP 2, States should ensure that:
a) all aircraft operators file the designator 'Z' in item 10 and 'NAV/RNP 2' in item 18 to indicate RNP 2 capability until the ICAO flight plan is updated to include RNP 2; and
b) an equivalence for RNP 2 is recognised if the aircraft is approved for RNAV 2, RNP 1 and GNSS.</td><td>Expected impact:
☒ Political / Global
☒ Economic
☒ Environmental
☒ Ops/Technical</td></tr>
<tr><td colspan="2">Why: to provide assistance to States implementing RNP 2 in accordance with the Seamless ATM Plan.</td></tr>
<tr><td>When: immediately upon adoption by APANPIRG/27.</td><td>Status: Open until advised to States by ICAO State Letter.</td></tr>
<tr><td colspan="2">Who: ☒States ☒APAC RO ☒ICAO HQ ☐Other:</td></tr>
</table>

Note: reference is made to:

1/ CASA guidance:

- *Web page: https://www.casa.gov.au/airspace/standard-page/cns-atm-navigation*
- *Doc: https://www.casa.gov.au/file/163716/download?token=zgrG8S77*

2/ APANPIRG Conclusion 24/36 on RNAV Substitution for Conventional Instrument Flight Procedures, item b/ ii/ regarding the flight plan issue inviting ICAO HQ to "review the current Flight Plan contents to consider the listing of aircraft navigation capabilities rather than the listing of specific equipment carried (revisions should include the addition of Item 18 PBN codes for navigation specifications not currently included)."

5.22 Consistently, noting that RNAV 2 within surveillance airspace may have equivalence with RNP2, the Seamless ATM v2 specification for phase II would need to include now RNP 2 and RNAV 2 for Category S (surveilled/serviced) airspace.

IP/15 - PBN Implementation in Fiji (Fiji)

5.23 Fiji presented its update on PBN progress with changes in their Focal Persons with inclusion of Mr. Ivan Wong and Mrs. Sereima Bolanavatu with further update on their review of an updated Fiji PBN Plan to be completed before the end of April 2016. A summary of Fiji's PBN scope of works and deployment work-plan which has revised the initial dates in 2015 was also presented with Fiji's PBN implementation progress report form indicating a fair amount of PBN tasks targeted for completion in 2016.

5.24 It was discussed that the significant experience gained by Fiji on UPR could benefit to other States/Administrations.

Update by Malaysia

5.25 Malaysia informed the meeting of the its PBN implementation status including the construction of the new ATM center in Kuala Lumpur which was in progress, and the publication of RNP /AR procedures at Kuching and Penang.

Summary about regional PBN reporting

5.26 Based on PBN Implementation Progress Reports and updates made in the meeting, the PBN progress was updated and adopted by the meeting as per **Appendix G**.

5.27 The progress shows that the Assembly Resolution 37-11 objective for Approach is met by 4 States, and will probably be almost met by 5 more end 2016 (for international and domestic runway ends). Based on third party data, the ICAO regional performance dashboard shows that 16 States have implemented 100% PBN approach at their international runway ends. However some discrepancies with the detailed reports indicate this could be a bit too optimistic.

5.28 In any case, it is forecast that the bulk of APAC States will not meet the Assembly Resolution 37-11 objectives end 2016 for international and domestic runway ends.

5.29 Therefore, such States should review their PBN implementation plan to speed up implementation and continue sharing with PBNICG all the issues they may face. Even though they cannot meet Assembly Resolution 37-11 objectives of 100% end 2016, the updated PBN plans should give an ambitious but reachable target for end 2016, and plan the date at which the Assembly Resolution 37-11 objectives will be met. An ICAO State letter would be sent to the concerned States

5.30 In terms of PBN arrival and departure route development, the number of airports where PBN arrival and departure procedures were developed does not match with the number of airports where PBN approach procedures were developed. From this, it can be inferred that these procedures were developed individually and arrival procedures did not connect to approach procedures. States were encouraged to connect their PBN arrival procedures to the approach procedures irrespective of their being PBN or conventional.

5.31 Even though RNP approach is intended to be used by a stand-alone GNSS equipped aircraft, it will increase users' workload and reduce flight operations efficiency if arrival and departure procedures are not connected to the RNP approach procedure. Likewise, operations will be suboptimal if initial approach waypoints (IAW) of a RNP approach procedure do not coincide with those of existing conventional approach procedures, especially with ILS procedures, the main precision approach method. Therefore, it is recommended to connect PBN arrival procedures to the approach procedures regardless of PBN or conventional.

5.32 In addition, the reports show that most States have already implemented at least one PBN route or will implement PBN routes by 2016.

ACTION 3/6: ICAO to update the PBN related indicators of the APAC Regional Performance Dashboard to reflect the progress reported as per Appendix G

Agenda Item 6: Report of Progress from PBNICG Tasks

6.1 Refer to Agenda Item 12 for progress of related actions.

Agenda Item 7: Implementations of PBN in Terminal Area

7.1 Refer to Agenda Item 12 for progress of related actions.

Agenda Item 8: Implementations of PBN in Domestic En-route Airspace

8.1 Refer to Agenda Items 10 and 12 for progress of related actions.

Agenda Item 9: Regional and Sub-regional Implementations of PBN in En-route Airspace

IP/16 - PBN Highways (Secretariat)

9.1 The Fourth Inter-Regional Co-ordination Meeting (IRCM/4) on Interface Issues between the Asia/Pacific (APAC), European and North Atlantic (EUR/NAT) and Middle East (MID) Regional Offices of ICAO held at Bangkok in September 2015 discussed a paper detailing proposals from the Fourth Meeting of the Trans-Regional Airspace and Supporting ATM Systems Steering Group (TRASAS/4, Bangkok. Thailand, October 2014) for Advanced Inter-Regional ATS Route Development Task Forces (AIRARD/TF) about PBN highways. This concept is designed to use the most efficient Performance-based Navigation (PBN) specifications, a degree of prioritisation, and end-to-end planning between Asia and Europe, and was supported by IRCM/4. In its Summary of Discussion, the IRCM/4 agreed to the formation of AIRARD/TF.

9.2 An information paper was provided on the AIRARD/TF to the European route development group RDGE. An information paper on PBN Highways was also reviewed by the combined Sixth Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOACG/6) and the Twenty-Third South East Asia ATM Coordination Group (SEACG/23), which supported the concept.

Agenda Item 10: Issues and challenges regarding PBN implementations

WP/09 - Implementing PBN for Remote and Mountainous Area Airport (Indonesia)

10.1 Indonesia introduced the case of Enarotali Airport which is located in remote and mountainous area. As the airport is surrounded by mountains, RNP APCH procedures for each runway end was considered not feasible because of obstacles near runway caused aerodrome minima, obstacle clearance altitude/height (OCA/H) and visibility. Besides RNP AR approach was difficult to apply because of the limited resources and aircraft capabilities suitable for RNP AR APCH.

10.2 Therefore, Indonesia developed STAR RNP1 Concept, which allows aircraft to fly until visual decision point (VDP) where pilot would decide whether to continue to the runway or to execute a missed approach based on the recognition of visual reference or runway.

10.3 The meeting provided various options such as RNP 0.3 or RNP AR design criteria. The Secretariat mentioned that the approach concept presented was similar to the Guided Visual Approach Concept which the ICAO Flight Operations Panel (FLTOPSP) is currently addressing. Consequently the meeting agreed to the following action item:

ACTION 3/7: ICAO APAC FPP to provide Indonesia with assistance in comparing the different possible designs, including a Guided Visual Approach

IP/14 – PBN Implementation in Indonesia in its State Action Plan for Emissions Reduction in Aviation (Indonesia)

10.4 Indonesia, support by an ICAO TCB project, presented PBN implementation in its State Action Plan for Emissions Reduction in Aviation, expected environmental benefits, and the related support actions taken. An initial assessment with DGCA identified as an immediate need the

need to involve key aviation stakeholders in a collaborative approach to ensure smooth and timely implementation of Indonesia PBN Plan, as mandated by ICAO, which led to the creation of a PBN implementation stakeholder Working Group.

10. 5 The main issues and challenges and envisaged solutions identified by Indonesian stakeholders for an effective PBN Implementation were discussed by the meeting, and acknowledged as symptomatic of the issues more generally faced region-wide:

1) Some airports are equipped with PBN procedures which are still not being used effectively:

   - Further work will be needed in coordinating ATC´s jurisdictions, harmonized use of military restricted areas and integration with conventional and visual traffic.

2) Approved and published procedures are not flown by operators.

   - Economic, safety and operational benefits need to be assessed and communicated to incentivize the allocation of operator's resources and necessary investments.

   - Improved knowledge of PBN concept and navigation specification shall facilitate implementation.

3) Approved and published procedures are normally not cleared by ATC.

   - Training local ATC´s would improve confidence on management of PBN traffic and provide a better perception of benefits in terms of workload and complexity reduction.

   - Shared operational approval databases among Regulator and ANSP would facilitate oversight of Pilots/Operators capability to operate PBN procedures.

4) Need of updated information airport´s data on Obstacle Limitation Surface (OLS).
   - Allocation of resources to develop & update data and shared database systems would accelerate the design and approval of new PBN procedures.

5) Procedures that have been already developed have not yet been approved/published.

   - Consultation/involvement of key actors would facilitate further approval/implementation.

6) Operational approvals of aircraft operators are below fleet's operational capabilities.

   - Facilitation of approval/certification process would reduce barriers for operators to use existing PBN procedures.

10.6 A number of participants considered that issues and solutions proposed in IP14 were of interest to many APAC States/Administrations.

10.7 Regarding the environmental benefits, it was reported that a first estimation had been made with ICAO IFSET for the three main Indonesian airlines with international operations (Garuda Indonesia, Indonesia Airasia and Lion Air). PBN procedures could generate average savings of about

12.5 Million Liter of jet fuel and about 30,000 Ton of CO2 emissions per year with the current traffic, which is estimated to keep significantly growing in Indonesia.

10.8 ICAO thanked Indonesia for the excellent analysis of problem areas that were barriers to the effective implementation of PBN, including air traffic controllers not utilizing PBN procedures because of no buy-in. Noting the importance of this work and relevance to other States, ICAO encouraged Indonesia to submit a more detailed assessment of the problem areas to the ATM/SG for its information and action.

