



International Civil Aviation Organization

**NINETEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION
AND SURVEILLANCE SUB-GROUP (CNS SG/19) OF APANPIRG**

Bangkok, Thailand, 20 – 24 July 2015

Agenda Item 5: Navigation

**5.1 Review reports of PBNICG/1 and PBNICG/2 meetings and
PBN Seminar**

**5.2 Updates on national PBN implementation plan and PBN
implementation issues**

REPORTS OF PBNICG/1 AND PBNICG/2 MEETINGS AND PBN SEMINAR

(Presented by the Secretariat)

SUMMARY

This paper presents the outcomes of the First and Second meetings of Performance-based Navigation Implementation Coordination Group (PBNICG/1 and PBNICG/2) which were held from 10-12 March 2015 and 11-12 June 2015 respectively and ICAO Regional PBN Seminar which was held before PBNICG/2 from 8-10 June 2015.

1. INTRODUCTION

1.1 The First Meeting of Performance Based Navigation Implementation Coordination Group (PBNICG/1) was held at the ICAO Asia-Pacific Regional Sub-Office (RSO), Beijing, China, 10-12 March 2015. The meeting was attended by 30 participants from 10 States and administrations and considered 11 Working Papers (WP), 12 Information Papers (IP), 3 Presentations and 2 Flimsies. All relevant documents and the report of the meeting are available at <http://www.icao.int/APAC/Meetings/Pages/2015-PBNICG1.aspx>.

1.2 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. The meeting was attended by 54 participants from 18 States/Administrations and 2 international organizations and considered 10 Working Papers (WP), 4 Information Papers (IP), 2 Presentations and 1 Flimsy. All meeting documents and the report of the meeting are available at <http://www.icao.int/APAC/Meetings/Pages/2015-PBNICG2.aspx>.

1.3 Before the PBNICG/2, an ICAO Regional PBN Seminar on “Expanding PBN and Facing the Challenges in the Asia and Pacific Regions” took place at the same venue from 8-10 June 2015. 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>.

2. DISCUSSION

PBNICG/1 and PBNICG/2 outcomes

2.1 During the two PBNICG meetings, many action items were developed (see **Attachment 1**). Among them, the followings are requested to review and consider by the meeting:

2.2 Development of 'PBN-in-a page' document (see **Attachment 2**).

2.2.1 'PBN-in-a-page' is a document which summarized relevant PBN-related information from various ICAO documents, including Doc 9613, PANS-OPS, and PANS-ATM and tabularized them into one page to be used as a quick reference material during PBNICG meetings and during PBN airspace and route design sessions. It contains RNP requirements for each phase of flight, required navigation infrastructure, route spacing (separation) requirements, additional functionality and operational requirements for each navigation specification.

2.2.2 The PBN-in-a-page has been updated the contents reflecting inputs from several PBN Design Sessions conducted by ICAO APAC RSO with APAC States and PBNICG meetings. Regarding route spacing, criteria in addition to ICAO standards are included in the document as PBN Manual (Doc 9613) includes other States' best practices regarding route spacing. In this regard, PBNICG/2 asked ICAO to provide this document to the relevant Panels and Study Groups for the review and provide related guidance on route spacing. Also the meeting established the following draft decision for adoption by the APANPIRG:

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.

2.3 Development of PBN Procedure Safety Assessment Checklist (see **Attachment 3**).

2.3.1 Recognizing the safety assessment requirement on PBN procedures in various ICAO documents including PANS-OPS (Doc 8168) and Quality Assurance Manual for Flight Procedure Design (Doc 9906) and difficulties on the proceed of safety assessment, PBNICG meeting developed PBN Procedure Safety Assessment Checklist. The checklist consists of three parts, RNP Approach, SID/STAR and ATS Route and can be used when identifying hazards in the procedures.

2.3.2 Once hazards are identified, the safety assessment team of a State could begin safety assessment process which is detailed in the Safety Management Manual (Doc 9859) or in its own regulation. After the completion of safety assessment, a form which includes the summary of hazard identification, analysis and mitigation can be used to record the results.

