International Civil Aviation Organization

FOURTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND METEOROLOGY SUB-GROUP OF APANPIRG (CNS/MET SG/14)

Jakarta, Indonesia, 19 – 22 July 2010

Agenda Item 5: **Navigation**

1) Review reports of the Performance Based Navigation (PBN) Task Force meetings

OUTCOME OF SIXTH MEETING OF PBN TASK FORCE (PBN TF/6)

(Prepared by the Secretariat and presented by Chairman of PBN Task Force)

SUMMARY

Early implementation of RNAV/RNP (Performance Based Navigation) was recommended both by the Eleventh Air Navigation Conference and by the 36th ICAO Assembly. Regional PBN Task Force was established to facilitate early implementation of PBN in the region. This paper presents the outcomes of Sixth Meeting of the PBN Task Force.

This paper relates to:

Strategic Objectives:
A – Safety;
D – Efficiency

Global Plan Initiatives:
GPI-5 RNAV and RNP (Performance-based navigation)
GPI-11 RNP and RNAV SIDs and STARs
GPI-21 Navigation systems

1. Introduction

1.1 The Thirty Sixth session of ICAO Assembly after recognizing that the implementation of approaches with vertical guidance was not progressing at the desired level and that the global air navigation plan had identified global plan initiatives (GPIs) to concentrate on the incorporation of advanced aircraft navigation capabilities into air navigation infrastructure, adopted Resolution A 36/23 to establish global goals for the implementation of Performance Based Navigation (PBN). State Letter AN 11/45-07/22 dated 27 April 2007 informing about the guidance material for the issuance of PBN operational approvals was released to facilitate the implementation of PBN by the States.

1.2 To meet the requirements of ICAO Assembly Resolution A 36/23, APANPIRG in its Eighteenth Meeting (August 2007) adopted Conclusion 18/52 which stipulated the establishment of a Regional Performance Based Navigation Task Force (PBN/TF), assigning the Task Force the responsibility of developing a PBN Implementation Plan for the Asia Pacific Region and addressing regional PBN implementation related issues. The Terms of Reference for the Task Force were subsequently developed and revised.

1.3 Sixth Meeting of PBN Task Force (PBN TF/6), hosted by Civil Aviation Department, Hong Kong China was held from 3 to 5 February 2010. The meeting was attended by 101 participants from 26 States, 3 International Organizations and two industry partners. Full report of the Meeting is placed at ICAO APAC Office website and can be accessed on the following ICAO APAC webpage: http://www.icao.or.th/meetings/2010/pbn_tf6/index.html. Relevant portion of the meeting report is provided in **Attachment** to this paper.

1.4 Meeting was preceded by the ICAO – CAD Hong Kong China Asia-Pacific PBN Implementation Seminar, also hosted by Civil Aviation Department, Hong Kong China held on 1 and 2 February 2010. The Seminar was attended by 154 participants from 26 States, 4 International Organizations and 3 industry partners. 23 presentations made to the seminar covered following aspects of PBN implementation:

i) ICAO PBN Concept Facilitation
ii) Navigation and Surveillance System Requirements
iii) PBN Procedure Design and Implementation
iv) PBN Operational Approval – Best Practices
v) Benefits of PBN Implementation
vi) PBN Implementation – Users' perspective
vii) State Presentation on Implementation Status.

2. Discussion

2.1 PBN Task Force met in Hong Kong for its Sixth Meeting to discuss issues related to the Global and Regional PBN Implementation progress, technical and operational issues related to the implementation, State and Industry contribution towards the implementation efforts, Regional PBN Performance Metrics, feasibility of establishing a Regional RAIM Prediction System and the Amendment to the Flight Plan.

2.2 Meeting also reviewed the existing Tasks Lists and decided to integrate the Implementation Tasks List into the PBN Task Force Tasks List and formulated a draft Decision recommending its adoption by the CNS/MET SG and the APANPIRG. Meeting, after reviewing the APAC Regional PBN Implementation Plan agreed to update it and formulated a draft Conclusion recommending its adoption.

2.3 Issues related to Aircraft Equipage requirements were discussed, particularly with reference to the display and a draft Conclusion was formulated recommending a procedure to support early adoption of PBN in the region.