IP/07 - ICAO PBN Study Group Papers

10.9 Australia introduced two papers that would be presented to the PBNSG at the global level:

- one proposing to expand the PBN Manual RNP AR Operations section; and
- another proposing that the PBN Manual be revised to provide better PBN implementation guidance, based on Australian experience.

10.10 Both papers raised awareness on the complexity of the safety case for RNP AR Operations and the need for strong project management principles in PBN implementation, considering the experience gained by Australia in mandating that all IFR aircraft be equipped with GNSS from 4 February 2016, that from 26 May 2016 all continental en route operations be RNP 2 and terminal procedures be RNP 1. Many issues developed in the papers were of interest to APAC States/Administrations in their implementation of PBN.

SP/01 - ACTION 2/13: Progress Report by ICAO and IATA

10.11 The meeting discussed the follow-up work made by IATA and ICAO regarding the action 2/13 to provide training to decision makers and executives who make decisions about the funding of PBN implementation projects.

10.12 The meeting discussed that the one day training made in conjunction with APANPIRG would miss its target, as most APANPIRG participants have already a knowledge regarding PBN strategy and implementation. The initial intention of the ICAO PBN Seminar was to train the DG and Directors. As a result, the meeting agreed that only the one hour training for DGs and Directors involved in PBN Strategy would bring added value. The briefing should last around one hour, in the form of an interactive presentation and address the following topics:

- Educate executives on the PBN concept and its benefits
- Explain the scope of PBN projects that are possible (simple to complex)
- Explain the business case elements and process (Safety and Efficiency)
- Explain the consultative process and importance of involving all aviation stakeholders to have buy in
- Explain the implementation process (generic – as each country may have different processes) including the approval process
- Conduct a case study example

10.13 It should build upon the ICAO PBN iKit, IATA expertise and also the recently developed Australian PBN CNS-ATM package. For a greater benefit it should also be usable in any part of the world.

SP/03 - Practical PBN Implementation - from an ATM Perspective

10.14 SP/03 highlighted that a whole-of-system planning approach is required for PBN. More specifically it was discussed that in a surveillance environment with VHF/CPDLC, the ATC separation standards should be based on the Seamless ATM specifications applicable in Category S airspace (example: 5 NM), and not on the PBN specifications (example: 50NM longitudinal between RNP10 aircraft).

10.15 ICAO noted that many States had been improperly applying the provisions of the Seamless ATM Plan; using RNP 10 (RNAV 10) within category S (surveilled) airspace when that navigation specification was supposed to be used in category R (remote) airspace. Moreover, it appeared that a number of States were not doing an assessment of the aircraft equipage (current and planned) and therefore not utilizing the most efficient navigation specifications such as RNAV 2 (which was generally observed to be approximately 70% or more in most Asia/Pacific airspace). Such assessment has to be covered in the PBN plan.

10.16 ICAO commented that RNAV 5 was not an appropriate navigation specification within category S airspace unless there was no other choice, because it did not have the track-keeping assurance of GNSS as a mandated sensor, nor a database and the capability for waypoint sequencing functionality.

Agenda Item 11: Working Arrangements for PBN Region-wide implementations

WP/08 - APAC Enroute PBN Network Optimization (Secretariat)

11.1 The meeting discussed a draft statement of work aiming at optimizing the APAC Enroute PBN network. To achieve the APAC Seamless ATM plan expectations regarding PBN routes, the objectives were to:

- to identify the main opportunities of optimization review traffic flows among entry/exit points and city pairs, existing and planned CNS infrastructure and the status of PBN approved aircraft and fleet readiness of the sub-region.

- based on initial opportunities above, the sub-regional groups jointly develop a proposal for optimized/realigned route structure and implement it.

11.2 While some of the sub-regional groups (a,b,c below) were already active and working, the interest to expand the concept to other APAC sub regions was recognized by the meeting.

a) BIMT (Bangladesh, India, Myanmar, Thailand),
b) Mekhong Delta (Myanmar, Thailand, Laos PDR, Cambodia, Vietnam); and
c) South China Sea Major Traffic Flow Review Group (SCS-MTFRG) (China, Hong Kong China, Malaysia, Philippines, Singapore, Vietnam).
d) Myanmar-Bangladesh-Nepal-India-Bhutan-Pakistan (Himalaya routes)
e) Maldives-Sri Lanka-India
f) China-Mongolia-Russia;
g) Singapore-Malaysia-Thailand; and
h) Indonesia-Singapore-Malaysia.

11.3 The meeting agreed that the South Asia/Indian Ocean ATM Coordination Group (SAIOACG) and the South East Asia ATM Coordination Group (SEACG) chairs should be consulted about the draft Statement of work. Based on the outcomes of the groups already at work, the meeting considered as an efficient way forward to encourage the establishment of these other subgroups, informal or formal. Whether the task should be coordinated under ATM/SG or CNS/SG umbrella would need to be further discussed. Accordingly, the meeting agreed to the following action:

ACTION 3/8: ICAO RO to circulate the draft Statement of Work *Optimizing the APAC Enroute PBN network* (Appendix H) to SAIOACG SEACG chairs and coordinate with the ATM/SG and CNS/SG for the most efficient option regarding the coordination of the task

Agenda Item 12: Review of Action List

12.1 The list of actions was reviewed and updated as per **Appendix I**.

Agenda Item 13: Any Other Business

13.1 The PBNICG/4 would tentatively be held in March 2017 in Fiji, in conjunction with a PBN workshop. The PBN workshop would require involvement from the various participants.

ACTION 3/9 Ian Mallett: To coordinate the preparation of the workshop (Objectives / presentations)

Closing of the Meeting

13.2 The Chairman thanked the participants for their contributions and expressed appreciation to the ICAO APAC Regional Office and Regional Sub Office for their support. He reminded the participants about the PBN iKit, and support offered by APAC FPP programme. The meeting also thanked Mr. Huho Ha for his dedication and valuable support provided in PBN area.

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Nov. 2015

		Performance-based Navigation (PBN) Approach	Performance-based Navigation (PBN) Routes	Performance-based Navigation (PBN) Airspace	Continuous Descent Operations (CDO)	Continuous Climb Operations (CCO)	Standard Instrument Departures (SID)	Standard Terminal Arrivals (STAR)	PBN Visual Departure and Arrival Procedures	ATM systems enabling optimal PBN/ATC operations	UPR and DARP
Seamless Item		**110**	140	150	90	100	120		130	250	290
ASBU		**B0-APTA**	B0-FRTO	Regional	B0-CDO	B0-CCO	B0-CCO/B0-CDO		Regional	B0-APTA	B0-FRTO
PRIORITY		**PRIORITY 1**									
Australia	**2015 - 3**	100%	100%	100%	N/A	N/A	No data	100%		90%	100%
Bangladesh	**2015 - 2**	30%	10%	N/A	N/A	N/A	50%	0%		No data	N/A
Bhutan	**2015 - 2**	No data	0%	No data	N/A	N/A	No data	No data		N/A	N/A
China	**2015 - 3**	100%	10%	100%	0%	0%	No data	100%		100%	N/A
Fiji	**2015 - 3**	70%	No data	No data	No data	No data	No data	No data		No data	No data
French Polynesia, France	**2015 - 3**	100%	80%	N/A	No data	No data	100%	80%		100%	100%
Hong Kong, China	**2014 - 1**	100%	100%	0%	100%	0%	100%	100%		100%	N/A
India	**2015 - 4**	100%	60%	0%	100%	100%	100%	100%		100%	25%
Indonesia	**2015 - 4**	30%	No data	No data	No data	No data	No data	20%		No data	No data
Japan	**2014 - 4**	0%	100%	100%	30%	0%	100%	100%		100%	100%
Macao, China	**2014 - 4**	No data	N/A	N/A	N/A	N/A	No data	No data		N/A	N/A
Malaysia	**2015 - 4**	0%	40%	100%	100%	100%	0%	100%		100%	N/A
Maldives	**2016 - 1**	100%	60%	No data	100%	100%	100%	100%		100%	100%
Mongolia	**2016 - 1**	No data	No data	0%	10%	10%	No data	10%		10%	100%
Nepal	**2016 - 1**	No data	20%	No data	No data	N/A	N/A	N/A		20%	N/A
New Caledonia	**2015 - 2**	0%	No data	No data	N/A	N/A	No data	100%		N/A	N/A
Philippines	**2016 - 1**	100%	30%	0%	50%	50%	30%	100%		20%	0%
Republic of Korea	**2015 - 3**	No data	70%	No data	30%	0%	No data	No data		100%	N/A
Singapore	**2015 - 3**	100%	0%	100%	100%	0%	No data	100%		0%	N/A
Sri Lanka	**2015 - 4**	50%	100%	N/A	70%	70%	70%	70%		100%	100%
Thailand	**2015 - 4**	80%	20%	0%	20%	20%	40%	50%		100%	N/A
United States	**2015 - 1**	N/A	100%	100%	N/A	N/A	N/A	N/A		100%	50.0%
Indicator		% of high density aerodromes with precision approaches or APV or LNAV (High density aerodrome is defined by Asia-Pacific Seamless ATM Plan as aerodromes with scheduled operations in excess of 100,000/year)	% of ATS routes designated as PBN routes in accordance with Seamless ATM Phase 1	Are all your Category R and S upper controlled airspace, and Category T airspace supporting high density aerodromes designated as non-exclusive or exclusive PBN airspace as appropriate.? (1- yes, 0- no)	% of international aerodromes/TMA where CDO is implemented	% of international aerodromes where CCO is implemented	% of international aerodromes / TMAs with PBN SID implemented	% of international aerodromes / TMAs with PBN STAR implemented		% of ATC units with ATM systems enabling optimal PBN operations	% of FIRs using UPR and DARP within R airspace

