



**INTERNATIONAL CIVIL AVIATION ORGANIZATION  
ASIA AND PACIFIC OFFICE**

**REPORT OF**

**SECOND MEETING OF THE PERFORMANCE BASED NAVIGATION  
IMPLEMENTATION COORDINATION GROUP (PBNICG/2)**

Bangkok, Thailand

(11-12 June 2015)

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## **PART I – HISTORY OF THE MEETING**

### **1. Introduction**

1.1 The Second Meeting of Performance Based Navigation Implementation Coordination Group (PBNICG/2) was held at the ICAO Asia-Pacific Regional Office, Bangkok, Thailand, 11-12 June 2015.

### **2. Attendance**

2.1 The meeting was attended by 54 participants from 18 States/Administrations and 2 International Organizations.

2.2 The participants were PBN experts from States. The relevant presentations and documents are available at <http://www.icao.int/APAC/Meetings/Pages/2015-PBNICG2.aspx>. The list of participants is contained in **Attachment 1**.

### **3. Opening of the Meeting**

3.1 The Chairman opened the meeting and complimented the results of the ICAO Regional Seminar which was held from 8 to 10 June 15. He also welcomed the participants of the meeting.

### **4. Officers and Secretariat**

4.1 The meeting was chaired by Mr. Ian Mallett from Civil Aviation Safety Authority (CASA), Australia. Mr. Noppadol Pringvanich, Chief of ICAO APAC RSO and Mr. Frederic Lecat, Regional Officer CNS acted as secretaries and were assisted by Mr. Ha Huho, Regional Officer ATM (AOM-PBN), Joe Lam, TMA Rapporteur and IlaitiaTabakaucoro, En-route Rapporteur. Mr. Erwin Lassooy, ICAO PBN Programme Manager, provided the meeting with updates on the global policies and standards, and PBN expertise.

### **5. Working Arrangements, Language and Documentation**

5.1 The working language of the meeting was English inclusive of all documentation and this Report. There were 10 Working Papers (WP), 4 Information Papers (IP), 2 Presentations and 1 Flimsy considered by the meeting. The lists of Working/ Information Papers and Presentations are provided at **Attachment 2**.

5.2 Before the meeting, an ICAO Regional PBN Seminar on “Expanding PBN and Facing the Challenges in the Asia and Pacific Regions” took place at the same venue for three days. 102 participants from 22 States including a Special Administration, 5 International Organizations and 6 Industries attended. Presentations and keynotes of the Seminar can be found at <http://www.icao.int/APAC/Meetings/Pages/2015-PBN.aspx>.

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**Agenda Item 1 – Adoption of agenda**

- 1.1 The provisional agenda (WP01) 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
  - 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: Other Business
  - Agenda Item 13: Review of Report and Action List
- 1.2 The meeting agreed that this agenda would now be a standing agenda for PBNICG.

**Agenda Item 2: Global and Regional PBN Updates****IP/01 - INFORMATION ON ICAO SARPS AND PANS AMENDMENT AS RELATED TO PBN, AOM AND FPD (SECRETARIAT)**

2.1 The Secretariat provided information concerning ICAO's SARPs and PANS amendments which were expected to be applicable from November 2014 to November 2016 to form a common perspective on the timeframe of current development of SARPs and PANS related to PBN, Airspace Organization and Management and Flight Procedure Design.

2.2 The ICAO PBN Programme Manager elaborated on the contents of the recently amended PANS-OPS criteria including the new navigation specification design criteria, procedure design criteria for helicopters and new charting criteria. He also introduced the upcoming PBN related criteria such as RNAV/RNP to xLS, and emphasized the future addition of Protocol questions concerning PBN in the USOAP/CMA process, as well as complex PBN operation, new phraseologies, upcoming manual updates, and use of PBN *i*-Kit. The PBN *i*-Kit can be accessed at [www.icao.int/pbn](http://www.icao.int/pbn).

**Agenda Item 3: Review of related global/regional plans, priorities and targets****IP/02 - UPDATES ON PBN IMPLEMENTATION IN CHINA (CHINA)**

3.1 China provided information on the progress of PBN implementation following the PBN Implementation Roadmap of China. China reported that in terminal area, 145 airports out of 202 airports (around 71%) had PBN procedures including RNP APCH and RNP AR approaches. Among them, 66 airports had fully implemented PBN procedures. CAAC was planning to accomplish PBN implementation by 85% of airports with PBN procedures and at least 50% of airports with fully implemented PBN procedures by the end of this year.

3.2 China reported that in terms of en-route airspace, 61 routes, 15 RNAV 2, 4 RNAV 5, 39 RNP 4 and 3 RNP 10, were designated as PBN routes, accounting for 20% of total mileage of ATS route in China by the end of May 2015. Among them, 47 ATS routes with the same route designators were permitted mixed navigational operations in order to get operational approval from CAAC and help flight crews and ATC getting familiar with en-route PBN practices.

#### **Agenda Item 4: Reports on relevant meetings outcomes**

##### **IP/03 - PROGRESS REPORT ABOUT APANPIRG IONOSPHERIC STUDY TASK FORCE (SECRETARIAT)**

4.1 The Secretariat presented the outcomes of the Fifth Meeting of Ionospheric Studies Task Force (ISTF/5) which was held in Japan from 16 to 18 February 2015. The key question ISTF had to respond to was to confirm whether ionospheric threat models were needed in the APAC region. In this regard, ISTF/5 developed a draft decision for adoption by APANPIRG. The meeting was informed about the draft decision to be discussed in the upcoming CNS SG/19 in July 15, confirming the need for a GBAS threat model in the APAC region, and for guidance to establish a SBAS iono safety case model. The meeting was also informed of ISTF's way forward for developing iono models for GBAS and SBAS.

4.2 The meeting was referred to the update on ionospheric studies by ISTF Chairman who delivered a presentation in the ICAO Regional PBN Seminar. The presentation can be found at <http://www.icao.int/APAC/Meetings/2015PBN/3-12%20Update%20on%20ionospheric%20studies%20-%20Japan.pdf>.

#### **Agenda Item 5: States' PBN Implementation Progress**

##### **IP/04 - UPDATE ON HONG KONG, CHINA PBN IMPLEMENTATION (HONG KONG, CHINA)**

5.1 Hong Kong, China provided information on the latest progress of PBN implementation, mentioning all the Short Term and most of the Medium Term projects had been completed as planned in its PBN Implementation Plan. However, it explained a couple of barriers to the application of Advanced RNP (ARNP) such as mandatory Radius to Fix (RF) functionality requirement, insufficient guidance material for implementation of ARNP procedures and small ratio of RF capable aircraft, approximately 25% of flights as of May 2015.

5.2 For congested and saturated terminal airspaces like Hong Kong where mixed navigation specification operations (e.g. in ILS plus RNP AR) were not beneficial, Hong Kong China suggested a harmonized implementation.

5.3 Regarding the RF capability issues, ICAO PBN Programme Manager mentioned that there was the possibility that aircraft be RF capable while not being approved for the use of RF functionality. However, Hong Kong mentioned that it conducted the survey in cooperation with IATA in 2013 and some European airlines did not consider to get an approval on RF until 2018. The EASA planning concerning RF approval material would need to be known, and coordinated.

5.4 As a consequence, the meeting agreed on the following action item:

**Action 2/1 ICAO to coordinate with EASA on their PBN roadmap, with a particular focus on RF.**

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**WP/04 - PROPOSAL FOR PBN IMPLEMENTATION PROGRESS REPORTING FORM (SECRETARIAT)**

5.5 The Secretariat presented a paper regarding PBN Implementation Progress Report Form which aimed at meeting global and regional PBN implementation reporting requirements. Two options were proposed: option A consisted in the collection of high level indicators, while option B proposed a more detailed data collection down to the types of procedures per runway end (see **Appendix B**).

5.6 In option A the level of data collection was thought in accordance with the principles of the seamless ATM reporting scheme, as a balance between the workload for States and the need to report to allow APANPIRG to steer the changes to the ANS system in APAC Region. With this option, there was no overlap with the existing iSTARS collection scheme based on third party data. Option B main advantage was that it could help solve some inconsistencies between iSTARS and States reporting. However the burden for States with option was felt to be too high, and partly to be a duplication of the existing iSTARS collection scheme.