3. Action required by the Meeting

3.1 The meeting is invited to:

i) Note the outcome of PBN TF/6 meeting; and

ii) Consider the recommendations of the meeting as highlighted in the Attachment to this paper.

OUTCOME OF PBN TF/6 MEETING

Significant issues discussed in the PBN TF/6 Meeting and the discussion outcome on various Agenda Items is described below:

Global PBN Implementation – Update

The meeting was briefed about the significant PBN initiatives being worked or coordinated by ICAO PBN Programme Office, Montreal. The meeting was also briefed about the work programme related to PBN implementation in the region and the global initiatives taken on this subject. Meeting was informed about the completion of the initial draft of PBN Operational Approval manual. PBN Study Group, in the meeting held in September 2009 adopted the following decisions to give direction to the global PBN implementation:

i) Development of a navigation specifications for SBAS and its inclusion in the PBN Manual as part of the RNP APCH nav spec;
ii) Development of an RNP 2 nav spec for en-route continental application, including remote continental;
iii) Application of RF turns outside final approach in RNP APCH, advanced RNP and Basic – RNP 1 nav specs; and
iv) Development of an Advanced RNP navigation specification

An amendment to the PBN Manual is expected to be ready by the end of 2010, incorporating above decisions.

The meeting was informed that advance copy of the Continuous Descent Operations (CDO) manual to standardize and harmonize development and implementation of CDO will be placed on the ICAO – NET. Providing update on the APAC Flight Procedure Programme, it was informed that the contribution by each Active Participating State was set at $16,000 to facilitate budgeting and approval of States' participation. Meeting was informed about the structure of the programme and the working arrangements. In addition to CAAC, the additional contributions are assured from the following organizations:

- FAA is funding the FPP manager position
- French DGAC/ENAC is providing their GeoTITAN procedure software
- Airbus is providing the funding for the substantial start-up installation and middleware costs associated with introduction of the GeoTITAN software
- Hong Kong China is providing the services of procedure design instructor
- Jeppesen will provide aeronautical data to populate the FPP database
- Other States and organizations have offered or are considering offering additional support to the FPP in the future.

APAC Region PBN Implementation

The meeting was informed that Version 1.0 of the Asia Pacific Regional PBN Implementation Plan had been adopted by APANPIRG and the States, which had not developed their State PBN Implementation Plan, were reminded to develop it. Issues related to the implementation of Continuous Descent Operations (CDO) were discussed and the meeting adopted following Action Items to define the course of action for the implementation of CDO:

Action Item 6/1: that, States are encouraged to consider implementation of CDO in accordance with ICAO CDO Manual Doc 9331 on as many STARs as practicable to enhance fuel efficiency, ease pilot and ATC workloads, and reduce emission and noise.

Action Item 6/2: that, States are encouraged to attend the ICAO PBN Airspace Planning Workshop at the ICAO APAC Office Bangkok on 19 -22 April 2010 to enhance their expertise with airspace design relating to implementation of PBN.

Action Item 6/3: that, States are encouraged to attend the CDO workshop to be held in Bangkok in the week of March 15, 2010 in conjunction with IFPP meeting.
Meeting was briefed about outcome of RASMAG/12 meeting relevant to the subject. The meeting reviewed the revised PBN and Data Link Approvals Database Record Form and agreed with the proposed format and developed following action item:

Action Item 6/4: IATA to provide the progress on the development of global database for PBN approval at the PBN/TF/7 Meeting
Meeting also reviewed the progress achieved in PBN implementation in the en-route environment and agreed to facilitate harmonization of the State PBN Implementation Plans. IATA agreed to serve as Coordinator of the harmonization activities. Meeting concluded that IATA and the volunteering States should develop recommendation report for State Plan harmonization to be presented to the next PBN/TF meeting:

ActionItem6/5: States are requested to list the challenges and impediments for PBN implementations to be reported at the PBN TF/7 Meeting.

Action Item 6/6: A harmonization analysis report to be developed by IATA and volunteering States and to be reported to PBN TF/7 Meeting.