		Performance-based Navigation (PBN) Approach	Performance-based Navigation (PBN) Routes	Performance-based Navigation (PBN) Airspace	Continuous Descent Operations (CDO)	Continuous Climb Operations (CCO)	Standard Instrument Departures (SID)	Standard Terminal Arrivals (STAR)	PBN Visual Departure and Arrival Procedures	ATM systems enabling optimal PBN/ATC operations	UPR and DARP
Seamless Item		**110**	140	150	90	100	120		130	250	290
ASBU		**B0-APTA**	B0-FRTO	Regional	B0-CDO	B0-CCO	B0-CCO/B0-CDO		Regional	B0-APTA	B0-FRTO
Australia	**2015 - 3**		100%						No data	No data	
Bangladesh	**2015 - 2**		40%						N/A	0%	
Bhutan	**2015 - 2**		0%						No data	N/A	
China	**2015 - 3**		0%						No data	No data	
Fiji	**2015 - 3**		No data						No data	No data	
French Polynesia, France	**2015 - 3**		100%						N/A	No data	
Hong Kong, China	**2014 - 1**		0%						N/A	No data	
India	**2015 - 4**		100%						0%	100%	
Indonesia	**2015 - 4**		No data						No data	No data	
Japan	**2014 - 4**		0%						0%	100%	
Macao, China	**2014 - 4**		N/A						N/A	N/A	
Malaysia	**2015 - 4**		100%						100%	No data	
Maldives	**2016 - 1**		100%						N/A	100%	
Mongolia	**2016 - 1**		No data						No data	No data	
Nepal	**2016 - 1**		0%						No data	No data	
New Caledonia	**2015 - 2**		No data						N/A	N/A	
Philippines	**2016 - 1**		0%						No data	0%	
Republic of Korea	**2015 - 3**		No data						No data	100%	
Singapore	**2015 - 3**		0%						0%	No data	
Sri Lanka	**2015 - 4**		100%						100%	100%	
Thailand	**2015 - 4**		0%						No data	0%	
United States	**2015 - 1**		No data						N/A	100%	
	Indicator		% of ATS routes designated as PBN routes in accordance with Seamless ATM Phase 2						% of high density aerodromes with PBN procedures that overlay visual arrival and departure procedures	% of ATC units with ATM systems supporting optimal aerodrome capacity and using electronic fight progress strips	

Nov. 2018

N/A: Not Applicable

Implementation status of Seamless ATM items relating to Optimal trajectories

(Regional Picture 16 Feb. 2016)

Performance Based Navigation (PBN)

State Implementation Plan

Standard Template

International Civil Aviation Organization

Instructions

[This document is an example template of a State PBN Implementation Plan and provides step-by-step guidance to States on how to establish their own national plan in a standard consistent way in relation to Assembly Resolutions, ICAO SARPs, GANP, GASP, Regional plans and other related documents.

The requirement for a State PBN Implementation Plan is detailed in Assembly Resolution 37-11.

In developing a State Implementation Plan, it is essential that all aviation stakeholders are involved. This is a collaborative exercise, and input from the airspace users is key to developing an effective and achievable plan. (See Doc 9992).

This template includes, boilerplate text, and fields that should be replaced with the values specific to the State PBN Implementation Plan.

- ***Blue** italicized text enclosed in square brackets ([text]) provides instructions to the document author, including explanation on the intent, assumptions and context for content that should be included in this document.*

- *Text and tables in **Black** are provided as boilerplate examples of wording and formats that may be used or modified as appropriate to a specific plan. These are offered only as suggestions to assist in developing planning documents; they are not mandatory formats.*

When using this template for your PBN Implementation Plan, it is recommended that you follow these steps:

1. *Modify boilerplate text as appropriate to address the State's own requirements.*
2. *Add extra chapters and sections which are not included in the template to provide more detail information or to address specific State issues.*
3. *Complete the chapters and sections that the template contains as these are mandatory fields to be filled.]*

ICAO Reference documents:

Assembly Resolution A37-11
Global Air Navigation Plan (GANP)
Performance-based Navigation (PBN) Manual (Doc 9613)
Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)
Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168)
Continuous Descent Operations (CDO) Manual (Doc 9931)
Continuous Climb Operations (CCO) Manual (Doc 9993)
Manual on the Use of Performance-based Navigation (PBN) in Airspace Design (Doc 9992)
PBN Business Case Development guidance (TBD)

SUMMARY OF AMENDMENTS

Date	Amendment #	Name	Signature

EXECUTIVE SUMMARY

[This section provides a summary of the key points of the plan including the actions to be taken by all stakeholders.]

It should briefly describe:

- *the purpose of the plan*
- *the key stakeholders that were involved;*
- *the strategic objectives, ,*
- *the airspace affected, ,*
- *the benefits that are expected and;*
- *the final end state to be achieved.*

TABLE OF CONTENTS

(Insert here)

_____

[List the specifics as per the template format (State can add more if required)]

Chapter 4 – Implementation Targets

- 4.1 Short Term (years)
- 4.2 Medium Term (years)
- 4.3 Long Term (years)
- 4.4 End State (year)

Chapter 5 – Plan Coordination

- 5.1 Coordination and Consultation
- 5.2 Plan Responsibility
- 5.3 Plan Review
- 5.4 Stakeholder Commitment

Chapter 6 – Safety

- 6.1 Preliminary safety assessment
- 6. 2 Implementation safety assessment

Appendices [add as required]

- A A37-11 Resolution
- B. PBN Implementation Schedule for en-route, terminal and approach
- C. References

Glossary of Definitions/Acronyms/Abbreviations

The following table provides definitions and explanations for terms and acronyms relevant to the content presented within this document.

Term	Definition
[Insert Term]	*<Provide definition of term and acronyms used in this document.>*
ANSP	Air Navigation Service Provider
APCH	Approach
ATM	Air Traffic Management
CNS	Communication, Navigation, Surveillance
GANP	Global Air Navigation Plan
GASP	Global Air Safety Plan
ICAO	International Civil Aviation Organization
NAVAID	Navigation Aid
PBN	Performance-based navigation
RNAV	Area Navigation
RNP	Required Navigation Performance
SARPs	Standards and Recommended Practices
SID	Standard Instrument Departure
STAR	Standard Terminal Arrival

CHAPTER 1

OVERVIEW

1.1 BACKGROUND

[This subsection provides an overall system overview, any requirements to implement the system. This section should be completed at a very high level. It may be as long as necessary, but most information should be contained in a half of a page. This section is intended to provide the background information necessary to indicate the process that the system has been going through from past to present.]

1.2 PURPOSE

[This subsection describes the purpose of the plan and identifies the system to be implemented.]

1.3 STRATEGIC OBJECTIVES

[Describe objectives of the State PBN Implementation Planning.]

- *[Insert description of the first objective. (For example -Efficiency and capacity – implementation of PBN routes, RNP SIDs and STARs, Terminal airspace redesigns)]*
- *[Insert description of the second objective (For example – Safety – implementation of RNP APCH procedures with vertical guidance, straight-in approach procedures).]*
- *[Add additional objectives as necessary (For example reduced environmental impact, reduction in ground-based navigation aids, etc)]*

Examples of Strategic objectives include:

- Achieve a total performance-based area navigation environment with defined ICAO PBN Navigation Specification designator values for all operations and airspaces;
- Address current and forecast airspace capacity and operational efficiency issues through application of the ICAO PBN concept;
- Maximize the use of current and emerging navigation (GBAS and SBAS), air traffic management and aircraft avionics systems
- Utilize PBN to reduce environmental impact from aviation through more efficient operations that result in a less fuel burn and noise emissions

1.4 ASSUMPTIONS

[This subsection describes the assumptions made regarding the development and execution of this document as well as the applicable constraints. It is useful to identify the most important assumptions in the State Implementation Plan to test these assumptions and to accommodate these unexpected outcomes. Some items to consider when identifying the assumptions and constraints are:

- *Capacity and efficiency*
- *Infrastructure and equipment*
- *Airspace*
- *Aircraft equipage*
- *Environmental factors,*
- *Existing and emerging Technology …]*

CHAPTER 2

Performance-based Navigation (PBN)

2.1 PBN CONCEPT

[This section is provided to describe the general PBN Concept, show that the concept is fully understood, and explain how it will be implemented by the State,. PBN sets clear performance requirements for flight operations. PBN involves a major shift from conventional ground based navigation and procedures to satellite based navigation and area navigation procedures. Details can be found in Doc 9613 and Doc 9992]. Example text follows:

The PBN Concept is based on a shift from sensor-based navigation to performance based. The PBN concept specifies that aircraft area navigation system performance is defined in terms of accuracy, integrity, continuity and functionality. It explains and describes the performance-based RNAV and RNP navigation specifications that can be applied to oceanic, enroute and terminal airspace, to improve safety, efficiency and capacity, as well as reduce the environmental impact. These specifications also detail the navigation sensors and equipment necessary to meet the performance requirement.

The application of a PBN specification depends on many factors – the navigation infrastructure, communications capability, surveillance capability, the operational requirement, the aircraft fleet capability and operational approvals. etc. In determining which PBN specification to apply, these factors must be taken into consideration in consultation with all stakeholders.

For [state the Country], the application of the PBN concept is important mainly for [explain the main reason (s) – safety (procedures with vertical guidance), efficiency, capacity, environment, redundancy, etc]

2.2 CURRENT IMPLEMENTATION STATUS

[This subsection provides information with respect to the current status of RNAV and RNP operations for different phases of flight in the State.]

2.2.1 Oceanic, Remote and Continental Enroute

2.2.2 Terminal Areas (SIDs and STARs)

2.2.3 Approach

2.2.4 Helicopter Operations

2.2.5 Military Operations

[Use of a table is recommended]

2.3 PBN APPROACHES WITH AND WITHOUT VERTICAL GUIDANCE

[This subsection provides information on the importance of instrument approach procedures with vertical guidance and on the current status of APV implementation][This can also be covered under PBN Status under 2.2.3,if preferred.]

PBN facilitates the implementation of instrument approaches with vertical guidance (APV) to all runway ends. This has a significant safety impact, as non-precision approaches (dive and drive) with no vertical guidance can be removed. It has been proven that approach procedures with vertical guidance are 25% safer than procedures with no vertical guidance. Furthermore, PBN facilitates the design and implementation of APV to runways that do not currently have an approach capability, thus improving airport accessibility and flight operations efficiency.