2.3.3 Recognizing the usefulness of the checklist as an interim guidance material for the region before the ICAO global material to become available, the meeting developed the following draft decision for adoption by the APANPIRG. Also the meeting asked ICAO to coordinate with the relevant Panels and Study Groups on the proposed checklists to include them in the Quality Assessment process.

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.

2.4 Development of PBN Implementation Progress Reporting Form (see Attachment 4)

2.4.1 The PBNICG meeting reviewed the PBN Implementation Progress Report which was used by the previous APAC PBN Task Force and developed PBN Implementation Progress Report Form which aimed at meeting global and regional PBN implementation reporting requirements.

2.4.2 The reporting form includes States' PBN implementation status information on State PBN Implementation Plan, continuous descent/climb operations (CDO/CCO), PBN approach, standard instrument departures/ standard terminal arrivals (SID/STAR) and PBN routes, Also it has two levels of data collection, Option A and Option B. Option A consisted in the collection of high level indicators in line with Regional Seamless ATM reporting scheme, while Option B proposed a more detailed data collection down to the types of procedures per runway end, which could help solve some inconsistencies between ICAO *integrated* Safety Trend Analysis and Reporting System (iSTARS) 2.0 SPACE and States' actual implementation status.

2.4.3 In this regard, the meeting agreed to retain option A as mandatory and integrate it as soon as possible in the Seamless ATM reporting scheme. In addition, Option B would be used for those States/Administrations needing assistance in tracking their detailed progress and ICAO APAC RSO would assess the feasibility of an engine for assisting desirous States with computing their metrics as per Option B.

2.4.4 Considering the importance of the reporting, following actions were taken:

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.

2.5 Other issues related to Navigation

2.5.1 Recognizing 14 out of 42 States had not submitted their State PBN Implementation Plans and updating State's PBN implementation plan which was already published was required, the meeting asked APAC Regional Office to issue a State letter to request APAC States and Administrations who have not submitted yet a PBN plan to do so and who published their plan to update the plan by the end of 2016.

2.5.2 The Maldives informed the meeting of the operations of RNP 1 domestic parallel routes and using their experiences, expressed their intention to extend the RNP 1 parallel route operations between Male and Colombo, Sri Lanka. ICAO APAC RSO was requested to coordinate with the stakeholders in Sri Lanka and facilitate the possible discussion on the PBN parallel route concept between Male and Colombo.

2.5.3 Recognizing the benefit of establishing conditional routes (CDR) with appropriate PBN navigation specifications within special use of airspace (SUA), the meeting discussed the efficiency and safety value of national development of particular specifications for State aircrafts to meet performance level of PBN specifications. To gather more information, the meeting asked States to provide their views as to the necessity and feasibility to have a national military PBN operational approval mechanism.

2.5.4 Regarding implementation of Advanced RNP (ARNP) navigation specification implementation, the mandatory requirement of the radius to fix (RF) functionality may create a difficulty to an early implementation of ARNP because of limited guidance material for implementation of ARNP procedures and small ratio of RF capable aircraft. In addition, some European airlines did not consider to get an approval on RF until 2018. Considering these, the PBNICG requested PBN Study Group to consider RF as an optional requirement for ARNP during the transition period.

2.5.5 Realizing insufficient guidance materials and fleet capability information on the new PBN navigation specification (RNP2, ARNP and RNP 0.3) implementation, the meeting asked IATA to provide the estimated population and the forecast growth for every 5 years period of all new navigation specifications and States, through ICAO HQ, to prepare a paper to PBN study group specifying needs and operational requirements for establishing new or updating PBN navigation specification and PBN Manual to support 0.3 NM outside final approach segment.

2.5.6 PBNICG/2 discussed the need for updating PBN related information in the APAC Seamless ATM Plan. Considering the review cycle of the plan, the meeting agreed to form a small group to review PBN related elements such as targets, metrics, implementation status and the related documents in the APAC Region Seamless ATM Plan and present the review report to the CNS SG/20 of the APANPIRG in 2016.