5.7 It was also discussed that option B was indeed a way to compute the metrics for option A. The meeting also agreed that using an offline mechanism for States/Administrations to report would constitute a step backwards. As a result the meeting agreed to retain option A as mandatory and integrate it as soon as possible in the Seamless ATM reporting scheme. For those States/Administrations needing assistance in tracking their detailed progress, ICAO RSO proposed to assist them with a separate engine. Therefore, the meeting agreed to the following action item:

**Action 2/2 ICAO RO to plan the integration of option A in the Seamless ATM reporting scheme.**

**Action 2/3 ICAO RSO to assess the feasibility of an engine for assisting desirous States with computing their metrics as per option B.**

**Agenda Item 6: Report of Progress from PBNICG Tasks****WP/ 07 - REVIEW OF PBNICG ACTION ITEMS (SECRETARIAT)**

6.1 The meeting reviewed the list of action items made by PBNICG/1 and agreed on the updated list as per **Appendix A**.

**Agenda Item 7: Implementations of PBN in Terminal Area**

7.1 *No papers presented*

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

8.1 *No papers presented*

**Agenda Item 9: Regional and Sub-regional Implementations of PBN in En-route Airspace****WP/10 - PBN CITY PAIR MALE-COLOMBO (MALDIVES)**

9.1 Maldives presented a PBN unidirectional parallel route concept between Male (VRMM) and Colombo (VCBI) to improve safety and efficiency and reduce the workload of controllers on M512, which was used bi-directionally. RNP 1 navigation specifications with minimum 7NM lateral spacing between routes was considered and if not feasible, RNP 2 would be an alternative.

9.2 ICAO PBN Programme Manager commented that either navigation specification would be applicable between cross-border city pairs. The meeting was informed that RNP2 operational approval guidance material was available as unedited version. IATA added that RNP 2 would be preferred as it was adopted as en-route navigation specifications in the APAC Regional Seamless ATM Plan.

9.3 ICAO agreed to facilitate the coordination between the stakeholders on the proposed concept. In this regard, the meeting agreed on the following action item:

**Action 2/4 ICAO APAC RSO to coordinate with the stakeholders in Sri Lanka and facilitate a possible discussion on the PBN parallel route concept between Male (VRMM) and Colombo (VCBI).**

**FLIMSY 01 - EXAMPLE OF SUB-REGIONAL COORDINATION ON PBN ROUTE ENHANCEMENT (SECRETARIAT)**

9.4 The meeting was informed that a few sub-regional groups, including BIMT (Bangladesh, India, Myanmar, Thailand) and Mekhong (Myanmar, Thailand, Laos PDR, Cambodia, Vietnam), were now working on sub-regional route enhancements. More sub-regional groups were envisaged, and concerned States/Administrations were invited to start discussions. Example outcome of sub-regional coordination on PBN route enhancement through a design session process was provided. Example Terms of Reference of the Sub-regional group and standing agenda may also be found in Attachment B of Flimsy 01.

**Agenda Item 10: Issues and challenges regarding PBN implementations****WP/02 - PBN IN A PAGE (SECRETARIAT)**

10.1 In relation to the Action Item 1/17 of PBNICG/1, the Secretariat presented an enhanced “PBN-in-a-page” table which reflected the inputs from the meeting such as the inclusion of database requirement for each navigation specifications and separation of COM/SUR/NAV requirement (see **Appendix C**).

10.2 The meeting provided various comments regarding the contents of the table. Among them, it was noted that route spacing in the table included criteria other than ICAO criteria. Also U.S.A recommended to include references for criteria in each cell. ICAO HQ proposed to review the content.

**Action 2/5 ICAO to provide the PBN-in-a-page to the relevant Panels and Study Groups for the review and provide related guidance on route spacing.**

10.3 The review would be conducted before the CNS SG/19 in July 2015. As a result, the meeting agreed the following draft decision action item:

**Draft Decision 2/1 - PBN in a page**

That, the PBN-in-a-page document be adopted as regional supporting material and be published on the ICAO RO website after the review by relevant Panels and Study Group as well as ICAO.

**WP/03 - PBN PROCEDURE SAFETY ASSESSMENT CHECKLISTS AND UTILIZATION (SECRETARIAT)**

10.4 In relation to the Action Item 1/22 of PBNICG/1, the Secretariat presented the updated checklists which would be used for the preparation of PBN procedure safety assessment. The checklists consisted of three parts, RNP Approach, SID/STAR and ATS Route that could be used when identifying hazards in the procedures (see **Appendix D**). The paper also proposed to use a form to record the safety assessment process, which included the summary of hazard identification, analysis and mitigation.

10.5 U.S.A recommended to build safety cases in PBN development in order to use them where there was no full SMS. ICAO PBN Programme Manager would coordinate with Instrument Flight Procedure Panel (IFPP) and Safety Management Panel (SMP) on the proposed checklists to include them in the Quality Assessment process. He also advised the meeting that the proposed checklists could be used as an interim guidance material for this region. The meeting was also referred to the presentation made in the seminar on the matter: <http://www.icao.int/APAC/Meetings/2015PBN/3-1b%20PBN%20Safety%20assessment%20-%20ICAO%20-%20final.pptx>.

10.6 As a result, the meeting adopted the following draft decision:

**Draft Decision 2/2 - PBN Procedure Safety Assessment Checklists and Record of Hazard Template**

That,

1. The PBN Procedure Safety Assessment Checklists and Record of Hazard Template be adopted as regional supporting material; and
2. The checklists and template be published on the ICAO RO website.

**WP/05 - NEW PBN NAVIGATION SPECIFICATIONS (NAVSPECS) IMPLEMENTATION ISSUES (HONG KONG, CHINA)**

10.7 Hong Kong, China presented the issues related to the implementation of new navigation specifications (RNP 2, ARNP and RNP 0.3) introduced by the latest edition (4<sup>th</sup>) of ICAO Doc 9613, PBN Manual with effective from 13 November 2014. One of the issues was insufficient guidance materials to support the implementation of new navigation specifications because States would not be able to achieve the timeline recommended by ICAO or Asia/ Pacific Seamless ATM Plan without them.

10.8 The other concern was insufficient information on the fleet capability, which was an important factor for States to determine appropriate navigation specifications and implementation timeline. As it was difficult for States to collect such data, especially for overflights, there would be a benefit to collect reliable data on PBN fleet readiness in the APAC Region over a sliding 5 years forecast period. ICAO PBN Programme Manager advised the meeting that this issue was currently considered by ICAO PBN related Panels and Study Groups.



10.9 In this regard, the meeting drafted the following action item:

**Action 2/6 IATA to provide the estimated population and the forecast growth for every 5 years period of all new navigation specifications.**

**Action 2/7 States, through ICAO HQ, to prepare a paper to PBN study group specifying needs and operational requirements for establishing new or updating PBN Nav Spec and PBN Manual to support 0.3 NM outside final approach segment.**

**Action 2/8 ICAO to provide chart specimen for ARNP in TMA and Approach.**

**PRESENTATION/01 - ATS ROUTE AND WAYPOINT IMPLEMENTATION**  
**(SECRETARIAT)**

10.10 The Secretariat presented the promulgation process for ATS routes and waypoints. The key elements of presentation concerned the agreement between administrations on ATS route implementation, implementation planning considering various stages of decision and circulation, coordination with Regional Office on ATS route designator and waypoint name, amendment of APAC Region Basic Air Navigation Plan and promulgation of new information in Sate Aeronautical Information Publication (AIP).

10.11 It was clarified that to include a new ATS route between two States into the regional route structure a proposal for amendment process of Regional Air Navigation Plan was necessary.

**WP/ 08 - APAC SEAMLESS ATM PLAN UPDATE (SECRETARIAT)**

10.12 The Secretariat presented the need for updating PBN related information in the APAC Seamless ATM Plan. Considering the review cycle of the plan, the paper proposed the meeting to form a small group to review the targets, metrics, implementation status and the related documents in the plan and draft a work plan with dates for deliverable and present the review report to the CNS SG/20 of the APANPIRG in 2016.