Therefore, [state Country, in collaboration with the airspace users] places a high priority on the design and implementation of PBN approach procedures with vertical guidance in concert with Assembly Resolution A37-11, to improve both safety and efficiency.

2.4 AIRCRAFT FLEET CAPABILITIES

[This subsection is provided to show the current PBN capability of aircraft flying within and over the State airspace and the traffic forecast over the timeframe of the plan, as this is essential for the development of the plan..]

2.5 CNS/ATM CAPABILITIES

[This subsection is provided to show the current status of Ground and Space based NAVAIDs, Communications and ATM infrastructure that the State has already established and which enables the implementation of PBN.]

2.6 BENEFITS OF PBN AND GLOBAL HARMONIZATION

[This subsection describes the benefits that the State is planning to achieve from the implementation of PBN and the cooperation with the other national, regional and international stakeholders in line with GASP, GANP and regional plans.]

PBN offers a number of advantages over the sensor-specific method of developing airspace and obstacle clearance criteria. For example:

a) *It reduces the need to maintain sensor-specific routes and procedures and their associated costs (e.g. VOR, NDB, DME);*

b) *Enhances safety by allowing for straight-in approach procedures with vertical guidance as a primary approach or back up to existing precision approach procedures;*

c) Improves airport accessibility under all weather conditions;

d) Allows for more efficient use of airspace, thus increasing capacity;

e) Improves operational efficiency through user preferred routings, reduced delays and holds, and enables continuous descent and continuous climb operations;

f) Lessens the environmental impact by contributing to reduced aircraft fuel burn and noise emissions

For [state Country], the main benefits are [explain the main benefits that the State wants to achieve and how this relates to harmonization within the region]

CHAPTER 3

IMPLEMENTATION CHALLENGES

3.1 SAFETY

[This subsection describes what kind of challenges States face and what measures have been taken for the safe operations during the transition to PBN operations.]

3.2 AIRCRAFT OPERATIONS

[This subsection describes the existing aircraft fleet capability for the air operators that transit the State airspace (fly in, out, and over) and the air operators that fly solely within the State airspace against the PBN concept. The subsection would also address challenges with respect to aircraft equipage, pilot training and operations approvals]

3.3 INFRASTUCTURE

[This subsection describes the challenges with respect to the equipment and infrastructure which are essential requirements for the implementation of PBN concept.]

3.4 EFFICIENCY and CAPACITY

[This subsection shows that how the new system helped the State through the increase in the capacity and efficiency to meet the demand in the aviation sector.]

3.5 ENVIRONMENT (NOISE and EMISSIONS)

[This subsection shows the environmental challenges and how the PBN Concept helped State reduce the environmental effect of operations.]

3.6 REGULATORY

[This subsection shows the regulatory changes that may be necessary and the timelines to implement in order to facilitate implementation of the PBN Concept.]

3.7 RESOURCES

[This subsection identifies any additional resources that are required to facilitate implementation of the PBN concept.]

3.8 AIR NAVIGATION SERVICE PROVIDER

[This subsection identifies any issues that may need to be addressed with the ANSP. It may include ATCO training, procedure design training, etc.]

CHAPTER 4

IMPLEMENTATION

[This section provides the targets and schedule for these targets to be accomplished in the short, medium and long term. It is recommended that the minimum time for each term is 3 years – State can assign a longer period if it so desires]

4.1 SHORT TERM (Show applicable years – e.g 2016-2019)

4.1.1 Oceanic, Remote and Continental Enroute

4.1.2 Terminal Areas (SIDs and STARs)

4.1.3 Approach

4.1.4 Helicopter Operations

4.1.5 Military Operations

4.2 MEDIUM TERM (Show applicable years – e.g. 2020-2023)

4.2.1 Oceanic, Remote and Continental Enroute

4.2.2 Terminal Areas (SIDs and STARs)

4.2.3 Approach

4.2.4 Helicopter Operations

4.2.5 Military Operations

4.3 LONG TERM OBJECTIVES (Show applicable years – e.g 2024-2027)

4.3.1 Oceanic, Remote and Continental Enroute

4.3.2 Terminal Areas (SIDs and STARs)

4.3.3 Approach

4.3.4 Helicopter Operations

4.3.5 Military Operations

[As this is further out, it may be more general and not follow the specific sub-paras above.]

4.4 END STATE (Show Year)

[Describe the end state and when it will be achieved. This can then be used in the executive summary] The end state should relate to the Strategic Objectives and could also include:

- PBN Specs implemented and where (Oceanic, Enroute, Terminal)
- Relationship to the objectives of A37-11 (met, partially met)
- Total expected Improvements to safety, efficiency and capacity
- Total expected environmental benefits from reduced fuel burn and noise emissions

CHAPTER 5

PLAN COORDINATION

5.1 COORDINATION AND CONSULTATION

[This section addresses the coordination, collaboration and consultation process that the State will utilize with all stakeholders - the operators operating within the State, ANSPs, aerodrome operators, regional and international organizations - during the preparation and implementation phase of the plan. There should be consensus on the resultant implementation plan.]

5.2 PLAN RESPONSIBILITY

[Describe the appropriate authority having responsibility for the effective and efficient performance of the State's PBN implementation plan.

[Describe the ultimate responsibility for each organizations being involved to the plan to fulfil all requirements in order to achieve the targets set in the plan. For example:

- *CAA to review regulations and guidance material to be amended (by date);*
- *Operators to commit to equipage by(date);*
- *Operators to ensure necessary equipage by (date);*
- *CAA to proceed with approvals of national operators by (date) and to coordinate with foreign operators to ensure appropriate approvals;*
- *ANSP to ensure availability of resources to complete design of procedures, including safety assessments and business cases by (date);*
- *ANSP in coordination with CAA to ensure completion of appropriate safety documentation and approvals by (date).*

5.3 PLAN REVIEW

[Describe the amendment process – for example the plan will be reviewed after each term timeframe, amendments will be solicited from all stakeholders and the plan will be amended as required]

5.4 STAKEHOLDER COMMITMENT

[It is important to obtain the commitment of all stakeholders impacted by the plan. Therefore having the plan signed by the Stakeholders would be beneficial. As well identify the commitment by each stakeholder including financial and personnel resources.],

Chapter 6

SAFETY

6.1 PRELIMINARY SAFETY ASSESSMENT AND RISK ANALYSIS

[This subsection defines the possible scenarios and safety analysis that may be required to identify hazards and control the potential consequences in order to reach an acceptable level of safety. It should include the safety assessment and risk analysis process performed in line with ICAO Safety Management Manual (Doc 9853).]

6.2 IMPLEMENTATION SAFETY ASSESSMENT

[This subsection provides information with respect to the analysis that will be performed after the implementation of PBN procedures to see if the safety requirements are met.]

APPENDIX A

Assembly Resolution A37-11

PERFORMANCE BASED NAVIGATION GLOBAL GOALS

Note: Resolution A37-11 is a result of the 11th Air Navigation Conference recommendations on area navigation implementation and Resolution A33-16 that requested Council to develop a program to encourage States to implement approach procedures with vertical guidance. The main points of Resolution A37-11 are as follows:

{Preamble Removed}

The Assembly

1. *Urges* all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with 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% by 2010, 70% 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 and where there are no aircraft suitably equipped for APV operations with a maximum certificated take-off mass of 5700 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 5700kg 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 PBNB by States according to the defined implementation plans and report annually to ICAO any deficiencies that may occur; and

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

APPENDIX B

PBN Implementation Schedule for En-route, Terminal and Approach Procedures

PBN Specification	En-route (Oceanic, Remote, Continental)	Terminal Airspace SIDs.STARs	Approach Procedures
RNAV 10			
RNAV 5			
RNAV 2			
RNAV 1			
RNP 4			
RNP 2			
RNP 1			
Advanced RNP			
RNP APCH			
RNP AR APCH			
RNP 0.3			

[For each box indicate timeframe for implementation and where specifications will be used (if applicable. For example, indicate the airports, terminal airspace or en-route airspace). If some are not to be used or are not applicable, indicate N/A.]

APPENDIX C

References

[Insert the name, version number, description, and physical location of any documents referenced in this document. Add rows to the table as necessary.]

The following table summarizes the documents referenced in this document.

Document Name	Description	Location
<Document Name and Version Number>	*<Document description>*	*<URL or location where document is located>*

[This should include other documents besides icao docs – regional plans, state plans, etc]

APPENDIX 4 (and others)

[If required to support information in the main part of the plan. For example list of organizations that were consulted, etc].

Terms of Reference (TOR)
APAC PBN Implementation Coordination Group (PBNICG)

1) Serve as the primary APAC Regional Body to support PBN implementation, harmonization and prioritization with a goal to enhance safety and efficiency of aircraft trajectories and operations. The forum also takes into account activities related to the implementation of relevant ASBU elements, with initial focus on B0-CDO, B0-FRTO, B0-CCO, and B0-APTA. The following are the main activities envisaged:

   a. Monitor PBN implementation by ~~of~~ APAC States/Administrations of PBN related Assembly Resolution and of the Seamless ATM items relating to Optimal trajectories, associated regional priorities and targets, and make recommendations as necessary in areas where ICAO and international organizations can provide assistance.

   b. Through ICAO, provide guidance to States to update their PBN implementation plans. Identify challenges within State PBN Implementation Plans and PBN implementation activities and advise States in addressing these challenges in a harmonized manner.

   c. Taking a multi-disciplinary approach, promote more efficient flight operations and trajectories and, as necessary, address related topics including Air Traffic Services (ATS) route network.

   d. Analyze and report operational benefits of PBN implementation and provide regular PBN implementation updated information to ICAO for inclusion in the air navigation reports and regional performance dashboard.

2) Identify issues/action items which are related to the regional implementation of PBN and related ASBU elements, and where appropriate, communicate with related regional groups.

3) Review regional priorities/targets and relevant regional plans as related to PBN implementation.

4) Identify, propose and facilitate where necessary, appropriate corrective action in the development and implementation of action plans by States to resolve identified deficiencies.

5) Review and update Air navigation deficiencies in the field of PBN (as listed in the APANPIRG database);

4 6) PBNICG will report to CNS/SG. CNS/SG will coordinate with ATM/SG.

