INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE TWELFTH MEETING OF THE PERFORMANCE BASED NAVIGATION IMPLEMENTATION COORDINATION GROUP (PBNICG/12)

16-18 December 2025
At APAC RSO in Beijing, China

The views expressed in this Report should be taken as those of the Meeting and not the Organization

Approved by the Meeting
and published by the ICAO Asia and Pacific Office, Bangkok

HISTORY OF THE MEETING

1. Introduction

1.1 The twelfth Meeting of the Performance Based Navigation Implementation Coordination Group (PBNICG/12) was held at the ICAO Asia and Pacific Regional Sub-Office (APAC RSO), Beijing, China from 16 to 18 December 2025.

2. Attendance

2.1 The meeting was attended by 47 participants (in-person and online) from Australia, Brunei Darussalam, Cambodia, China, Hong Kong, China, DPRK, Fiji, India, Indonesia, Lao PDR, Malaysia, Maldives, Philippines, Singapore, Thailand, the United States of America, Viet Nam, IATA and ICAO

2.2 The participants from States were multi-disciplinary experts in various fields related to PBN implementation including CAA Regulators, Inspectors, ANSPs, instrument flight procedure designers, engineers and airlines. The relevant presentations and documents are available at https://www.icao.int/APAC/meetingdocs?fid=599 The list of participants is placed at **Attachment 1.**

3. Opening of the Meeting

3.1 The Chairman of the PBNICG, Mr. Ravinder Singh Jamwal, Director of operations (ANSS & FSD), DGCA India, joined the meeting online and welcomed the participants.

3.2 Mr. Raphael Guillet, Chief of ICAO Asia/Pacific Regional Sub-Office (RSO), welcomed the participants of the PBNICG/12. He emphasized that sharing experiences and learning from others were the most important objectives of the meeting. He then invited all States to actively participate in the meeting discussion and provide ideas to sustain the PBN implementation in the APAC region.

4 Officers and Secretariat

4.1 The meeting was chaired by Mr. Ravinder Singh Jamwal. Mr. Raphael Guillet acted as secretary and was supported by Ms. Chen Yan RU, Program Assistant, ICAO APAC RSO.

5. Working Arrangements, Language and Documentation

5.2 The working language of the meeting was English, including all documentation and this report. A list of Working and Information Papers is provided in IP01.

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Agenda Item 1: Adoption of agenda

1.1 The Chairman introduced the provisional agenda (WP01) to the meeting.

1.2 The meeting reviewed and agreed on the proposed agenda without changes, as follows:

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Global and Regional PBN Updates

Agenda Item 3: Review of PBN priorities in APAC Seamless ANS Plan

Agenda Item 4: States' PBN Implementation Progress and the challenges faced by the States and lessons learnt.

Agenda Item 5: Outcomes of SBAS GBAS implementation workshop for airspace users, 14-16 Oct 2025, Bengaluru, India and SBAS/GBAS ITF

Agenda Item 6: RAIM understanding and implementation

Agenda Item 7: Any other business

Agenda Item 8: Date and Venue of the Next Meeting

Agenda item 2: Global and Regional PBN updates

SP01– Global and Regional PBN Update (Secretariat)

2.1 The Secretary recalled the different documents in which PBN is mentioned: GANP, A37-11 resolution, Beijing and Delhi Declarations, APAC Seamless ANS plan. This last document will soon be replaced by the Regional Air Navigation Plan Vol III. PBN remains a Global Priority and States are encouraged to continue their PBN implementation at international and domestic airports.

2.2 ICAO has a partnership with Jeppesen to obtain, on a quarterly basis, all the PBN procedures for international airports all over the world. This enables ICAO to report on the PBN implementation in APAC at DGCA Conference, APANPIRG, and PBNICG meetings. This annual monitoring indicates the development of PBN year after year. The APAC region has a good percentage of LNAV/VNAV implementation compared to the global picture but for LPV we can see that APAC is lagging behind. With the development of six SBAS systems in APAC, it is expected that the number of LPV procedures will soon increase in APAC.

2.3 The Secretary also informed the meeting about the last ICAO Electronic Bulletin 2025.36 to follow up on the Amendments of Annex 10 related to PBN.