10.13 The meeting reviewed the paper and agreed to form a small group to review PBN related elements in the APAC Region Seamless ATM Plan. The small group would be composed of Terminal and En-route Rapporteurs, IATA, ICAO Secretariat and volunteers from States. In this regard, the meeting adopted the following action item:

**Action 2/9 The small group to propose amendments regarding PBN related elements to the Seamless ATM plan targets and Seamless ATM implementation guidance on the targets and guidance material.**

**WP/09 - OUTCOMES OF THE ICAO REGIONAL PBN SEMINAR (SECRETARIAT)**

10.14 The meeting reviewed the outcomes of the ICAO Regional Performance-based Navigation (PBN) Seminar. The seminar addressed multiple aspects of PBN including the implementation of PBN, optimizing the airspace, regulatory and oversight perspective about PBN, PBN implementation support and facing the regional challenges in the Asia and Pacific region. 23 key points identified by the participants of the Seminar were reviewed by the meeting as per **Appendix E**.

**Action 2/10 ICAO HQ to share the key points of the Seminar to appropriate SGs and Panels**

- 10.15 The meeting reviewed the key points and agreed on the follow-up:
- In reviewing key point 1, the following action item was agreed:
- Action 2/11 ICAO to deliver PBN Operational Approval training material for new PBN navigation specifications RNP 2 and Advanced RNP, by September 2015 and training delivery by Dec 2015 .**
- In reviewing key point 7, the following action item was agreed:
- Action 2/12 ICAO to consider conducting the education conference in conjunction with PBNICG/4.**
- In reviewing key point 9, the following action item was agreed:
- Action 2/13 Note that the IATA course is currently available. ICAO to consider conduct the training in conjunction with future DGCA conference.**
- In reviewing key point 15, it was noted that States were invited to consider services and trainings available from ICAO Global PBN Programmes and the following action item was agreed:
- Action 2/14 Noppadol and Erwin to inform the FPP SC so that they include this into future procedure design training provisions.**
- In reviewing key point 16 the PBNICG recognized that there can be confusion and a lack of understanding of PBN terminologies and requirements Regulators are invited to consider educational and training requirements for pilots and other stakeholders to enhance proficiency and understanding of PBN operations and terminology. In this respect ICAO will provide training material to Regulators, IATA and IFALPA to assist. The following action item was agreed:
- Action 2/15 ICAO to distribute training material (including CBT) to IFALPA for its members, IATA and Regulators.**
- In reviewing key point 17, the following action item was agreed
- Action 2/16 RSO to coordinate with Airbus and Boeing to summarize fleet readiness status for PBN and GBAS into one table.**
- In reviewing key point 18, the meeting noted APAC States/Administrations current operational needs for SID/STAR phraseology and the meeting was informed about the current work in ICAO Panels and ICAO State Letter AN 13/2.5-15/40.
  - In reviewing key point 19, States were invited to coordinate with ICAO with regards to the need for licensing requirement and the following action item was agreed:
- Action 2/17 PBNICG members to submit paper on their needs for quality assurance and licensing needs by next PBNICG/3.**
- In reviewing key point 20, IATA reconfirmed that their business case for SBAS was currently not favorable.

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

11.1 *No papers presented*

**Agenda Item 12: Other Business****WP 06 - SCHEDULE FOR FUTURE MEETINGS (SECRETARIAT)**

12.1 The Secretariat proposed the schedule for future PBNICG meeting. Tentative date was planned for first half of March 2016.

12.2 A 5 days event was considered suitable to combine a small group meeting focusing on sub-regional air traffic services (ATS) route structures and PBNICG/3 altogether.

12.3 States were invited to consider hosting the meeting. The date and venue would be confirmed in CNS SG19.

12.4 Philippines raised an issue about the lack of guidance to implement the guided visual approaches (or RNAV visual approaches). Guided visual approaches were considered a useful method for airports where non-precision approaches or no instrument approaches were used.

12.5 ICAO PBN Programme Manager provided information on the ongoing work conducted by various ICAO Panels and Study Groups including IFPP, OPSP and PBN SG and informed the meeting that related guidance material would be available by 2018.

**Action 2/18 ICAO to consider providing information on current progress of Panel works regarding guided visual procedures.**

**Action 2/19 State to present a paper on their implementation experience regarding guided visual procedures.**

**Agenda Item 13: Review of Report and Action List**

13.1 The meeting updated the action list as shown in **Appendix A**.

**Action 2/20 States are invited to provide papers on PBN Implementation status to future PBNICG meetings.**

**Action 2/21 States to use the template of the PBN progress reporting form (option A) to summarize and submit the PBN activities to regularly report PBN implementation status as soon as possible and preferably before July 2015.**

**Closing of the meeting**

13.2 The Chairman thanked the participants for their contributions and in particular expressed appreciation to the ICAO APAC Regional Office for its hosting of the successful 2015 ICAO PBN seminar and PBNICG/2 meeting. He also expressed appreciations to Mr. Erwin Lassooij, ICAO PBN Programme Manager and Secretaries of the meeting.

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PBNICG/2  
Appendix A to the Report

| Action Item | Action  | Owner                                | Contributors   | Target date  | Status | Result | Comment                            | Reference to TOR |
|-------------|---|--------------------------------------|--|--|--------|--------|------------------------------------|------------------|
| 2/1         | ICAO to coordinate with EASA on their PBN roadmap, with a particular focus on RF.   | Erwin Lassoosj                       | Noppadol Pringvanich, Frederic Lecat   | 26-Feb-16  | Open   |        | ICG2-IP04                          | 1-b              |
| 2/2         | ICAO RO to plan the integration of option A in the Seamless ATM reporting scheme.   | Frederic Lecat                       |  | 26-Feb-16  | Open   |        | ICG2-WP04                          | 1-d, 2           |
| 2/3         | ICAO RSO to assess the feasibility of an engine for assisting desirous States with computing their metrics as per option B.   | Noppadol Pringvanich                 |  | 26-Feb-16  | Open   |        | ICG2-WP04                          | 1-d, 2           |
| 2/4         | ICAO APAC RSO to coordinate with the stakeholders in Sri Lanka and facilitate a possible discussion on the PBN parallel route concept between Male (VRMM) and Colombo (VCBI).   | Noppadol Pringvanich                 |  | 15-Oct-15  | Open   |        | ICG2-WP10                          | 1-c              |
| 2/5         | ICAO provide PBN-in-a-page to the relevant Panels and Study Groups for the review and provide related guidance on route spacing.  | Erwin Lassoosj                       | Noppadol Pringvanich, Frederic Lecat   | 13-Jul-15  | Open   |        | ICG2-WP02, with Draft Decision 2/1 | 1-a, 2           |
| 2/6         | IATA to provide the estimated population and the forecast growth for every 5 years period of all new navigation specifications.   | IATA                                 | Erwin Lassoosj, Noppadol Pringvanich, Frederic Lecat                               | 18-Dec-15  | Open   |        | ICG2-WP05                          | 1-b, 2           |
| 2/7         | States, through ICAO HQ, to prepare a paper to PBN study group specifying needs and operational requirements for establishing new or updating PBN nav spec and PBN Manual to support 0.3 NM outside final approach segment.       | Joe Lam                              | Erwin Lassoosj, Huho Ha  | 16-Nov-15  | Open   |        | ICG2-WP05                          | 1-b, 2           |
| 2/8         | ICAO requested to provide chart specimen for ARNP in TMA and Approach.  | Erwin Lassoosj                       | Noppadol Pringvanich   | 18-Dec-15  | Open   |        | ICG2-WP05                          | 1-b, 2           |
| 2/9         | The small group to propose amendments regarding PBN related elements to the Seamless ATM plan targets and Seamless ATM implementation guidance on the targets and guidance material.  | Frederic Lecat                       | IlaitiaTabakucoro, Joe Lam, Len Wicks, Noppadol Pringvanich, Huho Ha, IATA, States | The next review cycle of the APAC Seamless ATM Plan. | Open   |        | ICG2-WP08                          | 3                |
| 2/10        | ICAO HQ to share the key points of the Seminar to appropriate SGs and Panels.   | Erwin Lassoosj                       |  | 18-Dec-15  | Open   |        | ICG2-WP09                          | 1-a              |
| 2/11        | ICAO to deliver PBN Operational Approval training material for new PBN navigation specifications RNP 2 and Advanced RNP, by September 2015 and training delivery by Dec 2015  | ICAO                                 | Noppadol Pringvanich, Frederic Lecat   | 18-Dec-15  | Open   |        | ICG2-WP09                          | 1-a, b           |
| 2/12        | ICAO to consider conduct the education conference in conjunction with PBNICG/4.   | ICAO                                 | Noppadol Pringvanich, Frederic Lecat   | by PBNICG/4  | Open   |        | ICG2-WP09                          | 1-a, b           |
| 2/13        | Note that the IATA course is currently available. ICAO to consider conduct the training in conjunction with future DGCA conference.   | ICAO                                 | Noppadol Pringvanich, Frederic Lecat   | 15-Oct-15  | Open   |        | ICG2-WP09                          | 1-a, b           |
| 2/14        | Noppadol and Erwin to inform the FPP SC so that they include this into future procedure design training provisions.   | Noppadol Pringvanich, Erwin Lassoosj |  | 26-Nov-15  | Open   |        | ICG2-WP09                          | 1-a, b           |
| 2/15        | ICAO to distribute training material (including CBT) to IFALPA for its members, IATA and Regulators.  | ICAO                                 |  | 18-Dec-15  | Open   |        | ICG2-WP09                          | 1-a, b           |
| 2/16        | RSO to coordinate with Airbus and Boeing to summarize fleet readiness status for PBN and GBAS into one table.   | Noppadol Pringvanich                 | Huho Ha, Airbus, Boeing  | 15-Oct-15  | Open   |        | ICG2-WP09                          | 1-a, b           |
| 2/17        | PBNICG members to submit paper on their needs for quality assurance and licensing needs by next PBNICG/3.   | All                                  | IlaitiaTabakucoro  | 26-Feb-16  | Open   |        | ICG2-WP09                          | 1-a, b, 2        |
| 2/18        | ICAO to consider providing information on current progress of Panel works regarding guided visual procedures.   | Erwin Lassoosj                       | Noppadol Pringvanich   | 26-Feb-16  | Open   |        |                                    | 1-b, 2           |
| 2/19        | State to present a paper on their implementation experience regarding guided visual procedures.   | All                                  |  | 26-Feb-16  | Open   |        |                                    | 1-b, 2           |
| 2/20        | States are invited to provide papers on PBN Implementation status to future PBNICG meetings.  | All                                  |  | 26-Feb-16  | Open   |        |                                    | 1-a              |
| 2/21        | States to use the template of the PBN progress reporting form (option A) to summarize and submit the PBN activities to regularly report PBN implementation status as soon as possible and preferably before July 2015.            | All                                  | Frederic Lecat   | 24-Jul-15  | Open   |        |                                    | 1-d              |
| D2/1        | Draft Decision 2/1 - PBN in a page<br>That,<br>The PBN-in-a-page document be adopted as regional supporting material and be published on the ICAO RO website after the review by relevant Panels and Study Group as well as ICAO. |                                      |  |  |        |        | ICG2-WP02                          | 1-a, 2           |