Composition

The PBNICG will be composed of multi-disciplinary experts with knowledge of and/or responsibility for PBN implementation nominated by ICAO member States/Administrations in the Asia and Pacific Regions and International Organizations. The PBNICG adopts project management principles as necessary. Secretariat support for the PBNICG will be provided by the ICAO APAC RSO ~~with assistance from the~~ and/or APAC RO and ANB. Representatives of ICAO programmes such as COSCAPs and FPP will be invited to participate as applicable.
The scale of the project is regional.

Note: The PBNICG, while ~~undertaking~~ conducting ~~the~~ its tasks, should take into account ~~of~~ the work being undertaken by relevant ICAO Panels and other study/working groups.

DRAFT TABLE OF CONTENTS
GUIDANCE FOR SBAS SAFETY CASE RELATED
TO ANOMALOUS IONOSPHERIC CONDITIONS

– – – – – – – – – – – –

DRAFT TABLE OF CONTENTS FOR GUIDANCE ON GBAS THREAT MODEL

1. Introduction

a) GBAS and its fundamental principles
b) Scope: GBAS threat model to mitigate anomalous ionospheric conditions
c) Ionospheric effects on GBAS

2. Ionosphere conditions to consider for GBAS safety analysis

a) Overview of relationship between GBAS safety assessment and ionospheric conditions
b) Nominal conditions bounded by PL (protection level)
c) Anomalous conditions and ionospheric disturbances to consider

i. Storm enhanced density
ii. Plasma bubble
iii. Other

d) Ionospheric threat model for GBAS safety analysis
e) Evaluation of requirements and performance including integrity monitoring
f) Ionospheric front model (wedge model) and its important parameters

i. Ranging errors induced by ionospheric anomaly
ii. Positioning errors in the final implementation

g) Other important descriptions

i. Locations, dominant season/time, occurrence rate and number of impacted satellites

3. Development and validation of the threat model

a) Observational approach

i. Tools like LTIAM
ii. Time Step method
iii. Other

b) Simulation approach
i. 3D

c) Validation

4. Post-implementation activities

a) Monitoring of ionospheric activity
b) Maintenance of threat model

5. Annexes

a) CONUS model
b) Safety analysis for GBAS prototyping in Osaka
c) other

– – – – – – – – – – – – –

Status of PBN Implementation Plan and implementation (as per 04 March16)

State/Administration	Date Versions Received
Australia	July 2009, 6 May 2010
Bangladesh	13 July 2009, 17 April 2011, 30 July 2012
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), 12 October 2012
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, 20 November 2012
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
Tonga	26 June 2012, 6 February 2013
Viet Nam	Cambodia, Laos and Vietnam IP for APANPIRG/23 – not a plan

Summary	Focal Point / Member	PBN Plan	Update to the PBN plan by end 2016	PBN Implementation Report
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 (29 Feb. 16: new focal point) 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. Tonga 29. French Polynesia 30. US territories	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. Tonga 26. Viet Nam 27. French Polynesia	1. French Polynesia 2. India (annexures only)	1. China, Hong Kong (Dec 15) 2. China, Macao (Dec 15) 3. French Polynesia (Nov 15) 4. India (Nov 15) 5. Maldives (Dec 15) 6. Mongolia (Dec 15) 7. Philippines (Dec 15) 8. Republic of Korea (Dec 15) 9. Singapore (Dec 15) 10. Thailand (Jan 16) 11. US territories (Jan 16) 12. Malaysia (Jan 16) 13. Lao PDR (Feb 16) 14. Pakistan (Mar 16) 15. Fiji (Mar 16) 16. New Zealand (Mar 16)
NOT Submitted	1. Afghanistan 2. Brunei Darussalam 3. Cook Islands 4. Kiribati 5. Marshall Islands 6. Micronesia 7. Nauru 8. Palau 9. Solomon Islands 10. Timor-Leste 11. Vanuatu 12. Viet Nam	1. Afghanistan 2. Bhutan 3. Brunei Darussalam 4. Cook Islands 5. Kiribati 6. Macao, China 7. Marshall Islands 8. Micronesia 9. Nauru 10. Palau 11. Samoa 12. Solomon Islands 13. Timor-Leste 14. Vanuatu 15. 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												Note: Based on Jepesen data, 100 % of the 4 runway ends: implemented (OAKB Kabul, OAKN, Kandahar)								
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	**ROBUST**	Mr. A.K.M. Faizul Haque Deputy Director (Aerodromes) Civil Aviation Authority of Bangladesh Headquarters, Kurmitola Dhaka-1229 Tel/Fax: +88-02-8901423 Email: ddaero@bracnet.net	BPEs 9/2/0	Work with BIMT: plan to establish 2 new PBN routes and to amend 1 PBN route.	Nil	70%	100%	Nil	Nil	Nil	Nil	**Implementation (international):0%** **Implementation (total): 0%**	Nil	70%	100 %	Nil	Nil	Nil	Nil	2 Int aerodromes in RANP VGEG and VGHS Targets 50% of RNAV1/RNP1 SID/STAR end 2018
Bhutan		Mr. Pema Tashi (Mr) Superintendent Air Navigation Services Air Navigation and Aerodrome Division Bhutan Civil Aviation Authority Paro International Airport Paro -Bhutan Mobile No. +975 17622702 /+975 77274647	No plan									Paro Intnl Airport has been analysed for PBN Approach and RNP-AR 0.3 is not possible Bhutan continues to analyse the possibilities of PBN approaches, perhaps as visual overlay **Implementation (international):0%** **Implementation (total): 0%**								
Brunei Darussalam																				
Cambodia	**INCOMPLETE**	Mr. Chhun Sivorn Director Director Air Navigation Standard and Safety Department State Secretariat of Civil Aviation No. 62 Preah Norodom Blvd. Phnom Penh CAMBODIA Tel: +855 (23) 224 259	BPEs 2/1/7 Email sent 16 Jun. 15 Robust: 1/4 Improv.: 10 NE: 2/3/5/6/7/8/9/11	RNAV 5 parallel routes between Siem Reap and Sihanouk Airports 15 October 2015 RNAV 5 parallel routes between Phnom Penh and Siem Reap		30% of instrument runways by 2013	50% by 2015	5	-	-	-	2 Int aerodromes in RANP (VDPP, VDSR) RNP APCH with Baro-VNAV in most possible airports VDPP was implemented on 25 July 2013 with 2 RNP Approaches (LNAV 23 and 05)			2	2	2	-	-	RNAV1/RNP1 SID/STAR and RNP APCH (LNAV) – Phnom Penh (27/06/2013), Siem Reap (2013), Sihanouk (2014). VDPP was implemented on 25 July 2013 with 16 RNAV 1 SIDs, and 16 RNAV 1 STARs Implementation: 100%

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	
		Fax: +855 (23) 224 258 E-mail: ans.ssca@gmail.com		and between Phnom Penh and Sihanouk planned Q1 2016								Siem Reap 1 RNP Sihanouk 2 RNP VDSV AIP SUP A2/15 DATED 10 AUG 2015								
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	NEEDS REVIEW DATA	June 15: • 15 RNAV 2 • 4 RNAV 5 • 39 RNP 4 • 3 RNP 10 routes Total: 61 PBN routes with the mileage of over 38,800km, accounting for 20% of the total mileage of air route in China								CAAC plans to expand LNAV/VNAV in approach operations. By 2016, RNP approach capability will be available to all instrument runway ends. RNP AR approach procedures will be implemented at airports with operational requirements. ZGSZ,ZGGG have LNAV/VNAV			34	8	8			34 Int. airports in RANP (June 15) SID/STAR implemented at 8 airports (August 15): ZBAA,ZSPD,ZSSS,ZGGG,ZGSZ,ZUUU,ZPPP,ZLXY Implementation: 23.5%
Cook Islands			Pacific PBN workshop planned in 2016									Dec. 15: Charting and Procedures Project: PBN approaches planned to be <u>completed end 2016</u>								
Fiji	**ROBUST**	IVAN WONG; ivanw@afl.com.fj; SEREIMA BOLANAVATU; sereimat@afl.com.fj; ILAITIA TABAKAUCORO ilaitia.tabakaucoro@caaf.org.fj	BPEs: 8/2/0 Incomplete: BPE 2 and BPE 10									70% of PBN implementation as per Seamless reporting form			2					
French Polynesia	**MARGINAL** <u>To be reviewed during PBNICG/3</u>	Joël LAULAN Head of Engineering and PANS OPS Dpt. French State Air Navigation Service French Polynesia - Tahiti Ph: + 689 40861295 joel.laulan@aviation-civile.gouv.fr	BPEs: 6/1/4 BPE 3 and BPE11 have been strengthened and need re-assessment	<u>Completed:</u> RNAV 5 routes-2 No CDO or CCO procedures implemented	15	36	52	20	2	8	0	Tahiti-Faa'a runways 04 and 022 have each a LNAV/VNAV and LNAV only procedure **Implementation (international): 100%** **<u>Note: To be added to the ICAO regional dashboard</u>** **Implementation (total): 38.5 %**	1	1	1	0	0	1	1	16 out of 16 SID/STAR completed for non-international runways
Hong Kong, China	**ROBUST**	Mr. Joe Lam, Evaluation Officer Email: jcclam@cad.gov.hk	BPEs: 8/2/0	<u>Completed</u>: RNAV10 routes-5. RNP4 routes-2. (L642 and M771 eff. 11 December 2014) The portion of	2	2	4	-	4	-	-	2 RNP AR APCHs for each runway at HKIA approximately 95% of aircraft movement is RNP 1 compliant (as of May 2015). Hong Kong is planning to phase out conventional procedure progressively from 2nd	-	-	1	1	1	-	-	Hong Kong implemented RNAV SID in 2005. RNP 1 SIDs and STARs procedures eff. January 2013 Total of 48 RNP-1 SID/STAR (34 SID and 14 STAR) published under AIP Sup A15/15 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	
				PBN routes L642 and M771 within Hong Kong FIR was changed from RNP 10 to RNP 4 eff.11 Dec 2014.								half of 2015 **Implementation (international): 100%** **<u>Note: To be added to the ICAO regional dashboard</u>** **Implementation (total): 100 %**								
India	**ROBUST** <u>Dec. 15:</u> Updated PBN Implementation Road map (Version 3) under preparation. Annexure 1, 2 & 3 sent in Dec.15	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	<u>Routes In progress</u>: RNAV 10 – 33 RNAV5 – 16 RNAV2: 2 Total number of ATS routes: 297	28	42	36	1	1	36	36	Dec. 15: 108 procedures are planned, including 26 for 2015-2016 (all are LNAV/VNAV and LNAV) Only 1 approach procedure implemented in India at Cochin International GLS trials at Chennai **Implementation (international): 1.85%** **Implementation (total): 0.93 %**	6	15	10	11	10	5	5	RNAV-1 SID and STAR at 11 Int aerodromes implemented and planned at 5 other airports in 2016 RNP-1 STAR implemented at 1 (Cochin) and planned at 2 (Calicut, Coimbatore)
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		RNV5 and RNP10 routes implementation has been completed.	43	156	163	12	19	0	11	All high density aerodromes have conventional precision approaches. In progress for other aerodromes for APV or LNAV. GAST D trials (GLS) at Ishigaki Airport	14	14	14	13	13	1	1	PBN Implementation Progress Report dated 01 May 2011. 25 Jan 2010
Kiribati			Pacific PBN workshop planned in 2016									Dec. 15: Pacific Aeronautical Charting and Procedures Project: Approach procedures planned for mid 2018								