2.4 USA mentioned that the Minimum Operational Network implementation will require lots of investment and time, and so planning all this is key. USA also added that a GPS failure can be considered as contingency and explained that the APAC ANSP Committee Work Stream 3 is working with the ICAO APAC regional office on the development of the APAC Contingency framework after

the Global Contingency Framework will be developed by ICAO Air Navigation Bureau.

SP02 - 2D 3D approach procedure (Secretariat)

2.5 The Secretary presented some information from ICAO Annex 6 to clearly explain the different types of approaches, 2D and 3D, as well as the corresponding horizontal and vertical alarm limits and the associated Decision Heights. He insisted on the difference between APV SBAS which has a DH of 250ft and above, while SBAS Cat I can provide DH around 200ft and is then categorized as 3D. Both GBAS and SBAS systems provide geometric guidance which are independent of QNH setting and Temperature.

2.6 Lao PDR mentioned some challenges they are facing in the approval process for domestic aircraft fleets operations and in the training. The Chair and Secretary emphasized the importance of national regulation in clearly specifying the obligations of each stakeholder. The Chair invited States interested to contact him to share the experience of India.

Agenda Item 3: Review of PBN priorities in APAC Seamless ANS Plan

SP03 – Review of PBN priorities in APAC Seamless ANS Plan (Secretariat)

3.1 The Secretary presented the ASBU elements listed in the APAC Seamless ANS plan (Version 4) which are related to PBN: APTA and NAVS. An inconsistency was notified few months ago on the priority of NAVS/Block 0 with all (GBAS, SBAS, ABAS Nav, MON) to have a priority 1. Correction has been discussed in CNS/SG and approved at last APANPIRG meeting. Now, NAVS-B0 GBAS and SBAS have priority 2 while NAVS-B0 ABAS and Nav. MON have priority 1.

Agenda Item 4: States' PBN Implementation Progress and the challenges faced by the States and lessons learnt.

WP02 – Update on Australian PBN implementation (Australia)

4.1 Australia presented the WP02 on the implementation of GBAS and of CDO, as well on the renaming of way points.

4.2 GLS procedures based on GBAS stations have been published at Sydney in 2014 and in Melbourne in 2018. Around 60% of aircraft landing on these airports are GLS equipped. Viet Nam asked for the advantages/differences between ILS and GLS. Australia replied that one GBAS station can serve several runway ends and pilots reported that flying GLS procedure is more stable than flying the ILS procedures. As for ATC, it does not change their work if aircraft are flying GLS or ILS procedures. USA also added that the sensitive area is much lower with a GBAS station than with an ILS system. USA asked if Australia has heard of cases of aircraft having faced GNSS RFI and then facing some problems while flying GLS procedures. Australia replied by a no.

4.3 For the CDO, Australia explained that there has been positive uptake of the trial both by domestic airline pilots as well as the Air Traffic Controllers from the trial areas. Australia added that domestic airlines are familiar with the procedures, so they ask to use CDO while Foreign Airlines need to get more experience and maybe also more communication on the frequency. China inquired about the possibility of detailing the method to compute the fuel savings. Australia said it could not

further explain but IATA informed the meeting that they were conducting some work to define a methodology to compute fuel savings in CDO.

4.4 Australia explained that the program to rename all duplicated waypoint names in compliance with ICAO conventions is nearing completion.

WP05 – PBN Implementation Progress Indonesia (Indonesia)

4.5 Indonesia presented their plan to deploy more PBN approach procedures and SID/STAR at Domestic and International airports. Indonesia also mentioned all the cooperation with Boeing, Airbus, DGAC France to optimize airspace capacity and flow management, ensuring the implementation of efficient PBN SID/STAR procedures. Indonesia added their national PBN forum is meeting once a year at least, involving air operators and defining all the planning of PBN deployment in Indonesia.

4.6 USA asked Indonesia who is defining the priorities, is it the CAA or the ANSP? And who is deciding on the funding? Indonesia replied that this is decided by the forum that consists of the regulator, ANSP, airport operator and the airlines. Budgeting for implementing PBN is the responsibility of each stakeholder in accordance with their respective duties and functions. The Chair shared the experience of India where priorities of deployment of PBN procedures are decided mainly by air operators then DGCA/AAI are doing their best to satisfy the expectations. Viet Nam also asked about Regulation and Safety Assessment for RNP AR. Indonesia replied that they are continuously learning and, for the RNP AR, they must conduct ground simulator or flight validation.