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| Action Item | Action  | Owner | Contributors | Target date | Status | Result | Comment   | Reference to TOR |
|-------------|---|-------|--------------|-------------|--------|--------|-----------|------------------|
| D2/2        | <p>Draft Decision 2/2 - PBN Procedure Safety Assessment Checklists and Record of Hazard Template</p> <p>That,</p> <p>1. The PBN Procedure Safety Assessment Checklists and Record of Hazard Template be adopted as regional supporting material; and</p> <p>2. The checklists and template be published on the ICAO RO website.</p> |       |              |             |        |        | ICG2-WP03 | 1-b              |

**PBN IMPLEMENTATION PROGRESS REPORT**

State: **(Name of State)**

Date: **(DD/MM/YY)**

**PBN Focal Point**

Focal Point: **(Name, Designation, Mailing Address, Email, Phone, Fax)**

**State PBN Implementation Plan**

Status: Developed (  Yes/  No)  
Submitted (  Yes/  No)

Note(s): **(States may include information on publication date and location for State PBN Implementation Plan and other relevant information.)**

(Reviewed by PBNICG)

|                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| BPE1                     | BPE2                     | BPE3                     | BPE4                     | BPE5                     | BPE6                     | BPE7                     | BPE8                     | BPE9                     | BPE10                    | BPE11                    |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

(Comment) :

**90 - Continuous Descent Operations (CDO)**

**100 - Continuous Climb Operations (CCO)**

Status:

| Airport Name | Runway End | CDO                      | CCO                      | Implementation Target |
|--------------|------------|--------------------------|--------------------------|-----------------------|
|              |            | <input type="checkbox"/> | <input type="checkbox"/> |                       |
|              |            | <input type="checkbox"/> | <input type="checkbox"/> |                       |

Note(s): **(States may include information on recent CDO/CCO implementation.)**

**110 - Performance-based Navigation (PBN) Approach**

**(Option A)**

|   |  |
|---|--|
| Total number of instrument runway ends (international and domestic airports): |  |
|---|--|

|                      |          | Date of complete implementation (planned or actual) | Number of procedures planned | Number of procedures published | Percentage (%) | Comments |
|----------------------|----------|---|------------------------------|--------------------------------|----------------|----------|
| Number of instrument | APV/Baro |   |                              |                                |                |          |
|                      | APV/SBAS |   |                              |                                |                |          |

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|                  |                     |  |  |  |  |  |  |
|------------------|---------------------|--|--|--|--|--|--|
| runway ends with | LNAV only           |  |  |  |  |  |  |
|                  | GLS (if applicable) |  |  |  |  |  |  |

**(Option B)**

Status:

| Airport Name | Runway End | LNAV                     | LNAV/VNAV                | LP                       | LPV                      | RNP AR                   | RNAV/RNP VA              | Unknown PBN              | Implementation Target |
|--------------|------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-----------------------|
|              |            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                       |
|              |            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                       |

Note(s): (States may include information on recent publications of new PBN approach procedures.)

**120 - Standard Instrument Departures/ Standard Terminal Arrivals (SID/STAR)**

Status:

| Airport Name | Runway End | SID                      | STAR                     | Implementation Target |
|--------------|------------|--------------------------|--------------------------|-----------------------|
|              |            | <input type="checkbox"/> | <input type="checkbox"/> |                       |
|              |            | <input type="checkbox"/> | <input type="checkbox"/> |                       |

Note(s): (States may include information on recent publications with new PBN arrival/departure procedures.)

**140 - Performance-based Navigation (PBN) Routes**

**(Option A)**

|   |  |
|---|--|
| Total number of ATS routes (international and domestic routes): |  |
|---|--|

|                       |         | Date of complete implementation (planned or actual) | Number of procedures planned | Number of procedures published | Percentage (%) | Comment |
|-----------------------|---------|---|------------------------------|--------------------------------|----------------|---------|
| Number of routes with | RNAV 10 |   |                              |                                |                |         |
|                       | RNAV 5  |   |                              |                                |                |         |
|                       | RNAV 2  |   |                              |                                |                |         |
|                       | RNP 4   |   |                              |                                |                |         |

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|  |        |  |  |  |  |  |
|--|--------|--|--|--|--|--|
|  | RNP 2  |  |  |  |  |  |
|  | RNP 1  |  |  |  |  |  |
|  | RNP AR |  |  |  |  |  |
|  | A-RNP  |  |  |  |  |  |

**(Option B)**

*Status (A):*

| Navigation Specification | Implementation Target (Planned or Actual) | # of Planned Routes | # of Published Routes | Percentage (%) | Comment |
|--------------------------|---|---------------------|-----------------------|----------------|---------|
| <b>RNAV 10</b>           |   |                     |                       |                |         |
| <b>RNAV 5</b>            |   |                     |                       |                |         |
| <b>RNAV 2</b>            |   |                     |                       |                |         |
| <b>RNP 4</b>             |   |                     |                       |                |         |
| <b>RNP 2</b>             |   |                     |                       |                |         |
| <b>RNP1</b>              |   |                     |                       |                |         |
| <b>RNP AR</b>            |   |                     |                       |                |         |
| <b>A-RNP</b>             |   |                     |                       |                |         |