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	
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. Koh Hanseung, #11, Doum-ro 6, Sejong Special Self-governing City, 339-012, Republic of Korea. Tel +82-44-201-4301, Email: koh119@korea.kr Republic of Korea	PBN BPEs: 10/0/0	RNAV5: 10 completed, 4 in progress, RNAV2: 2 in progress	15	35	50	34	27	16	21	Total 56 runway ends with 6 ends with no PBN planned 34 published: • 27 LNAV/VNAV and LNAV • 7 LNAV only 16 planned for 2016: • 12 LNAV/VNAV and LNAV • 2 LNAV only • 2 unknown **Implementation (international): 63%** **<u>Note: update the ICAO regional dashboard</u> (shows 70.83%)** **Implementation (total): 68%**	2	6	8	5	5	3	3	Missing SID/STAR for RKPK, RKNY and RKTN planned for 2016

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	
Lao PDR	**INCOMPLETE**	Sohnsacksit KHAMKEO Deputy director , Air navigation Division, Lao DCA Souphanouvong RD, Wattay International Airport Vientiane, Lao PDR P.O Box : 119, Tel : +(856) 21 512163 Fax : +(856) 21 520237 Mobile : +(856) 20 22499936 Email : saykhamkeo@gmail.com (Updated 29 Feb. 2016)	BPEs: 4/2/4	Plan to establish domestic RNAV5 parallel routes: • city-pair RNAV5 route between Vientiane-Luang Phabang • RNAV5 parallel route to R474 is planned to space the aircraft arriving and departing to and from Vientiane and Hanoi			6	2		2	1	**Implementation (international): 50%** Note: Update ICAO regional dashboard (shows 100%) **Implementation (total): 33%**								
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.	Macao has no En-route airspace.	1	2	2	1	1	0	-	Macau International Airport (VMMC) has implemented APV/Baro and LNAV only approach eff. 19 Sep. 13 (AMDT 01/13) RWY 34: LNAV/VNAV RWY 16: LNAV **Implementation: 100%** **Note: To be added to the ICAO regional dashboard**	0	1	0	1	1	-	-	AIC07/14 Macau International Airport has implemented Basic-RNP 1 SIDs and STARs.
Malaysia	**ROBUST**	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: 9/1/0		4	16	46	2	8 + 6 RNP AR	-	-	AIPSUPP 10/2014 LNAV 14R, 15, 32L, 33 **Implementation (international): 50%** Note: Update ICAO regional dashboard (shows 100%) **Implementation (total): 26.09%**	2	4	4	1	1	-	-	AIPSUPP 10/2014 SIDs and STARs into and out of KLIA are RNAV 1 and have been redesigned to permit a high hit rate for CDO. However, when independent parallel approaches are conducted, a levelling off segment has to be observed to establish a high and low sector for separation.
Maldives	**ROBUST**	Ms. Fathimath Ramiza Director Air Navigation and Aerodromes Civil Aviation Department Ministry of Civil Aviation and Communication	BPEs: 9/2/0	RNP 10 Implemented for 60% of routes. Work ongoing to implement on	2	14	20	2	2	8	4	Total number of instrument runway ends (international): 8 Total number of instrument runway ends	2	2	0	2	2	0	0	RNAV 1 (GNSS) SIDs and STARs published for Male International Airport since 2010.

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	
		PA Complex, Male' 20307, Maldives Tel: +960-334-2984 Fax: +960-332-3039 Email: ramiza@aviainfo.gov.mv		the remaining routes.								(domestic): 12 All procedures are planned to be completed in 2016 **Implementation (international): 50%** Note: Update ICAO regional dashboard (shows 100%) **Implementation (total): 50%**								
Marshall Islands																				
Micronesia, FS																				
Mongolia	**ROBUST**	Mr. Batchuluun GANGEREL Officer, Airspace management Department of Air Traffic Management Civil Aviation Authority Phone: 976 11 285026 (work) 976 99098555 (mobile) fax: 976 11 282111 mail: gangerel.b@mcaa.gov.mn website: www.mcaa.gov.mn ans.mcaa.gov.mn Mr. DORJSUREN NANZAD Manager of Air navigation services Department Civil Aviation Authority of Mongolia Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar-17120, Mongolia Tel: 976-11-285006 Fax: 976-11-282111 Mobile: 976-99113508 E-Mail: dorjsuren@mcaa.gov.mn	BPEs: 8/1/1	RNAV5: 3 routes published since 2013: • Y327 POLHO-SULOK • Y345 POLHO-UDA-SERNA • Y520 POLHO-SERNA	2	6	14	1	-	-	-	Total number of instrument runway ends (international): 2 Total number of instrument runway ends (domestic): 13 ZMUB RNP APCH RWY 14 implemented 15th November 2015 **Implementation (international): 50%** Note: Update ICAO regional dashboard (shows 100%) **Implementation (total): 6.7%**	1	5	-	-	1	1	-	SID ZMUB runway 32 published Oct. 15
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	-	4	-	5	Approach procedures with LNAV/VNAV have already been developed for Yangon, Mandalay and Nay Pyi Taw airports. Yangon International airport and Mandalay Airport: Baro-VNAV effective 28 May 2015. Baro-VNAV Planned: Nay Pyi Taw, Terchilark, Heho, Bagan and Thandwe	3 (by 2012)		1	1	1	-	-	1 int aerodrome (VYYY) in the RANP RNAV1 SIDs and STARs implemented Yangon International airport and Mandalay Airport effective 28 May 2015. Implementation @int aerodromes: 100% Domestic Planned: Nay Pyi Taw, Terchilark, Heho, Bagan and Thandwe

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	
Nauru			Pacific PBN workshop planned in 2016									Dec. 15: Pacific Aeronautical Charting and Procedures Project: Approach procedures planned for mid 2018								
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		Fabien DINCLAUX Civil Aviation New Caledonia BP H1 98840 NOUMEA CEDEX New Caledonia Ph: +687 26 52 87 Fax :+687 26 52 06 email : prefered group address (Airspace manager, Program Manager, AIS manager, Procedure design manager) **sna-nc-ais@aviation-civile.gouv.fr**	No plan																	
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

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	
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	16	10	5	6 (LNAV/VNAV or LNAV)		03 Mar 16: 06 Pakistani airports in the ICAO regional air navigation plan with 16 runway ends. RNP1 STARs and RNP APCH procedures have been implemented for 10 runway ends of 05 airports so far whereas efforts are being made to cover remaining 06 runway ends during 2016. Domestic: Pakistan has also implemented RNP APCH procedures at some medium and small airports to facilitate aircraft operators. As a total, RNP APCH procedures for 21 Runway ends are now available at 11 airports in Pakistan **Implementation (international): 62.5%** Note: Update ICAO regional dashboard (shows 60%) **Implementation (total): 53.1%**	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 RSO (Dec 2015): 6/3/2																	
Philippines	**ROBUST**	Mrs. Jessica Adeline D. Jamero, CAAP PBN Task Force Team Leader, Airspace and Flight Procedures Design Division, Civil Aviation Authority of the Philippines Email: jamerojessica@gmail.com	BPEs: 8/2/0	7 RNAV 10 routes planned for end 2016	-	-	30	2	14	0	14	Completion is planned for end 2016 Subic Bay RPLB not planned 16 int. runway ends, 6 implemented **Implementation**			6	2	2	4	4	Subic Bay RPLB not planned

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	
		Telefax: 63 (2) 8799260										**(international): 37.5%** Note: Update ICAO regional dashboard (shows 26.7%) 14 dom. Runways, 10 implemented **Implementation (total): 53.3%**								
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	Pacific PBN workshop planned in 2016									Dec. 15: Pacific Aeronautical Charting and Procedures Project: Approach procedures planned for mid 2018								
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: 9, RNAV5: 2 Restructuring of ATS Routes L504, M635 and M774, in the Southeast portion of Singapore FIR to allow RNP10/RNAV10 operations eff.9 Feb 2012 RNAV 5 City pair routes connecting Singapore - Kuala Lumpur and Singapore Jakarta implemented in 23 August 2012. City Pair RNAV 5 routes connecting Major Airports in South-East Asia (JKT-SIN-BKK) are planned to be implemented (2015)	-	2	6	-	4	-	2	Changi: LNAV/VNAV) approaches implemented for 02L/20R in 2005. Implementation for 02C/20C completed in August 2014. RNP AR planned for 2018 onwards Paya Lebar: RWY 02 and 20 LNAV/VNAV planned for end 2016 WSSL SELETAR: non instrument runways **Implementation (international): 66.6%**	-	1	2	1	1	1	-	Changi: 57 RNAV1 SIDs & STARs. AIP Supplement 110/15 2 STARs (LEBAR 2A and 2B) recently undergone trials was for Changi airport. Overall implementation: 50%
Solomon Islands			Pacific PBN workshop planned in 2016									Dec. 15: Pacific Aeronautical Charting and Procedures Project: Approach procedures planned for mid 2018								