2.5.7 The meeting looked over the issue about the lack of guidance to implement the guided visual approaches (or RNAV visual approaches). Recognizing guided visual approaches may be considered an useful method for airports where non-precision approaches or no instrument approaches were used, the meeting asked ICAO to consider providing information on current progress of Panel works regarding guided visual procedures and States to present a paper on their implementation experience regarding guided visual procedures.

ICAO Regional PBN Seminar outcomes

2.6 During the Seminar, training issues related to PBN implementation were raised as follows:

2.6.1 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. In relation to this issue, PBNICG/2 which followed the Seminar asked 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.

2.6.2 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. The educational conference may be conducted in conjunction with PBNICG/4.

2.6.3 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.

2.7 Other key points

2.7.1 ICAO and APAC States are invited to improve the process for PBN operational 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.

2.7.2 The Seminar recognized the need to expedite the development of SARPS for Equivalent Lateral Spacing Operations (ELSO) and parallel approach operations for GLS and RNP.

2.8 Other key points of ICAO Regional Seminar are in **Attachment 5**.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the outcomes of the PBNICG/1 and PBNICG/2 meetings and ICAO Regional PBN Seminar;
- b) review and endorse the draft decisions developed by PBNICG meetings in paragraph 2.2 and 2.3; and
- c) discuss any relevant matters as appropriate.