*Status (B):*

| FIR Name | ATS Route Name |     | Navigation Specification | Published                | Implementation Target | Coordinated with Neighboring FIR  |
|----------|----------------|-----|--------------------------|--------------------------|-----------------------|---|
|          | Old            | New |                          |                          |                       |   |
|          |                |     |                          | <input type="checkbox"/> |                       | <input type="checkbox"/> Yes, <input type="checkbox"/> No, <input type="checkbox"/> N/A |
|          |                |     |                          | <input type="checkbox"/> |                       | <input type="checkbox"/> Yes, <input type="checkbox"/> No, <input type="checkbox"/> N/A |
|          |                |     |                          | <input type="checkbox"/> |                       | <input type="checkbox"/> Yes, <input type="checkbox"/> No, <input type="checkbox"/> N/A |

*Note(s):*      **(States may include information on recent publications with new PBN routes.)**

Do you use UPR/Flex Tracks?       Yes       No

— — — end — — —



**PBN NavSpecs and Route Spacing (PBN Manual Doc 9613 Volume II, Attachment B & PANS-OPS Doc 8168 Volume II, Part III)**

| Nav Specs                       | Flight Phase    |                      |                 |          |              |           |                                   |           | Supporting Nav. Infrastructure                                 | Route Spacing (NM)  | Additional Functionality (Required or Optional) |     |                    |                 |        | Operational Requirements  |  |  |  |
|---------------------------------|-----------------|----------------------|-----------------|----------|--------------|-----------|-----------------------------------|-----------|--|---|---|-----|--------------------|-----------------|--------|---|--|--|--|
|                                 | En-route Remote | En-route Continental | Arrival         | Approach |              |           |                                   | Departure |  |   | RF  | FRT | TOAC <sup>2)</sup> | Baro VNAV       | Nav DB | Communication   | Navigation   | Surveillance   | Others   |
|                                 |                 |                      |                 | Initial  | Intermediate | Final     | Missed <sup>1)</sup>              |           |  |   |   |     |                    |                 |        |   |  |  |  |
| RNAV 10                         | 10              |                      |                 |          |              |           |                                   |           | Not require ground-based Naviad Dual LRNS (INS, IRS FMS, GNSS) | 50  |   |     | TBD <sup>2)</sup>  |                 | O      | Voice com through 3rd party, DCPC in some areas   | RNAV 10 (RNP 10) Approval, lateral deviation less than 7NM (same direction)/6NM (opposite direction) | Procedural pilot position reports  | System safety must be monitored, TLS 5X10 <sup>-9</sup> accident per flight hour |
| RNAV 5                          |                 | 5                    | 5 <sup>3)</sup> |          |              |           |                                   |           | VOR/DME DME/DME INS or IRS GNSS                                | 16.5 - straight unidirectional racks (same direction route-ECAC)<br>18 - straight bidirectional tracks (opposite direction route- ECAC)<br>10 - ATC intervention capability (ECAC)<br>30 - No ATS Surveillance in high traffic density (ECAC) |   |     | TBD                |                 | O      | DCPC- VHF   | RNAV 5/RNP 5 OPS Approval (BRNAV)  | Procedural pilot position report (RNP 5) Radar surveillance (RNAV 5)       |  |
| RNAV 2                          |                 | 2                    | 2               |          |              |           |                                   | 2         | GNSS DME/DME DME/DME/IRU                                       | 8 to 9 - straight tracks in high traffic density (en-route) (FAA)   |   |     | TBD                |                 | R      | DCPC- VHF   | RNAV 2 OPS Approval (PRNAV, US RNAV AC 90-100)   | Radar surveillance   |  |
| RNAV 1                          |                 | 1                    | 1               | 1        | 1            |           | 1                                 | 1         | GNSS DME/DME DME/DMe/IRU                                       | 8 - straight tracks in high density (terminal, Eurocontrol)<br>7 for SIDs/STARs (PANS-ATM)  |   |     | TBD                | O               | R      | DCPC- VHF   | RNAV 1 OPS Approval (PRNAV, US RNAV AC 90-100)   | Radar surveillance   |  |
| RNP 4                           | 4               |                      |                 |          |              |           |                                   |           | Not require ground-based Naviad GNSS                           | 30 (part of the Pacific airspace)<br>50 or 30 * (PANS-ATM)<br>*23NM proposed by SASP (applicable date : 10 November 2016)   |   | O   | TBD                |                 | R      | DCPC or CPDLC   | RNP 4 OPS Approval   | ADS with a lateral deviation contract having 5NM                           | System verification assuring lateral deviation less than 15NM                    |
| RNP 2                           | 2               | 2                    |                 |          |              |           |                                   |           | GNSS   | 50, 30 or 15 (PANS-ATM)<br>7 for climb/descend through other aircraft with VHF DCPC<br>20 for climb/descend through other aircraft with other type of com.  |   | O   | TBD                |                 | R      | Depend on operational considerations (route spacing, traffic density, complexity, contingency procedures) | RNP 2 OPS Approval (Oceanic/Remote/continental)  | Not required except reduced route spacing                                  |  |
| RNP 1                           |                 |                      | 1               | 1        | 1            |           | 1                                 | 1         | GNSS   | 5 for SIDs/STARs (PANS-ATM)   | O   |     | TBD                | O               | R      | DCPC (RNP 1 SIDs/STARs)   | RNP 1 OPS Approval   | Not required except reduced route spacing                                  |  |
| A RNP <sup>4)</sup>             | 2               | 2 or 1               | 1 - 0.3         | 1 - 0.3  | 1 - 0.3      | 0.3       | 1 - 0.3                           | 1 - 0.3   | GNSS Multi-DME may be provided                                 | 7 - straight and turning tracks (<90°) in high traffic density (en-route, Terminal, Eurocontrol)<br>6 to 7 NM with an RNP 0.5 (terminal, Eurocontrol)   | R   | O   | TBD                | O               | R      | DCPC- VHF   | A-RNP OPS Approval (Navigation accuracy at least ±1NM, 95% of the flight time)                       | Radar surveillance (may not be required to certain navigation application) |  |
| RNP APCH (Part A) <sup>5)</sup> |                 |                      |                 | 1        | 1            | 0.3       | 1                                 |           | GNSS (Missed App - RNAV or Conv.)                              | 5 for SIDs/STARs (PANS-ATM)   | O   |     | TBD                | O               | R      | Not required  | RNP APCH OPS Approval  | Not required   |  |
| RNP APCH (Part B) <sup>5)</sup> |                 |                      |                 | 1        | 1            | Angular   | 1 or 0.3 (Initial Straight MISAP) |           | GNSS   | 5 for SIDs/STARs (PANS-ATM)   | O   |     | TBD                |                 | R      | Not required  | RNP APCH OPS Approval  | Not required   |  |
| RNP AR APCH                     |                 |                      |                 | 1 - 0.1  | 1 - 0.1      | 0.3 - 0.1 | 1 - 0.1                           |           | GNSS (DME/DME may be authorized)                               | 5 for SIDs/STARs (PANS-ATM)   | R <sup>6)</sup>                                 |     | TBD                | R <sup>6)</sup> | R      | Not required  | RNP AR APCH OPS Approval   | Not required   |  |
| RNP 0.3                         |                 | 0.3                  | 0.3             | 0.3      | 0.3          |           | 0.3                               | 0.3       | GNSS   |   | O   |     | TBD                | O               | R      | Not required  | RNP 0.3 OPS Approval   | Not required   |  |

1) RNP requirements do not apply to initial and intermediate missed approach segments.

2) TOAC (Time of Arrival Control), TBD (To Be Determined)

3) RNAV 5 may be used for initial parts of STARs outside 30 NM from the ARP.

4) Advanced RNP core requirements are limited to RNP 1 in all flight phases except final approach (RNP 0.3) and RNP 2 in oceanic/remote and en-route continental. A scalability option will allow accuracy values between 0.3 and 1.0, in 0.1 NM increments, in all flight phases except oceanic/remote/en-route continental (RNP 1 and RNP 2) and final approach (RNP 0.3).