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	
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.Chai KaewkitinarongEmail: psybuster@hotmail.com Mr.Kom Promsuttikul Email: kom.pr@aerothai.co.th	Thailand PBN Implementation Version 1.0 was approved by the National Working Group on PBN and GNSS in June 2009. Thailand PBN Implementation Plan was then submitted to ICAO PBN TF/5 Meeting in July 2009. The National Working Group is now revising Thailand PBN Implementation Plan and the new version is expected early 2013. No update to PBN plan received in Dec. 15	RNAV5: 13 published as of Dec.15, 13 planned for 2016 RNAV2: 0 published as of Dec.15, 2 planned for 2016 (Y1/Y2)	18	-	-	15	6	5	16	**Implementation (international): 57.14%** **Implementation (total): - %**	13			13	15	4	7	1. Lum Pang Airport – two RNP-1 SIDs were published in November 2012
Timor-Leste																				
Tonga	**ROBUST** BPEs: 8/2/1	Vili Cocker Director of Civil Aviation P.O.Box 845, Nuku'alofa Tonga Tino Fuka Tonga Airports Limited P.O.Box 876, Nuku'alofa Tonga, Tino Malo. Chief Operations Officer Tonga Airports Limited P +676 7767264 F +676 35211 E tfuka@tongaairports.com	Pacific PBN workshop planned in 2016																	
Vanuatu			Pacific PBN workshop planned in 2016									Pacific Aeronautical Charting and Procedures Project: 9 approaches planned to be completed end 2016: Tanna / Whitegrass								

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	
												NVVW new RNAV GNSS approach RWY's 15/33 Santo / Pekoa NVSS RNAV GNSS RWY 12, new RNAV GNSS RWY 30 Norsup NVSP New RNAV GNSS RWY 13 Lonorore NVSO New RNAV GNSS A 'circling' approach aligned towards RWY 15 Craig Cove NVSF New RNAV GNSS RWY 11 Longana NVSG New RNAV GNSS A, one-way aerodrome Mota Lava NVSA New RNAV GNSS RWY 13 Sola NVSC New RNAV GNSS RWY 15 Futuna NVVF New RNAV GNSS RWY 14								
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, Mariana, Palmyra, Wake Islands)		Ahmad Usmani Asia-Pacific Manager FAA, Air Traffic Organization ATO International (202) 267-0913					12	12	-	0	-	Mariana: 6 LNAV Midway: 2 LNAV Guam: 6L, 6R, 24L, 24R 4 LNAV + 4 RNP/AR Johnston, Palmyra and Kingman, are respectively, a closed airport, an unpaved airstrip, and an old flying boat lagoon **Implementation (international): 100%**								

Progress based on State PBN implementation progress reports

	International					Domestic					Overall				
	Target	**Imple-mented**	**Planned before end 2016**	**Achieved as of Mar. 2016**	**Planned before end 2016**	**Target**	**Imple-mented**	**Planned before end 2016**	**Achieved as of Mar. 2016**	**Planned progress end 2016**	**Target**	**Imple-mented**	**Planned before end 2016**	**Achieved as of Mar. 2016**	**Planned before end 2016**
China, Hong Kong	4	8	0	100.00%	100.00%	0	0	0	0.00%	0.00%	4	8	0	100.00%	100.00%
China, Macao	2	2	0	100.00%	100.00%	0	0	0	0.00%	0.00%	2	2	0	100.00%	100.00%
French Polynesia	2	2	0	100.00%	100.00%	50	18	8	36.00%	52.00%	52	20	8	38.46%	53.85%
Fiji	6	4	2	66.7 %	100%	14	2	2	14.3%	28.5%	20	6	4	30%	50%
India	54	1	22	1.85%	40.74%	106	0	14	0.00%	13.21%	160	1	36	0.63%	22.5%
Lao PDR	2	1	1	50%	100%	4	1	2	25%	75%	6	2	5	33.33%	83.33%
Malaysia	16	10	4	62.5%	87.50%	30	2	4	6.67%	20%	46	12	8	26.09%	43.48%
Maldives	8	4	2	50.00%	100.00%	12	6	6	50%	100%	20	10	10	50%	100%
Mongolia	2	1	0	50%	50%	13	0	0	0.00%	0%	14	1	0	6.7%	6.7%
Pakistan	16	10	6	62.5%	100%	14	7	7	50%	100%	30	17	13	56.7%	100%
Philippines	16	10	6	62.5%	100%	14	12	1	85.7%	92.8%	30	22	7	73.33%	93.66%
Republic of Korea	27	17	8	62.96%	92.59%	23	17	6	73.91%	100.00%	50	34	14	68.00%	96.00%
Singapore	6	4	2	66.67%	100.00%	-	-	-	-	-	6	4	2	66.67%	100.00%
Thailand	27	14	13	51.85%	100.00%	42	16	23	38.10%	92.86%	69	30	36	42.86%	95.65%
US territories[1]	12	12	-	100.00%	-	-	-	-	-	-	12	12	-	100.00%	-

1) RNP APCH Implementation Status (against the number of runway ends) – Seamless ATM item 110

[1] Guam, Mariana, Midway

2) PBN Arrivals and Departures (Seamless ATM item 120)

	Nb of aerodromes implemented		Nb of aerodromes in progress	
	ARR	**DEP**	**ARR**	**DEP**
China, Hong Kong	1	1	0	0
China, Macao	1	1	0	0
Fiji				
French Polynesia	3	3	0	1
India	11	10	10	10
Lao PDR	8	11	6	6
Malaysia	2	2	3	3
Maldives	1	1	-	-
Mongolia	0	0	1	1
Pakistan	0	0	several	several
Philippines	9	9	7	6
Republic of Korea	12	12	5	5
Singapore		1	0	0
Thailand	2	4	5	6
US territories	Not specified	Not specified	Not specified	Not specified

3) PBN ATS Routes (Seamless ATM item 140)

	Implemented	**progress**	**% of ATS routes designated PBN Seamless ATM Phase 1**	**% of ATS routes designated PBN Seamless ATM Phase 2**
China, Hong Kong	2	Not specified	100%	0%
China, Macao	0	Not specified	Not applicable	Not applicable
Fiji				
French Polynesia	2	0	80%	100%
India	70	-	100%	-
Lao PDR	-	-	No seamless ATM report	No seamless ATM report
Malaysia	16	-	40%	100%
Maldives	9	Not specified	60%	100%
Mongolia	3	Not specified	0%	0%
Pakistan	16	4	No seamless ATM report	No seamless ATM report
Philippines	0	7	30%	0%
Republic of Korea	7	3	70%	Not specified
Singapore	1	Not specified	0%	0%
Thailand	15	13	20%	0%
US territories			100%	Not specified

Note: objectives of the Seamless ATM plan v1 for phase 1 and phase 2:

- *Phase 1 (Nov. 15)*

- *Category R airspace – RNP 4, RNP 10 (RNAV 10) (other acceptable navigation specifications – RNP 2 oceanic);*
- *Category S airspace –RNAV 2 or RNP 2 (other acceptable navigation specifications – RNAV 5).*

- *Phase 2 (Nov. 19)[1]: Category R and S airspace – RNP 2/RNAV2[2]*

4) CCO – CDO (Seamless ATM items 90 and 100)

	Nb of aerodromes Implemented	**Progress**	**% of International aerodromes implemented (Seamless ATM report)**
China, Hong Kong	CDO: 1 airport	-	0% CCO 100% CDO
China, Macao	Not Applicable	-	Not Applicable
Fiji			
French Polynesia	Not implemented	Not implemented	Not Applicable
India	CCO: 10 CDO: 11	CCO:10 CDO:10	100% CCO 100% CDO
Lao PDR	-	-	No seamless ATM report
Malaysia	Not implemented	Not implemented	100% CCO 100% CDO
Maldives	-	-	100% CCO 100% CDO
Mongolia	Not specified	Not specified	10% CCO 10% CDO
Pakistan	-	planning phase for CDO/CCO at major airports	No seamless ATM report
Philippines	Not implemented	Not implemented	50% CCO 50% CDO
Republic of Korea	CCO: 0 CDO :1	Most of RNAV1 SIDs/STARs in ROK were developed on the bases of CCO/CDO concepts for the efficient operations	0% CCO 30% CDO
Singapore	CCO: 0 CDO: 1	-	0% CCO 100% CDO
Thailand	CCO: 0 CDO: 3	-	20% CCO 20% CDO
US territories (Guam, Mariana, Midway)	Not specified	Not specified	Not Applicable

[1] Nov. 19 is the target date for phase 2 proposed in the draft Seamless ATM plan v2. Current approved date in Seamless plan v1 is Nov. 18

[2] RNP 2/RNAV2 is the proposed specification in the draft Seamless ATM plan v2. Current approved specification in Seamless plan v1for phase 2 is RNP 2 only

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Statement of Work **Task** Optimizing the APAC Enroute PBN network **Task Manager: To be defined**

Project: PBNICG	
Revision number: 1	**Approved:** Click here to enter a date.

Objective and scope of the task

Background: ICAO Assembly Resolution A37-11 urges all States to implement RNAV and RNP air traffic services (ATS) routes in accordance with the ICAO Performance-based Navigation (PBN) Manual (Doc 9613). PBN Implementation is the highest priority in the implementation of ICAO Global Air navigation Plan and APAC Region. PBN is a major enabler of air navigation development in Aviation System Block Upgrade (ASBU). Currently several sub-regional en-route PBN implementation cooperation groups are working in Asia and Pacific Region.

Objectives: To achieve the APAC Seamless ATM plan expectations regarding PBN routes, the objectives of the task Optimizing the APAC Enroute PBN network are to assist the informal sub regional groups to realign existing routes and develop new PBN routes based on the available CNS infrastructure and possible PBN navigation specifications to improve efficiency and capacity of APAC airspace.