IP03 – Update on PBN implementation in Lao PDR (Lao PDR)

4.7 Lao PDR presented its progress in PBN implementation, including new RNP APCH and RNP 1 SID/STAR procedures, updates to RNAV 2 ATS routes, and completion of the RNAV to RNP chart transition. Future plans include further PBN expansion at Savannakhet International Airport and exploration of new ATS route connectivity.

4.8 The Secretary pointed out that he did not see any LNAV/VNAV procedures listed in the IP. Lao PDR confirmed that currently there is no LNAV/VNAV procedures published yet.

IP04 – Update on PBN implementation progress in Viet Nam and challenges encountered (Viet Nam)

4.9 Viet Nam presented the details of PBN implementation in the country. To ensure service availability and integrity for airspace users, Viet Nam has implemented a web-based RAIM information service developed by third party. Due to the valley terrain and surrounding high mountains in some airports, which limit obstacle clearance and gradient (unsuitable for Baro-VNAV), Viet Nam has researched and designed RNP AR procedures but is still facing challenges due to a lack of practical experience in RNP AR. The Chair invited Viet Nam to contact India to explore how they could share their experiences.

WP03 – Initiative for RNP (VPT) implementation in Thailand

4.10 Thailand presented the information on an initiative to implement RNP (VPT)

procedures, as detailed in ICAO Circular 359, for runway ends where no instrument approach procedures are available.

4.11 RNP (VPT) has been identified as more practical than RNP AR in Thailand due to its simpler authorization process, which reduces regulatory burdens for airlines while maintaining an equivalent level of operational safety. This is achieved by applying the same design criteria during the visual phase of flight.

4.12 Thailand plans to establish its first RNP (VPT) procedure for Runway 14 at Krabi Airport (VTSG), which currently has no instrument approach procedure, and where circling approaches are not permitted due to high terrain. In addition, an RNP (VPT) procedure will be established for Runway 32 to reduce track miles compared with the existing ILS procedures. Both RNP (VPT) procedures are expected to be implemented by 2026.

4.13 The meeting agreed that this is a new subject and States are invited to review the documentation internally and come to the next meeting to share their thoughts/ideas and experiences. The Secretary also mentioned an EASA Safety Information Bulletin on this matter issued on 27 May 2025.

Agenda Item 5: Outcomes of SBAS GBAS implementation workshop for airspace users, 14-16 Oct 2025, Bengaluru, India and SBAS/GBAS ITF

SP04 - Outcomes of SBAS GBAS implementation workshop for airspace users Oct 2025 Bengaluru India (Secretariat)

5.1 The Secretary presented the content of the GBAS SBAS workshop conducted in India mid-October. This followed the first workshop conducted in 2019 in Republic of Korea and aimed at exchanging more with airspace users. Indeed, India has recently published 23 LPV procedures and Indigo airlines have made a presentation to explain their strategy to use LPV.

5.2 The Secretary recalled that the GBAS SBAS implementation task force has developed GBAS implementation guidance document and is finalizing the SBAS implementation guidance document, soon available on ICAO APAC webpage. The task force has also developed a map of the GLS and LPV published procedures to improve communication towards airspace users. The Secretary plans to attend an IATA regional meeting with airlines to share the implementation status of GBAS and SBAS development in the region and highlight where procedures have already been published.

Agenda Item 6: RAIM understanding and implementation

SP05- Introduction to Receiver Autonomous Integrity Monitoring (RAIM) (Secretariat)

6.1 The Secretary presented an overview of the RAIM function in all GPS receivers onboard aircraft to ensure integrity of the positioning. Using the redundancy of the GPS satellite constellation, it is possible to detect and exclude some faulty satellites. If RAIM is predicted to be unavailable for more than five minutes, the pilot should amend the planned route or plan an appropriate alternative in accordance with published procedures.