Action Item	Action	Owner	Contributors	Target date	Status	Result	Comment	Reference to TOR
1/1	States are encouraged to consider including military aerodromes where international civil operations are taking place into the Regional Air Navigation Plan (RANP) and State PBN Implementation Plan.	All		18-Dec-15	Closed	States are invited to consider this action	ICG1-WP2	1-b
1/2	To provide Fiji with the draft amendment to Annex 11 regarding the flight procedures regulatory framework.	Noppadol Pringvanich	Erwin Lassooij	11-Jun-15	Closed	State Letter 2015/22	ICG1-WP4	2
1/3	To coordinate with APAC FPP Steering committee about the need for procedure design course for helicopters.	Noppadol Pringvanich		30-Nov-15	Open	WP will be submitted to APAC FPP SC during their annual meeting in Nov 2015	Need was raised by Maldives (Ibrahim Hameed)	1-a
1/4	To review and enhance the PBN Implementation Progress Report form, such that it can fulfill global and regional PBN reporting requirements.	IlaitiaTabakaucooro	Hermizan Jumari, Xiang Xiao Jun, Zhang Ying, Frederic Lecat, Huho Ha	11-Jun-15	Closed	See. PBNICG/2 WP/04	ICG1WP1/WP9	1-a
1/5	APAC Regional Office to issue a State letter to request APAC States and Administrations not having submitted yet a PBN plan to do so, provide PBN POCs, and consider forming sub-regional groups as necessary.	Frederic Lecat	Noppadol Pringvanich	11-Jun-15	Closed	See State Letter AP052-15	As per 11Mar. 15, States/Adm. not having submitted are: Afghanistan, Bhutan, Brunei Darussalam, China Macao, Cook Islands, Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, Palau, Samoa, Solomon Islands, Timor-Leste, Vanuatu	1-b
1/6	With regard to action 1/5, Fiji in cooperation with RSO to assist Pacific Islands States who have not developed or submitted their PBN Implementation Plan.	IlaitiaTabakaucooro	Noppadol Pringvanich	18-Dec-15	Open	Fiji will coordinate this in June 2015	ICG1-WP10	1-b
1/7	With regard to action 1/5, to coordinate with Brunei Darussalam for the PBN implementation including the submission of State PBN Implementation Plan.	Noppadol Pringvanich		11-Jun-15	Open	Planning for PBN implementation support for Brunei is being coordinated between ICAO HQ and ICAO APAC RSO	ICG1-WP10	1-b
1/8	Maldives to share with Myanmar the benefits/experience of implementation of PBN (RNP 1) Domestic routes.	Ibrahim Hameed	Noppadol Pringvanich	14-Aug-15	Closed	See Maldives presentation during 2015 APAC PBN Seminar	ICG1 - IP04	1-c
1/9	To remind PBN Study Group through APAC RO about the need for the requirement for ARNP Charting Criteria to support the application of ARNP to be available by as soon as possible, preferably by the end of 2015.	Frederic Lecat	Joe Lam	11-Jun-15	Closed	Updated received from ICAO HQ. The charting for ARNP is available but still need for the enroute part. Job cards for panels have been developed	ICG1 - IP8	2
1/10	To invite PBN Study Group to develop/review guidance material on PBN when used to support User Preferred Route (UPR)/Flex Track operations, especially regarding database management.	Frederic Lecat	IlaitiaTabakaucooro, Noppadol Pringvanich	11-Jun-15	Closed		ICG1-IP12	1-c, 2
1/11	APAC Regional Office to issue a State letter to request APAC States and Administrations to update their PBN Implementation Plan by the end of 2016.	Frederic Lecat	Noppadol Pringvanich	11-Jun-15	Closed	See State Letter AP052-15	ICG1-WP5	1-a, b
1/12	To review the targets and metrics which are related to PBN in the APAC Seamless ATM Plan and provide inputs, if any to the APAC Regional Office before the next review cycle of the APAC Seamless ATM Plan.	Noppadol Pringvanich	Frederic Lecat	The next review cycle of the APAC Seamless ATM Plan.	Open	See PBNICG/2 WP/08. PBNICG agrees to form a small group to work on the proposal for update.	ICG1-IP6	3
1/13	States to report analysis of benefits and challenges with implementing PBN.	All	Noppadol Pringvanich	30-Sep-15	Closed	See PBN Seminar 2015		1-d
1/14	To collect issues regarding the use of ICARD system by the States and deliver them to the relevant section of ICAO HQ through ICAO RO.	Joe Lam	Zhang Ying	31-Mar-16 PBNICG/3	Open		ICG1-IP6	1-a, 2
1/15	ICAO to clarify relevant criteria of 5LNC and route designation allocation in respect of all the parameters applied e.g. similar pronunciation definition and to provide clear detailed guidelines on using ICARD system. On the other hand to enhance the performance of ICARD application.	ICAO		11-Jun-15	Closed		ICG1-IP6	1-a, 2
1/16	To stipulate clearly the logic, the criteria for ICARD parameters and supplement with clear detail guidelines; and to enhance the service provided by ICARD regarding the similar pronunciation and ICARD application performance.	ICAO		11-Jun-15	Closed		ICG1-IP6	1-a, 2
1/17	To improve and review the draft 'PBN-in-a-page' (see comment part).	Joe Lam, IlaitiaTabakaucooro	Hu Ho Ha, all participants for inputs	11-Jun-15	Closed	See. PBNICG/2 WP/02	ICG1- Flimsy01 - Add a column on database requirements, and isolate COM/SUR/NAV as columns	1-a, 2