Deliverables

1) Assist informal sub regional groups in preparing/identifying opportunities of optimization
    a) Review of traffic flows among entry/exit points and city pairs, existing and planned CNS infrastructure and the status of PBN approved aircraft and fleet readiness by sub-region;
    b) Proposal of appropriate PBN navigation specifications by sub-region;
    c) Review of proposals from sub-regions and selection of opportunities with the highest benefits (efficiency – capacity – environment)
    d) Proposal of realigned and new optimized ATS routes including PBN parallel routes and associated implementation work plan;
2) Assist informal sub regional groups with implementation
    a) Adopt suitable longitudinal separation minima for each route, in line with the Seamless ATM plan;
    b) Review the current flight level allocation scheme and recommend it as appropriate;
    c) Review the current definition of area control center (ACC) sectors and make recommendations as necessary;
    d) Review Letter of Agreement between ACCs and make recommendations as necessary;

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e) Implement the new route structure, whilst taking into account the need for harmonization with adjacent airspaces and inter-regional airspaces;

f) Conduct pre implementation safety assessment in cooperation with an appropriate Monitoring Agency in the region;

3) Report through the Task Lead to about progress, issues and benefits (safety/efficiency/capacity) realized;

4) Coordinate the work of the different sub-regional groups:

- BIMT (Bangladesh, India, Myanmar, Thailand),
- Mekhong Delta (Myanmar, Thailand, Laos PDR, Cambodia, Vietnam); and
- South China Sea Major Traffic Flow Review Group (SCS-MTFRG) (China, Hong Kong China, Malaysia, Philippines, Singapore, Vietnam).
- Myanmar-Bangladesh-Nepal-India-Bhutan-Pakistan (Himalaya routes)
- Maldives-Sri Lanka-India
- China-Mongolia-Russia

And optionally, if needed:

- Singapore-Malaysia-Thailand; and
- Indonesia-Singapore-Malaysia.

5) Explore possibilities for further enhancements to operational efficiency of route structures through the implementation of CDM/ATFM and FUA

Milestones

Indicate here the main milestones of the task or give a reference to a planning (Gantt chart etc)

- **T0:** adoption of SOW
- **T0+12 months:** Preparation/identification of opportunities completed and approved by PBNICG
- **T0+36 months:** Implementation of optimized route network completed
- **T0+36 months:** possibilities for further enhancements identified

Dependencies

Dependencies with projects supervised by different SG (will be controlled by APANPIRG):

- Coordination needed with ATM/SG for route network and Civil/military cooperation in China

Dependencies with projects supervised by the SG (will be controlled by SG):

- None

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Dependencies between tasks in the project (will be controlled by PBNICG):

- None

Task participants

- BIMT (Bangladesh, India, Myanmar, Thailand),

State/Organization	Name	Role/Responsibility	Email	Phone

- Mekhong Delta (Myanmar, Thailand, Laos PDR, Cambodia, Vietnam);

State/Organization	Name	Role/Responsibility	Email	Phone

- South China Sea Major Traffic Flow Review Group (SCS-MTFRG) (China, Hong Kong China, Malaysia, Philippines, Singapore, Vietnam).

State/Organization	Name	Role/Responsibility	Email	Phone

- Myanmar-Bangladesh-Nepal-India-Bhutan-Pakistan (Himalaya routes)

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State/Organization	Name	Role/Responsibility	Email	Phone

- Maldives-Sri Lanka-India

State/Organization	Name	Role/Responsibility	Email	Phone

- China-Mongolia-Russia

State/Organization	Name	Role/Responsibility	Email	Phone

- Singapore-Malaysia-Thailand

State/Organization	Name	Role/Responsibility	Email	Phone

ICAO BANGKOK

- Indonesia-Singapore-Malaysia.

State/Organization	Name	Role/Responsibility	Email	Phone

Working arrangements

☒ Face to face meetings

☒ Webconferences

☒ Needs an ICAO secured portal, name: Click here to enter text.

☐ Other: Click here to enter text.

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Action Item	Action	Owner	Contributors	Target date	Status	Result	Comment	Reference to TOR
3/1	ICAO Regional Office (RO) to investigate how training in PBN procedure charting and ATC training in PBN procedures can be addressed.	Frederic Lecat	APAC RSO	Before APAC FPP SCM8 (Nov or Dec 2016)	Open		ICG3-IP02	1-b
3/2	States to cross check reporting information between Seamless POC and PBN POC and take action on implementation gaps identified through the Regional Picture and the regional performance dashboard.	All		31-Dec-16	Open		ICG3-WP02	1-d
3/3	ICAO Regional Office (RO) to amend the para 7.19 of the draft Seamless ATM plan and consider inclusion of PBCS.	Frederic Lecat		30-Jun-16	Open		ICG3-IP03	3
3/4	(follow-up to ICAO State Letter, AP052-15): For those States/Administrations which did not submit their PBN implementation plan, submit it using the proposed new template and for those States/Administrations which update their existing one, choose either to update their current one or to use the proposed template.	Frederic Lecat	APAC RSO	31-Dec-16	Open		ICG3-IP05	1-a, b
3/5	ICAO RO to convey the reviewed tables of contents (Appendices D and E) to the ISTF	Frederic Lecat		31-May-16	Open		ICG3-WP04	2
3/6	ICAO to update the PBN related indicators of the APAC Regional Performance Dashboard to reflect the progress reported as per Appendix G	Frederic Lecat	APAC RSO	Before PBNICG/4	Open		ICG3-Summary of Agenda 5 b)	1-d
3/7	ICAO RSO to provide Indonesia with assistance in comparing the different possible designs including a Guided Visual Approach	Huho Ha		17-Jun-16	Open		ICG3-WP09	1-b
3/8	ICAO RO to circulate the draft Statement of Work Optimizing the APAC Enroute PBN network (Appendix H) to SAIOACG SEACG chairs and coordinate with the ATM/SG and CNS/SG for the most efficient option regarding the coordination of the task	Frederic Lecat		31-May-16	Open		ICG3-WP08	1-c, 4
3/9	Chairperson to coordinate the preparation of the workshop (Objectives/presentation)	Ian Mallett	Frederic Lecat	Before PBNICG/4	Open		ICG3-Agenda 13	1-b
C3/1	**Draft Conclusion 3/1 - Asia and Pacific Flight Procedure Programme (APAC FPP)** Considering the benefits derived from APAC FPP support, That, any State not participating in the Asia and Pacific Flight Procedure Programme (APAC FPP) consider joining the programme and if so, coordinate with the ICAO Regional Office.						ICG3-WP07	1-b
C3/2	**Draft Conclusion PBNICG 3/2 - RNP 2 Implementation Guidance** That, for the implementation of RNP 2, States should ensure that: a) all aircraft operators file the designator 'Z' in item 10 and 'NAV/RNP 2' in item 18 to indicate RNP 2 capability until the ICAO flight plan is updated to include RNP 2; and b) an equivalence for RNP 2 is recognised if the aircraft is approved for RNAV 2, RNP 1 and GNSS.						ICG3-SP04	1-c
D3/1	**Draft Decision 3/1 - Updated Terms of Reference for PBNICG** That, as a follow-up to Decision APANPIRG/26/66 regarding the Review of Terms of Reference of Contributory Bodies under the APANPIRG Sub Groups, the updated PBNICG TOR as per Attachment C be adopted.						ICG3-WP06	

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

Bangkok, Thailand, 08 – 10 March 2016

Attachment 1 to the Report

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International Civil Aviation Organization

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

Bangkok, Thailand, 8 – 10 March 2016

LIST OF WORKING/INFORMATION PAPERS, PRESENTATIONS AND FLIMSY

WP/IP/ SP No.	Agenda	Subject	Presented by
		WORKING PAPERS	
WP/1		Provisional Agenda	Secretariat
WP/2	3	Update on the Seamless ATM Reporting Process and Regional Picture	Secretariat
WP/3	12	Review of PBNICG Action Items	Secretariat
WP/4	4	ISTF/6 Outcomes	Secretariat
WP/5	5 (a, b)	Review of the PBN Implementation Progress in APAC	Secretariat
WP/6	4	Review of the Terms Of Reference of PBNICG as a contribution to APANPIRG Reorganization	Secretariat
WP/7	2	APAC Flight Procedure Programme (FPP) Strategy Forward	Secretariat
WP/8	9, 11	APAC Enroute PBN Network Optimization	Secretariat
WP/9	10	Implementing PBN for Remote and Mountainous Area Airport	Indonesia
		INFORMATION PAPERS	
IP/1	-	Meeting Bulletin	Secretariat
IP/2	2	Global PBN Update	Secretariat
IP/3	3	Asia/Pacific Seamless ATM Plan Review 2016	Secretariat
IP/4	4	Regional APANPIRG/26 and Global NSP/2 Outcomes	Secretariat

WP/IP/ SP No.	Agenda	Subject	Presented by
IP/5	3	Updated Template for PBN Plan	Secretariat
IP/6	5	Update on Indonesia PBN Implementation	Indonesia
IP/7	10	ICAO PBN Study Group Papers	Australia
IP/8	5	PBN Implementation in the Maldives	Maldives
IP/9	5 (b)	Update on Lao PDR PBN Implementation	Lao PDR
IP/10	5 (b)	Thailand PBN Implementation Progress	Thailand
IP/11	5 (b)	PBN Implementation in Pakistan	Pakistan
IP/12	5 (b)	PBN Implementation in Singapore	Singapore
IP/13	5 (b)	Update on Hong Kong, China Implementation	Hong Kong, China
IP/14	10	Indonesia PBN Implementation as Efficiency/Environmental Measure and Stakeholders Involvement	Indonesia
IP/15	5	PBN Implementation in Fiji	Fiji
IP/16	9	PBN Highways	Secretariat
IP/17	5 (b)	PBN Implementation Process in Mongolia	Mongolia
IP/18	5 (b)	PBN Implementation Status of Viet Nam	Viet Nam
		PRESENTATIONS	
SP/1		Action 2/13 – Progress Report	IATA and Secretariat
SP/2		Progress of ICAO Actions as of 02 March 2016	Secretariat
SP/3		Practical PBN Implementation from an ATM Perspective	Secretariat
SP/4		Australian CNS/ATM Transition	Australia
SP/5		PBN Status and Deployment	New Zealand

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