6.2 The GNSS Manual (Doc 9849, Fifth Edition 2025) para 4.2.1.2 states : “There are three general classes of integrity monitoring: receiver autonomous integrity monitoring (RAIM),

which uses the GPS L1 coarse/acquisition (C/A) signal information exclusively; advanced RAIM (ARAIM), which can use information from one or more GNSS core satellite constellations in single or dual frequency modes; and aircraft autonomous integrity monitoring (AAIM), which also uses information from additional on-board sensors such as inertial reference systems (IRS)."

6.3 The Secretary reminded the participants that each State needs to define in its AIC/AIP the conditions for the pilot to conduct the RAIM availability prediction. Some States in the APAC region do not have their own RAIM prediction tool and should consider partnership with another State or Industry to put such tool in place.

WP04- RAIM Understanding and Implementation in Indonesia (Indonesia)

6.4 Indonesia underlined the RAIM as a fundamental component of Performance-Based Navigation that ensures the integrity of GNSS signals used in modern air navigation. It provides critical support in maintaining the accuracy and safety of PBN operations, particularly in regions where satellite signals may be subject to degradation.

6.5 However, implementing RAIM across various states, especially in Indonesia, presents significant challenges, including variability in GNSS signal availability, technological limitations, and the need for robust training programs. To overcome these challenges, it is essential to prioritize collaboration and share best practices, while also investing in the necessary infrastructure and training to support the adoption of RAIM.

6.6 Indonesia demonstrated their RAIM prediction tool, available at https://iwish.kemenhub.go.id/

6.7 The Chair added that the RAIM prediction tool can not provide any information on existing GNSS RFI.

IP02- RAIM implementation in Australia (Australia)

6.8 Australia explained that, following data analysis, and after approval of the safety case, the following changes were made to the air traffic management system in November 2023:

- RAIM prediction data display was removed from the current air traffic management system
- the Australian Manual of Air Traffic Services (MATS), and local ATC procedures, were amended to remove the requirement for ATC to apply alternative separation standards in RAIM prediction areas.

6.9 Pilots have the possibility to use a national RAIM service prediction tool. It was also confirmed that no NOTAM is issued for predicted RAIM outage.

Agenda Item 7: Any other business

SP06- GNSS RFI (Secretariat)

7.1 ICAO presented the outcomes of CNS SG to the last APANPIRG meeting related to GNSS RFI. The ICAO APAC Radio Navigation Symposium was held in New Delhi, India, from 07–

09 April 2025. The theme of the Symposium was GNSS RFI: Collectively Bridging Gaps and Shaping the Path Forward.

7.2 The CNS SG Meeting recalled that ICAO, in collaboration with ITU and IMO, has recently issued a joint statement on the protection of the radio navigation satellite service from harmful interference. The ICAO/ITU/IMO statement called for five (5) key actions, which the Symposium reaffirmed and outlined a set of recommended actions and best practices containing six objectives and associated recommendations for all aviation stakeholders.

7.3 The Secretary recalled that coordination at national level is very important. CAA, ANSP, Nation Frequency Agency, law enforcement agencies need to work in coordination to define a clear process from the occurrence of a GNSS RFI until the source is found and stopped.

SP08- Presentation on GNSS Interference in India (India)

7.4 India described the roles and responsibilities of different stakeholders (Airlines, Pilots, ANSP, Air Traffic Controllers, DGCA) in monitoring and mitigating threats upon GNSS RFI occurrence. All this is described in Advisory Circular DGCA_CIRCULAR.pdf A reporting format is also provided.

7.5 If the RAIM outage occurs before the top of descent, then the pilot needs to immediately report to ATC. If it occurs after the top of descent, then reporting will be done post flight.

7.6 India suggested that an APAC Guidance material for GNSS Interference is developed. The Secretary replied that some APANPIRG sub-groups are already working on GNSS RFI and he proposed to double check with APAC CNS Regional Officer to get further details on the ongoing actions taken at regional level.

7.7 Cambodia asked what is the contingency plan for ATC when a GNSS RFI is reported. India replied that assistance first needs to be provided to aircraft, then report the GNSS RFI occurrence to CAA/ANSP who will then report to Nation Frequency Agency, then issue NOTAM if several aircraft are affected.

7.8 Hong Kong China asked if some States have some reversion procedure in case of GNSS RFI occurrence. For example, is it possible to go from RNP 1 (based on GPS only) to RNAV 1 which can also be based on DME/DME. India replied that in the event of GNSS RFI occurrence, the pilot needs to revert to conventional navigation aids.