5) Part A and B refer to the Performance-based Navigation (PBN) Manual (Doc 9613), Volume II, Part C, Chapter 5, Part A — RNP APCH operations down to LNAV and LNAV/VNAV minima and Part B — RNP APCH operations down to LP and LPV minima, respectively.

6) Specific requirement for RF and VNAV

**Checklists for Preparation of PBN Procedure Implementation Safety Assessment**

**1. RNP APCH**

| <b>PBN Procedure Safety Assessment Initial Checklist – RNP APCH</b> |  |                              |      |                                  |  |
|---|--|------------------------------|------|----------------------------------|--|
| Assessor  |  | <input type="checkbox"/> New |      | <input type="checkbox"/> Amended |  |
| Procedure Name  |  |                              | Date |                                  |  |
| <b>S : Satisfactory, U : Unsatisfactory, N/A : Not Available</b>    |  |                              |      |                                  |  |
| No.   | Check Items  | S                            | U    | N/A                              |  |
| 1   | Is the safety assessor independent of the flight procedure team and has s/he been involved with the process?<br>▪ Comments :   |                              |      |                                  |  |
| 2   | Were proposed flight procedures/amendments designed by an qualified flight procedure designer and reviewed independently by another qualified flight procedure designer?<br>▪ Comments :   |                              |      |                                  |  |
| 3   | Did procedure designers coordinate with stakeholders such as ATC, operators, etc., regarding new and/or amended flight procedures?<br>▪ Comments :   |                              |      |                                  |  |
| 4   | Did relevant ATC facilities review the new and/or amended procedures based on the Letter of Agreement (LOA) between facilities? Is the amended LOA published and effective?<br>▪ Comments :  |                              |      |                                  |  |
| 5   | Are the locations of waypoints and restrictions (speed, altitude, etc.) appropriate for the aircraft types expected to use these procedures?<br>▪ List aircraft categories considered:<br>▪ Comments :   |                              |      |                                  |  |
| 6   | Are there any expected difficulties or possibilities of phonetic confusion in the names used for waypoints and procedure ? It is recommended that proximity check for like-sounding codes be done within 250NM for TMA waypoints using ICARD system.<br>▪ Comments :                           |                              |      |                                  |  |
| 7   | Are there any elements that may lead to misinterpretation or other difficulties while using the proposed procedures (e.g. textual description of the chart, local wind condition or temperature causing difficulties while climbing/descending, etc.)?<br>▪ Comments :                         |                              |      |                                  |  |
| 8   | In case of procedure amendment, was a review of safety incidents/accidents concerning the existing procedure conducted, with the view of mitigating them?<br>Comments :  |                              |      |                                  |  |
| 9   | Referring to ICAO Annex 4, 15 and Doc 8697, are there any errors on the chart(s)?<br>(Items to focus on: Magnetic Bearings/True Headings, Distances, Climb/Descent Gradients, TAA/MSA, Magnetic Variation, Topography, Location of Obstacles, Coordinates, Restrictions, etc.)<br>▪ Comments : |                              |      |                                  |  |

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|    |   |  |  |  |
|----|---|--|--|--|
| 10 | Were all obstacles evaluated when calculating OCA/H in the proposed procedures and properly documented?<br>▪ Comments :   |  |  |  |
| 11 | Were RAIM/GNSS availability and prediction (as necessary) considered while implementing the proposed procedures?<br>▪ Comments :  |  |  |  |
| 12 | If RAIM/GNSS availability/prediction information is provided by entities other than the ANSP, are there any agreements with those entities regarding the provision of this information?<br>▪ Comments :   |  |  |  |
| 13 | Are the descent rates and descent angle, if not the same as the optimum value, of proposed approach procedure appropriate to enabling aircraft to complete its approach? If not, were operators consulted and consent obtained?<br>▪ Comments :                               |  |  |  |
| 14 | Do missed approach procedures enable aircraft to climb to the assigned altitude/s? Are climb gradients specified where the climb gradient exceeds the standard missed approach climb gradient of 2.5%? If so, have the operators been consulted?<br>▪ Comments :              |  |  |  |
| 15 | Do the proposed procedures take into account adequate separation between aircraft using these approaches and other aircraft using conventional approaches (ILS, VOR, NDB)? Was the standard operating procedure/operating manual updated?<br>▪ Comments :                     |  |  |  |
| 16 | Have any alternative procedures been instituted if an aircraft conducting the proposed procedure/s is unable to complete the assigned procedure due to temporary GNSS signal abnormality, airborne system failures, technical problems or other difficulties?<br>▪ Comments : |  |  |  |
| 17 | <b>For LNAV/VNAV Procedures:</b> Is the location of the altimeter setting source appropriate for the use of the Baro-VNAV approach procedure?<br>▪ Comments :   |  |  |  |
| 18 | <b>For LNAV/VNAV Procedure:</b> Is the published minimum temperature reasonable for the application of the Baro-VNAV procedure?<br>▪ Comments :   |  |  |  |
| 19 | Has implementation training been executed (or planned) for air traffic controllers on the use of the proposed procedures, including management of QNH in case of Baro-VNAV?<br>▪ Comments :   |  |  |  |
| 20 | Are there any criteria applied for the RNP APCH design using the minimum or maximum value in ICAO PANS-OPS (Doc 8168)? If so, are they documented properly?<br>▪ Comments :   |  |  |  |
| 21 | Are there any items requiring special authorization in the proposed procedures? If any, were sufficient reviews on criteria conducted and was the rationale for requiring such special authorization reasonable and necessary?<br>▪ Comments :                                |  |  |  |

## 2. SID/STAR

| <b>PBN Procedure Safety Assessment Initial Checklist – SID/STAR</b> |  |                              |                                  |     |
|---|--|------------------------------|----------------------------------|-----|
| Assessor  |  | <input type="checkbox"/> New | <input type="checkbox"/> Amended |     |
| Procedure Name  |  | Date                         |                                  |     |
| S : Satisfactory, U : Unsatisfactory, N/A : Not Available           |  |                              |                                  |     |
| No.   | Check Items  | S                            | U                                | N/A |
| 1   | Is the safety assessor independent of the flight procedure team and has s/he been involved with the process?<br>▪ Comments :   |                              |                                  |     |
| 2   | Were proposed flight procedures/amendments designed by an qualified flight procedure designer and reviewed independently by another qualified flight procedure designer?<br>▪ Comments :   |                              |                                  |     |
| 3   | Did procedure designers coordinate with related entities such as ATC, Operators, etc., regarding new and/or amended flight procedures?<br>▪ Comments :   |                              |                                  |     |
| 4   | Did related ATC facilities review and accept new and/or amended procedures based on the Letter of Agreement (LOA) between facilities? Is the amended LOA published and effective?<br>▪ Comments :  |                              |                                  |     |
| 5   | Are the locations of waypoint and restrictions (speed, altitude, etc.) appropriate for the aircraft that is expected to use the procedures?<br>▪ Comments :  |                              |                                  |     |
| 6   | Are there any expected difficulties or the possibility of confusion on the name of waypoints and procedures phonetically? It is recommended that proximity check for like-sounding codes should be done within 250NM for TMA waypoints using ICARD system.<br>▪ Comments :           |                              |                                  |     |
| 7   | Are there any parts that may lead to mistakes or difficulties while using the proposed procedures (e.g. textual description of the chart, local wind condition or temperature causing difficulties while climbing/descending, etc.)?<br>▪ Comments :                                 |                              |                                  |     |
| 8   | In case of procedure amendment, was a review of safety incidents/accidents concerning the existing procedure conducted, with the view of mitigating them?<br>▪ Comments :  |                              |                                  |     |
| 9   | Referring to ICAO Annex 4, 15 and Doc 8697, are there any errors on the chart(s)?<br>(check items : magnetic bearing/true heading, distance, climb/descent gradient, TAA/MSA, magnetic variation, topography, location of obstacle, coordinates, restrictions, etc.)<br>▪ Comments : |                              |                                  |     |