PBN Implementation Issues

Draft ICAO PBN Operational Approval Handbook containing a number of technical illustrations was presented to the meeting. Task Force members were encouraged to contribute additional graphics or suggest need for specific illustrations through the following Action Item:

Action Item 6/7: States are requested to review the draft PBN Operational Approval Handbook and provide feedback at the PBN TF/7 meeting. States are also invited to contribute relevant material to be integrated into the Handbook.
While appreciating the contribution being made by some States in assisting other States with PBN Operational Approval, the meeting adopted following Action Item recommending wider participation in the PBN Operational Approval Training:

Action Item 6/8: States are encouraged to participate in the PBN Operational Approval Training to be conducted under the auspices of COSCAPs in Singapore during 26 – 30 April 2010. Invitation will be issued to the selected States by COSCAPs.

Meeting recognized the limitation of earlier generation FMS in not being able to accept the procedure identification with more than 6 characters and consequent difficulty in accommodating ICAO Doc 8168 suggested ‘x’, ‘y’ or ‘z’ suffixes to differentiate between multiple RNP APCH procedures designed for the same runway. It was decided that ICAO Regional Office should be requested to convey this limitation to IFPP and following Action Item was identified:

Action Item 6/9: ICAO Regional Office is requested to inform IFPP, PBNSG and APANPIRG of the limitation of older FMS in putting procedure identification within 6-digit alpha-numeric. This limitation occurs when pilot attempts to select specific approach for an airport that has multiple runways and each of the runways has multiple approach procedures for the same type of navigation system. ICAO is requested to provide guidance and standardize solution on the issue.

Conversion to Draft Conclusion for consideration by APANPIRG/21

That, ICAO (IFPP, PBNSG) be invited to note the limitation of older FMS in putting procedure identification within 6-digit alpha-numeric. This limitation occurs when pilot attempts to select specific approach for an airport that has multiple runways and

each of the runways has multiple approach procedures for the same type of navigation system. ICAO is also requested to provide guidance and standardize solution on the issue.

State/Industry Contribution

Sixteen States presented the status of PBN implementation. Australia has adopted the concept of parallel availability of RNAV and RNP specifications in all classes of airspace thus providing flexibility for the operators. RNAV/RNP specifications for different types of operations were explained. Till date, Australia has implemented RNP AR APCH procedures at 17 aerodromes and pending in additional 11 aerodromes. Suite of regulations, order and guidance material should come into effect from June 2010 with the full transition to ICAO PBN specifications due for completion in June 2013. Hong Kong China plans to implement RNP AR APCH with Baro-VNAV procedures to the north runway tentatively in April 2010. In India, RNAV – 1, SID/STAR was implemented at Mumbai, Delhi, Ahmedabad in 2008 and in Chennai, it was implemented in 2009. RNAV – 1 SID/STAR was planned for Hyderabad Airport in April 2010. Same SID/STAR is planned for Kolkata, Guwahati, Bangalore and Trivandrum airports and activity is likely to be completed in December 2010. Baro VNAV procedure development has been initiated and implementation is likely to commence in 2010. Japan has implemented more than 100 RNAV 5 routes and is planning to introduce RNAV 5 preferential operation, called "Sky Highway", which segregates operations of RNAV and non-RNAV vertically. Japan has also implemented RNAV 1 SID/STARs and RNP APCHs, resulting in reduction of flight distance in terminal area by about 20%. Japan is planning to introduce RNP AR approach at Haneda Airport in October 2010. Maldives has implemented RNAV 10 on selected routes from November 2009. Longitudinal separation of 50 NM on these designated RNAV 10 routes will come to effect once the regional planning group has agreed upon the application of separation. Since November 2009, PBN SIDs and STARs are being flown on trial in Maldives. In Thailand, Department of Civil Aviation has approved full operation of RNP Approach Procedures for Phuket Airport in February 2009. RNP APCH Procedures for Hat Yai and Samui airports have also been designed and validated through flight trials. Information on the progress on PBN implementation was also provided by Cambodia, Hong Kong China, Mongolia, Myanmar, Nepal. New Zealand, Republic of Korea, Sri Lanka, China, Macao China, Singapore and Vietnam.
After noting the concern that there may be many airports that may only support small number of flights with limited or no APV capability, meeting recommended to the revise the Asia/Pacific Regional PBN Implementation l Plan and formulated following draft Conclusion:

Draft Conclusion 6/10: APAC Regional PBN Implementation Plan (Version 2)

That, the revised APAC Regional PBN Implementation Plan provided in **Appendix F** be adopted as Version 2.0

Review of Final Version (V 1) of APAC Regional PBN Implementation Plan

While reviewing Version 1 of the APAC Regional PBN Implementation Plan, the States were urged to develop their State Plans in accordance with APAC Regional PBN Implementation Plan to ensure harmonized transition and implementation at the regional level.