WP06- Global Action Plan to counter GNSS Interference (India)

7.9 India proposed that a strong and coordinated global response is needed to neutralize the GNSS RFI threat and prevent it from affecting global aviation plans in irrevocable manner. India pointed out that today there are several existing gaps in the present framework to tackle GNSS interference:

(a) No globally mandated incident reporting and database;
(b) No centralized threat monitoring and analysis;
(c) No standardized response protocols; and
(d) No enforcement mechanisms.

7.10 Considering the proposed action by India, the meeting recognized that GNSS interference, including spoofing, is a priority for aviation safety and security issue. Concerning the request to the Council, the Secretary explained that States have already identified this issue in the last 42nd Assembly this year in Montreal with the adoption of some resolutions. Regarding the proposed actions c and d, the Secretary replied that he proposed to coordinate with APAC CNS Regional Officer who are already following this subject for the APAC region.

7.11 USA mentioned that the Flight Safety Foundation was also working on global safety initiatives and that coordination with them could be envisaged to consider GNSS RFI as a safety issue.

SP07- Serious Incident in Paris CDG May 2022 / Transmission of incorrect altimeter setting (QNH) (Secretariat)

7.12 The Secretary presented the serious incident that occurred at Paris CDG in May 2022 due to the transmission of incorrect altimeter setting from the air traffic controller to the pilot while conducting an RNP APCH (with LNAV/VNAV minima). The vertical path followed by the plane was 280 ft below than expected and the aircraft was very close to the ground.

7.13 French CAA, EASA and ICAO EUR/NAT office has published Bulletin to inform the aviation community.

7.14 A few months later, the French ANSP conducted further analysis. The study conducted by the DSNA on a wide basis of observations makes it possible to estimate that the average probability of significant inconsistency (greater than or equal to 2 hPa) on the on-board QNH setting at the time of landing is of the magnitude of 10-3 per approach, and that the probability of occurrence of very significant inconsistency (greater than or equal to 10 hPa) is of the magnitude of 10-4 per approach.

7.15 Australia reported that Industry suggested the potential use of Mode S data to identify discrepancies between QNH in the cockpit and QNH at aerodrome.

7.16 APAC States are invited to share this information with their Safety team, to discuss the importance of QNH for APV Baro VNAV in their national PBN committee, to investigate whether QNH inconsistency is a risk and with which probability, to ensure that Air Traffic Controllers are well trained on the importance of QNH for APV Baro VNAV. It would be appreciated if States could share their findings and outcomes at the next PBNICG13 meeting.

SP09- Briefing on APAC FPP (APAC FPP Manager)

7.17 The APAC FPP manager introduced the programme which aims at supporting APAC States in the training of flight procedure designers. This programme is funded by a group of 8 Active States and one Donor State. 12 User States use the programme and service without participating in the programme funding by annual contribution. The FPP manager encouraged interested APAC States to join the programme.

7.18 The coming courses are:

4-5 Feb	PBN Flight Procedure Design Workshop for non-Designers	Online
30 Mar-3 Apr	RNP-AR Workshop	Beijing
11-15 May	Point in Space (Pins) Procedure Design Course	TBD
15 Jun-10 Jul	Pans-Ops Procedure Design Initial Course	Beijing
07-25 Sep	PBN Procedure Design Course	Beijing
16-20 Nov	Procedure Design Refresher Course (including Charting-Coding for Procedure Designers)	TBD

Agenda Item 8: Date and Venue of the Next Meeting

8.1 The Chairperson proposed that the next PBNICG/13 meeting would tentatively be held on 14 to 16 October 2026. States willing to host may contact the Secretary at rguillet@icao.int.

8.2 The following topics should be discussed at the next meeting: RAIM prediction implementation, QNH mis-setting, GNSS RFI, Contingency procedures, navaids Minimum Operational Network, RNP (VPT), reverse mode in RNP APCH.

Closing of the meeting

The Chairperson thanked the participants for their contributions and expressed appreciation to the ICAO Asia/Pacific Regional Sub-Office for their support. The Secretary appreciated the participation of the States' delegates and the fruitful sharing of information and experience.