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|    |  |  |  |  |
|----|--|--|--|--|
| 10 | Were all obstacles evaluated in the proposed procedures and properly documented?<br>▪ Comments :   |  |  |  |
| 11 | Were coverage and limitations of available avionics, ground navigational aids and GNSS considered while designing and validating the proposed procedures?<br>▪ Comments :  |  |  |  |
| 12 | Were traffic flows in the terminal area considered while designing the proposed procedures?<br>▪ Comments :  |  |  |  |
| 13 | Are climb/descent rates of the proposed procedures appropriate to enabling the climb/descent within the airspace?<br>▪ Comments :  |  |  |  |
| 14 | Does separation applied between instrument flight procedures of neighbouring airport(s), airspaces including special use airspaces (SUAs) and the proposed procedures satisfy separation criteria specified in ICAO PANS-ATM (Doc 4444)?<br>▪ Comments : |  |  |  |
| 15 | Do the proposed procedures consider separation between aircraft using PBN procedures and aircraft using other procedures specified in ICAO PANS-ATM (Doc 4444)?<br>▪ Comments :  |  |  |  |
| 16 | Did the proposed procedures consider current and expected future airspace capacity?<br>▪ Comments :  |  |  |  |
| 17 | Are there any alternative methods when an aircraft conducting a proposed procedure is unable to conduct the procedure because of ground/satellite/airborne system failures, technical problems or other difficulties?<br>▪ Comments :                    |  |  |  |
| 18 | Is there any training plan for air traffic controllers on the proposed procedures? Has the training been conducted?<br>▪ Comments :  |  |  |  |
| 19 | Are there any criteria applied for the SID/STAR design using the minimum or maximum value in ICAO PANS-OPS (Doc 8168)? If so, are they documented properly?<br>Comments :  |  |  |  |
| 20 | Are there any items requiring special authorization in the proposed procedures? If any, were sufficient reviews on criteria conducted and was rationale for requiring special authorization reasonable?<br>▪ Comments :                                  |  |  |  |

### 3. ATS Route

| <b>PBN Safety Assessment Initial Checklist – ATS Route</b>       |   |                              |                                  |     |
|--|---|------------------------------|----------------------------------|-----|
| Assessor   |   | <input type="checkbox"/> New | <input type="checkbox"/> Amended |     |
| Route Designator   |   | Date                         |                                  |     |
| <b>S : Satisfactory, U : Unsatisfactory, N/A : Not Available</b> |   |                              |                                  |     |
| No.  | Check Items   | S                            | U                                | N/A |
| 1  | Is the safety assessor independent of the flight procedure team and has s/he been involved with the process?<br>Comments :  |                              |                                  |     |
| 2  | Has proposed ATS route been reviewed independently by a qualified route designer?<br>Comments :   |                              |                                  |     |
| 3  | Did procedure designers coordinate with related entities such as ATC, Operators, etc., regarding the new and/or amended ATS route?<br>▪ Comments :  |                              |                                  |     |
| 4  | Did related ATC facilities review new and/or amended procedures based on the Letter of Agreement (LOA) between facilities? Is the amended LOA published and effective?<br>▪ Comments :  |                              |                                  |     |
| 5  | Are the locations of waypoint and restrictions (e.g. speed, altitude, etc.) appropriate for the aircraft that is expected to use the ATS route?<br>▪ Comments :   |                              |                                  |     |
| 6  | Are there any expected difficulties or the possibility of confusion on the name of waypoints phonetically? It is recommended that proximity check for like-sounding codes should be done within 500NM for en-route waypoints using ICARD system.<br>▪ Comments :  |                              |                                  |     |
| 7  | Is the designator of ATS route appropriate for its application, i.e. domestic or international? Is the duplicity of the name confirmed with neighbouring States?<br>▪ Comments :  |                              |                                  |     |
| 8  | Are there any parts that may lead to mistakes or difficulties while using the proposed ATS routes (e.g. separation from other ATS routes and/or airspace including military controlled airspace, coordination with other facilities including military, identification of navigation specification, difference of turn performance, introduction of FRT, etc.)?<br>▪ Comments : |                              |                                  |     |
| 9  | In case of procedure amendment, was a review of safety incidents/accidents concerning the existing procedure conducted, with the view of mitigating them?<br>▪ Comments :   |                              |                                  |     |
| 10   | Referring to ICAO Annex 4, 15 and Doc 8697, are there any errors on the AIP publication?<br>(check items : magnetic bearing/true heading, distance, coordinates, restrictions, directions, etc.)<br>▪ Comments :  |                              |                                  |     |

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|    |   |  |  |  |
|----|---|--|--|--|
| 11 | <p>Were all obstacles evaluated in the proposed ATS route and properly documented?</p> <p>▪ Comments :</p>  |  |  |  |
| 12 | <p>Were coverage and limitations of available avionics, ground navigational aids and GNSS considered while designing and validating the proposed procedures?</p> <p>▪ Comments :</p>  |  |  |  |
| 13 | <p>Does separation applied between instrument flight procedures of neighbouring airport(s), airspaces including special use airspaces (SUAs), neighbouring ATS routes and the proposed ATS route satisfy separation criteria specified in ICAO PANS-ATM (Doc 4444) and PANS-OPS (Doc 8168)?</p> <p>▪ Comments :</p> |  |  |  |
| 14 | <p>Do the proposed ATS route consider separation between aircraft using PBN procedures and aircraft using other procedures specified in ICAO PANS-ATM (Doc 4444)?</p> <p>▪ Comments :</p>   |  |  |  |
| 15 | <p>Did the proposed ATS route consider current and expected future airspace capacity?</p> <p>▪ Comments :</p>   |  |  |  |
| 16 | <p>Are there any alternative methods when an aircraft flying the proposed ATS route is unable to maintain the requirement of the route because of ground/satellite/airborne system failures, technical problems or other difficulties?</p> <p>▪ Comments :</p>  |  |  |  |
| 17 | <p>Is there any training plan for air traffic controllers on the proposed ATS route? Has the training been conducted?</p> <p>▪ Comments :</p>   |  |  |  |
| 18 | <p>Are there any items requiring special authorization on the use of the proposed ATS route, e.g. reduction of lateral separation between ATS routes? If any, were sufficient reviews on criteria conducted and was rationale for requiring special authorization reasonable?</p> <p>▪ Comments :</p>               |  |  |  |

**Appendix. Record on Identification, Analysis and Mitigation of Hazard**

|   |   |  |   |
|---|---|--|---|
| Identification No                                 |   | Source   | <input type="checkbox"/> Safety Report <input type="checkbox"/> Safety Review<br><input type="checkbox"/> Safety Assessment <input type="checkbox"/> Safety Audit<br><input type="checkbox"/> Safety Observation <input type="checkbox"/> Safety Survey<br><input type="checkbox"/> Sampling Survey <input type="checkbox"/> Others |
| Assessment Date                                   | YYYY.MM.DD  |  |   |
| Assessment Items                                  | Name of IFP/SID/STAR/ATS route  |  |   |
| Category of Hazard                                | <input type="checkbox"/> Human Factors <input type="checkbox"/> Equipment <input type="checkbox"/> Operational <input type="checkbox"/> Environment |  |   |
| Identification of Hazard(s)                       | Subject :   |  |   |
|   | Details (includes a review of safety incidents of the existing procedure(s), if any) :  |  |   |
| Risk Analysis                                     | Probability   | <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5       |   |
|   | Severity  | <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E       |   |
| Outcome of Risk Analysis                          | Assessed Risk Index   | <input type="checkbox"/> Unacceptable<br><input type="checkbox"/> Acceptable based on risk mitigation<br><input type="checkbox"/> Acceptable |   |
|   | (Probability & Severity, e.g. 3C)   |  |   |
| Mitigation Measures                               |   |  |   |
| Outcome of Safety Reassessment                    |   |  |   |
| Comments by Safety Assessment Team (If necessary) |   |  |   |
| Date Completed                                    | YYYY.MM.DD  |  |   |



**Safety Risk Probability Table (SMM Manual (Doc 9859) Figure 2-11)**

| Likelihood           | Meaning   | Value |
|----------------------|---|-------|
| Frequent             | Likely to occur many times (has occurred frequently)  | 5     |
| Occasional           | Likely to occur sometimes (has occurred infrequently) | 4     |
| Remote               | Unlikely to occur, but possible (has occurred rarely) | 3     |
| Improbable           | Very unlikely to occur (not known to have occurred)   | 2     |
| Extremely Improbable | Almost inconceivable that the event will occur        | 1     |