1/18	States to send their views as to the necessity and feasibility to have a national military PBN operational approval mechanism.	All	Noppadol Pringvanich	18-Dec-15	Open		ICG1-WP8	2
1/19	RSO to coordinate with Australia regarding RNP10 for A461.	Noppadol Pringvanich	Ian Mallett	11-Jun-15	Open	Discussion is now on-going at SCS MTRF meeting which will be conducted in July 2015. Australia will be coordinated following the meeting.	ICG1-IP01	1-c
1/20	To provide information from SASP to PBNICG about RNP AR and ILS simultaneous operations.	Ian Mallett		11-Jun-15	Closed	See presentations from PBN Seminar 2015	ICG1-IP01	1-a
1/21	APAC RSO to draft a Statement Of Work (SOW) for sub-regional groups to engage in sub-regional review of ATS routes, propose draft material and associated work plan to the relevant informal and formal (ICAO) bodies as needed, in order to ensure extensive review and consistency.	Noppadol Pringvanich	IlaitiaTabakaucoro, Frederic Lecat	11-Jun-15	Open	See PBNICG/2 Flimsy/1	ICG1-IP07	1-c
1/22	To better scope and enhance the PBN checklist for RNP APCH, SIDs/STARs and develop a draft checklist for PBN en-route.	Joe Lam, IlaitiaTabakaucoro	Ibrahim Hameed, M.S.Athar, Hermizan Jumari, Noppadol Pringvanich, Frederic Lecat, Huho Ha	11-Jun-15	Closed	See PBNICG/2 WP/03	ICG1-WP7	1-a, 2
1/23	Considering the low level of current fleet capability for RF, to request PBN Study Group to consider RF as an optional requirement for ARNP during the transition period.	Frederic Lecat	Joe Lam	11-Jun-15	Closed	This proposeal is being considered by PBNSG. Alternate options are being evaluated.	ICG1-WP11	2
1/24	To check that any reference to 12.6 NM separation be removed from RANP.	Frederic Lecat		11-Jun-15	Closed		ICG1-IP5	3

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 Lassooij	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 Lassooij	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 Lassooij, 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 Lassooij, 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 Lassooij	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	IlaitiaTabakaucoro, 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 Lassooij		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 Lassooij		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	IlaitiaTabakaucoro	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 Lassooij	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 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.						ICG2-WP02	1-a. 2
D2/2	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.						ICG2-WP03	1-b

Nav Specs	Flight Phase (PANS-OPS Table III-1-1-1, PBN Manual Table II-A-1-1)								Supporting Nav. Infrastructure	Route Spacing (NM)	Additional Functionality (Required or Optional)					Operational Requirements (Doc 9613, Vol II, Attachment B)			
	En-route Remote	En-route Continental	Arrival	Approach				Departure			RF	FRT	TOAC ²⁾	Baro VNAV	Nav DB	Communication	Navigation	Surveillance	Others
				Initial	Intermediate	Final	Missed ¹⁾												
RNAV 10	10								Not require ground-based Naviad Dual LRNS (INS, IRS FMS, GNSS)	50 (PANS-ATM Para 5.4.1.2.1.6, Doc 9613 Vol II, Part B Para 1.2.3.3)			TBD ²⁾	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 ⁻⁹ accident per flight hour	
RNAV 5		5	5 ³⁾						VOR/DME DME/DME INS or IRS GNSS	16.5 - straight unidirectional racks (same direction route-ECAC) 18 - straight bidirectional tracks (opposite direction route- ECAC) 10 - ATC intervention capability (ECAC) 30 - No ATS Surveillance in high traffic density (ECAC) (Doc 9613, II-B Para 2.2.3.2, 2.2.3.3, Attachment B, Para 4.3, 4.3.1)			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) (Doc 9613, Vol II Attachment B, Para 4.4)			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) (Doc 9613, Vol II Attachment B, Para 5.1) 7 for SIDs/STARs (PANS-ATM Para 5.4.1.2.1.4)			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) (Doc 9613, Vol II, Attachment B, Para 3.3) 50 or 30 [*] (PANS-ATM Para 5.4.1.2.1.6) [*] 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	Sytem verification assuring lateral deviation less than 15NM	
RNP 2	2	2							GNSS	50, 30 or 15 7 for climb/descend through other aircraft with VHF DCPC 20 for climb/descend through other aircraft with other type of com. (PANS-ATM Para 5.4.1.2.1.6)		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 Para 5.4.1.2.1.4)	O		TBD	O	R	DCPC (RNP 1 SIDs/STARs)	RNP 1 OPS Approval	Not required except reduced route spacing	
A RNP ⁴⁾	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) (Doc 9613, Vol II Attachment B, Para 4.4, 5.2) 6 to 7 NM with an RNP 0.5 (terminal, (Doc 9613, Vol II Attachment B, Para 5.2.1)	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) ⁵⁾				1	1	0.3	1		GNSS (Missed App - RNAV or Conv.)	5 for SIDs/STARs (PANS-ATM Para 5.4.1.2.1.4)	O		TBD	O	R	Not required	RNP APCH OPS Approval	Not required	
RNP APCH (Part B) ⁵⁾				1	1	Angular	1 or 0.3 (Initial Straight MISAP)		GNSS	5 for SIDs/STARs (PANS-ATM Para 5.4.1.2.1.4)	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 Para 5.4.1.2.1.4)	R ⁶⁾		TBD	R ⁶⁾	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 scaleability 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**