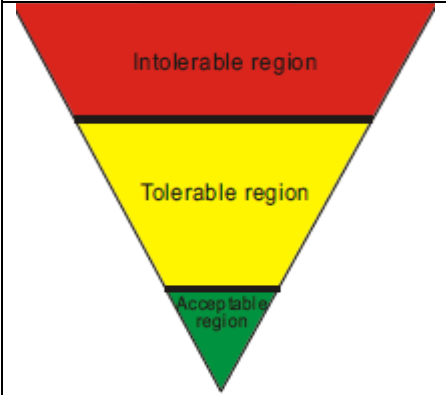
**Safety Risk Severity Table (SMM Manual (Doc 9859) Figure 2-12)**

| Severity     | Meaning  | Value |
|--------------|--|-------|
| Catastrophic | <ul style="list-style-type: none"> <li>• Equipment destroyed</li> <li>• Multiple deaths</li> </ul>   | A     |
| Hazardous    | <ul style="list-style-type: none"> <li>• A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely</li> <li>• Serious injury</li> <li>• Major equipment damage</li> </ul>   | B     |
| Major        | <ul style="list-style-type: none"> <li>• A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency</li> <li>• Serious incident</li> <li>• Injury to persons</li> </ul> | C     |
| Minor        | <ul style="list-style-type: none"> <li>• Nuisance</li> <li>• Operational limitations</li> <li>• Use of emergency procedures</li> <li>• Minor incident</li> </ul>   | D     |
| Negligible   | <ul style="list-style-type: none"> <li>• Few consequences</li> </ul>   | E     |

**Safety Risk Assessment Matrix (SMM Manual (Doc 9859) Figure 2-13)**

| Risk Probability              | Risk Severity            |                       |                   |                   |                        |
|-------------------------------|--------------------------|-----------------------|-------------------|-------------------|------------------------|
|                               | Catastrophic<br><b>A</b> | Hazardous<br><b>B</b> | Major<br><b>C</b> | Minor<br><b>D</b> | Negligible<br><b>E</b> |
| Frequent <b>5</b>             | <b>5A</b>                | <b>5B</b>             | <b>5C</b>         | <b>5D</b>         | <b>5E</b>              |
| Occasional <b>4</b>           | <b>4A</b>                | <b>4B</b>             | <b>4C</b>         | <b>4D</b>         | <b>4E</b>              |
| Remote <b>3</b>               | <b>3A</b>                | <b>3B</b>             | <b>3C</b>         | <b>3D</b>         | <b>3E</b>              |
| Improbable <b>2</b>           | <b>2A</b>                | <b>2B</b>             | <b>2C</b>         | <b>2D</b>         | <b>2E</b>              |
| Extremely Improbable <b>1</b> | <b>1A</b>                | <b>1B</b>             | <b>1C</b>         | <b>1D</b>         | <b>1E</b>              |

**Safety Risk Tolerability Matrix (SMM Manual (Doc 9859) Figure 2-14)**

| Tolerability Description  | Assessed Risk Index  | Suggested Criteria  |
|---|--|---|
|  <p>Intolerable region</p> | <p><b>5A, 5B, 5C,<br/>4A, 4B, 3A</b></p>                     | <p>Unacceptable under the existing circumstances</p>                            |
| <p>Tolerable region</p>   | <p>5D, 5E, 4C, 4D,<br/>4E, 3B, 3C, 3D<br/>2A, 2B, 2C, 1A</p> | <p>Acceptable based on risk mitigation. It may require management decision.</p> |
| <p>Acceptable region</p>  | <p><b>3E, 2D, 2E, 1B,<br/>1C, 1D, 1E</b></p>                 | <p>Acceptable</p>   |

**OUTCOMES (KEY POINTS) OF ICAO REGIONAL PBN SEMINAR**

1. Recognizing a need for PBN Operational Approval training for new PBN navigation specifications, such as RNP 2 and Advanced RNP, ICAO is invited to consider providing such training.
2. With regard to flight operational approval, APAC States and operators are recommended to consider establishing readiness timeline for RNP 2 operation.
3. The Seminar notes the current progress of PBN implementation within the APAC Regions and urges all States to continue moving forward with the implementation effort and reporting their implementation progress and challenges to ICAO, especially for the targets detailed in A37-11 and APAC Regional Priorities and Targets. Additionally, States without PBN plan are also urged to address this issue as a matter of urgency.
4. Noting the criticality of data quality for PBN operations, all APAC States are invited to review their WGS-84 implementation and survey status. APAC States are also invited to include metadata to each WGS-84 surveyed data to record the history and method of the survey.
5. ICAO is invited to develop a guidance material for surveying and data requirement for procedure design.
6. In line with A37-11, all APAC States are urged to expedite the update and publication of their State PBN plan and to consider including airlines and business aviation users into the consultation process while developing/updating the State PBN plans.
7. ICAO is invited to consider arranging an educational conference on advanced applications of PBN, including deployment and approval of RNP AR, implementation of closely-spaced PBN routes, Advanced RNP applications and other advanced ATM operations enabled by PBN.
8. APAC States are invited to consider adopting the Airspace design processes as detailed in Doc 9992 and ensuring that all required stakeholders are included in the process so that operation benefits can be derived from every PBN implementation. This airspace design process shall include a proper safety assessment and should be conducted with a good project management practice.
9. During the Seminar, APAC States indicated the need for training decision makers and executives who make decisions about the funding of PBN implementation projects.
10. APAC States are invited to conduct business case for PBN implementation in coordination with airlines, ANSPs and airspace users and ICAO to develop an example business case.  
[Note ICAO is developing template for business case.]
11. The Seminar recognizes the need to expedite the development of SARPS for ELSO and parallel approach operations for GLS and RNP.
12. The Seminar recognizes the needs to improve the FPL format for PBN to enhance the retrieval of information by ATC and accommodate new PBN navigation specifications, such as RNP AR departure and Advanced RNP.

13. ICAO and APAC States are invited to improve the process for PBN ops approval and APAC States are invited to expedite the approval as much as applicable. APAC States should also consider giving a high priority and sufficient resource for training and re-training Ops inspector on PBN Operational Approval.
14. The Seminar notes PBN implementation assistances which have been made available to APAC States by ICAO and invites APAC States to consider requesting implementation assistance as appropriate.
15. The Seminar notes the need for more PBN trainings, including Procedure Design and Ops Approval trainings for RNP AR and Procedure Design trainings for SBAS and GLS.
16. Regulators are invited to assure that the inclusion of proficiency requirements for pilots for appropriate PBN operations is ensured prior to granting PBN Operation approval. In some case, such as RNP APCH and RNP AR APCH, pilot simulation trainings should be considered as a training requirement. In this respect, ICAO is invited to include this aspect, along with other PBN-related regulatory issues, into future USOAP protocol questions.
17. ICAO RSO is invited to coordinate with Airbus and Boeing to summarize fleet readiness status for PBN and GBAS into one table.
18. The Seminar recognizes the urgent needs to expedite the standardization and global harmonization of necessary phraseology to support PBN operations in all phases of flight, especially SID/STAR.
19. APAC States are recommended ensure the proficiency of procedure designers is meeting the competency requirements as outlined in the Quality Assurance Manual (Doc 9906) and States are invited to coordinate with ICAO with regards to the need for licensing requirement.
20. Noting the progress of certification process of SBAS systems in APAC Regions, APAC States and operators are invited to evaluate the costs and operational benefits through business cases as appropriate.
21. Industry is invited to consider implementing ionospheric threat models once available in APAC Regions
22. APAC States are invited to consider using the Safety Assessment Check lists, once available, as part of the Safety assessment activities for new PBN procedures during the interim until the global material becomes available.
23. APAC States and the participants of the Seminar are invited to take home the lessons learnt and success stories from other States and PBN partners and share this information with their PBN teams to support future PBN implementations.

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**THE SECOND MEETING OF PERFORMANCE BASED NAVIGATION  
IMPLEMENTATION COORDINATION GROUP (PBNICG/2)**

Bangkok, Thailand, 11 – 12 June 2015

**Attachment 1 to the Report**

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