PBN Procedure Safety Assessment Initial Checklist – RNP APCH					
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? ▪ Comments :				
2	Were proposed flight procedures/amendments designed by an qualified flight procedure designer and reviewed independently by another qualified flight procedure designer? ▪ Comments :				
3	Did procedure designers coordinate with stakeholders such as ATC, operators, etc., regarding new and/or amended flight procedures? ▪ 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? ▪ Comments :				
5	Are the locations of waypoints and restrictions (speed, altitude, etc.) appropriate for the aircraft types expected to use these procedures? ▪ List aircraft categories considered: ▪ 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. ▪ 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.)? ▪ 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? Comments :				
9	Referring to ICAO Annex 4, 15 and Doc 8697, are there any errors on the chart(s)? (Items to focus on: Magnetic Bearings/True Headings, Distances, Climb/Descent Gradients, TAA/MSA, Magnetic Variation, Topography, Location of Obstacles, Coordinates, Restrictions, etc.) ▪ Comments :				

10	Were all obstacles evaluated when calculating OCA/H in the proposed procedures and properly documented? ▪ Comments :			
11	Were RAIM/GNSS availability and prediction (as necessary) considered while implementing the proposed procedures? ▪ 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? ▪ 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? ▪ 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? ▪ 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? ▪ 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? ▪ Comments :			
17	For LNAV/VNAV Procedures: Is the location of the altimeter setting source appropriate for the use of the Baro-VNAV approach procedure? ▪ Comments :			
18	For LNAV/VNAV Procedure: Is the published minimum temperature reasonable for the application of the Baro-VNAV procedure? ▪ 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? ▪ 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? ▪ Comments :			

21	<p>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?</p> <p>▪ Comments :</p>			
22	<p>Are there any other safety considerations regarding the procedure(s)?</p> <p>▪ Comment :</p>			

2. SID/STAR

PBN Procedure Safety Assessment Initial Checklist – SID/STAR					
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? ▪ Comments :				
2	Were proposed flight procedures/amendments designed by an qualified flight procedure designer and reviewed independently by another qualified flight procedure designer? ▪ Comments :				
3	Did procedure designers coordinate with related entities such as ATC, Operators, etc., regarding new and/or amended flight procedures? ▪ 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? ▪ Comments :				
5	Are the locations of waypoint and restrictions (speed, altitude, etc.) appropriate for the aircraft that is expected to use the procedures? ▪ 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. ▪ 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.)? ▪ 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? ▪ Comments :				
9	Referring to ICAO Annex 4, 15 and Doc 8697, are there any errors on the chart(s)? (check items : magnetic bearing/true heading, distance, climb/descent gradient, TAA/MSA, magnetic variation, topography, location of obstacle, coordinates, restrictions, etc.) ▪ Comments :				
10	Were all obstacles evaluated in the proposed procedures and properly documented? ▪ Comments :				

11	Were coverage and limitations of available avionics, ground navigational aids and GNSS considered while designing and validating the proposed procedures? ▪ Comments :			
12	Were traffic flows in the terminal area considered while designing the proposed procedures? ▪ Comments :			
13	Are climb/descent rates of the proposed procedures appropriate to enabling the climb/descent within the airspace? ▪ 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)? ▪ 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)? ▪ Comments :			
16	Did the proposed procedures consider current and expected future airspace capacity? ▪ 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? ▪ Comments :			
18	Is there any training plan for air traffic controllers on the proposed procedures? Has the training been conducted? ▪ 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? 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? ▪ Comments :			
21	Are there any other safety considerations regarding the procedure(s)? ▪ Comment :			

3. ATS Route

PBN Safety Assessment Initial Checklist – ATS Route					
Assessor				<input type="checkbox"/> New	<input type="checkbox"/> Amended
Route Designator				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? Comments :				
2	Has proposed ATS route been reviewed independently by a qualified route designer? Comments :				
3	Did procedure designers coordinate with related entities such as ATC, Operators, etc., regarding the new and/or amended ATS route? ▪ 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? ▪ 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? ▪ 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. ▪ 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? ▪ 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.)? ▪ 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? ▪ Comments :				
10	Referring to ICAO Annex 4, 15 and Doc 8697, are there any errors on the AIP publication? (check items : magnetic bearing/true heading, distance, coordinates, restrictions, directions, etc.) ▪ Comments :				

11	Were all obstacles evaluated in the proposed ATS route and properly documented? ▪ Comments :			
12	Were coverage and limitations of available avionics, ground navigational aids and GNSS considered while designing and validating the proposed procedures? ▪ Comments :			
13	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)? ▪ Comments :			
14	Do the proposed ATS route consider separation between aircraft using PBN procedures and aircraft using other procedures specified in ICAO PANS-ATM (Doc 4444)? ▪ Comments :			
15	Did the proposed ATS route consider current and expected future airspace capacity? ▪ Comments :			
16	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? ▪ Comments :			
17	Is there any training plan for air traffic controllers on the proposed ATS route? Has the training been conducted? ▪ Comments :			
18	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? ▪ Comments :			
19	Are there any other safety considerations regarding the proposed route(s)? ▪ Comments :			

Appendix. Record on Identification, Analysis and Mitigation of Hazard

Identification No		Source	<input type="checkbox"/> Safety Report <input type="checkbox"/> Safety Review <input type="checkbox"/> Safety Assessment <input type="checkbox"/> Safety Audit <input type="checkbox"/> Safety Observation <input type="checkbox"/> Safety Survey <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 <input type="checkbox"/> Acceptable based on risk mitigation <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

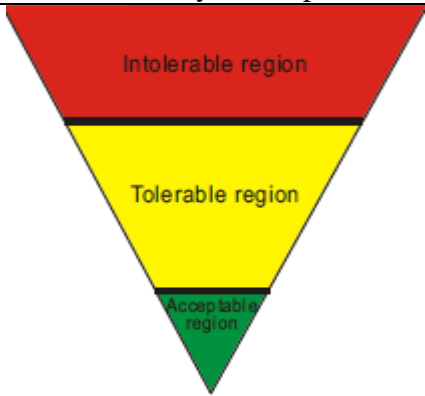
Safety Risk Severity Table (SMM Manual (Doc 9859) Figure 2-12)

Severity	Meaning	Value
Catastrophic	<ul style="list-style-type: none"> Equipment destroyed Multiple deaths 	A
Hazardous	<ul style="list-style-type: none"> 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 Serious injury Major equipment damage 	B
Major	<ul style="list-style-type: none"> 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 Serious incident Injury to persons 	C
Minor	<ul style="list-style-type: none"> Nuisance Operational limitations Use of emergency procedures Minor incident 	D
Negligible	<ul style="list-style-type: none"> Few consequences 	E

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

Risk Probability	Risk Severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely Improbable 1	1A	1B	1C	1D	1E

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

Tolerability Description	Assessed Risk Index	Suggested Criteria
	5A, 5B, 5C, 4A, 4B, 3A	Unacceptable under the existing circumstances
	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D 2A, 2B, 2C, 1A	Acceptable based on risk mitigation. It may require management decision.
	3E, 2D, 2E, 1B, 1C, 1D, 1E	Acceptable

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 PlanStatus: 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 runway ends with	APV/Baro					
	APV/SBAS					
	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					
	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
RNAV 10					
RNAV 5					
RNAV 2					
RNP 4					
RNP 2					
RNP1					
RNP AR					
A-RNP					

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 — — —

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.