Conversion to Draft Conclusion for consideration by APANPIRG/21

Draft Conclusion 14/xx – Develop State PBN Implementation Plan

That, States having done so were urged to develop their State PBN Implementation Plan in accordance with Asia/Pacific Regional PBN Implementation Plan.

While discussing issues related to the RNP operations to levels below 0.3, the meeting after reviewing the experiences gained by Alaska Airlines and Air New Zealand, recommended that aircraft that does not have a lateral and vertical readout on the navigation display, but does display the lateral and vertical profile on the navigation equipment could be considered as alternate means of compliance if

supplemented by appropriate flight crew training for RNP values of 0.3 or greater. Accordingly, Meeting formulated following draft Conclusion based on the above recommendation:

Draft Conclusion 6/11: Aircraft equipage requirement

That, ICAO provide guidance on aircraft that do not have a lateral and vertical readout on the navigation display, but do display the lateral and vertical profile on the navigation equipment, could be considered as alternate means of compliance if supplemented by appropriate flight crew training for RNP value of 0.3 RNP or greater.

PBN Implementation Progress Reporting

It was expressed that in order to accurately assess the benefit and return on investment of PBN implementation, it is important to measure progress in terms of PBN's ability to fulfill local and regional strategic objectives and that the PBN Progress Report Template should include the impact on safety, gains in efficiency, environmental savings and infrastructure cost reduction to allow for measurable determination of the regional impact and benefits gained as a result of PBN implementation. Based on the above argument, meeting decided to formulate following draft Decision and Action Item:

Draft Decision 6/12: PBN Performance Metrics

That, CNS/MET SG, ATM/AIS/SAR SG be tasked to review and consider amending the APAC Performance Monitoring and Measurement Metrics 2 and 3 for PBN to include specific measurements that capture operational benefits in terms of PBN's ability to help fulfill strategic objectives: safety, efficiency, capacity, access and the environment.

Action Item 6/13: ICAO be requested to identify the appropriate office or forum that would be best suited to develop a standardized calculation and reporting method for States. This would include a mathematical model to ensure environmental benefit calculations and standardized.

Task List Review

The Task Force agreed to integrate its Implementation Task List into the PBN Task Force Task List and update the PBN Task Force List as shown in **Appendix G.** Following draft Decision and action items were formulated in line with above discussion:

Draft Decision 6/14: PBN Task Force Task List

That, the document placed at **Appendix G** to this paper be adopted as the PBN Task Force Tasks List.

Action Item 6/15: ICAO Secretariat is requested to provide an update report on PBN TF activities to ICAO Route Review Task Force. The PBN TF also requested that activities of the RR TF to be reported to the PBN TF.

Action Item 6/16: States/Administrations are requested to submit their PBN Implementation Progress Report by 20 February 2010 for onward submission to APANPIRG/21 Meeting.

Feasibility of Establishing a Regional RAIM Prediction System

GNSS is considered a main navigation infrastructure supporting PBN operations and is also a critical component of surveillance system, such as ADS-B. Unpredicted outage of GNSS services can cause undesired interruptions on aircraft operations. PBN Manual requires the States and ANSPs to provide timely warning of GNSS RAIM outages to the users of the services like the pilots, flight dispatchers, air traffic controllers and airspace planners. Establishment of a regional RAIM Prediction System

was proposed to the meeting. By harmonizing RAIM prediction information among the States, the regional RAIM prediction service will enhance seamless air traffic operation. Significance of RAIM prediction to support safe and efficient operation was discussed and Aeronautical Radio of Thailand (AEROTHAI) was requested to develop more detailed technical architecture, operational concepts and administrative arrangements. Many other States agreed to participate in the programme and a Decision (Action Item 6/17) was adopted to establish a regional RAIM prediction system and cooperation between ICAO PBN TF and the APEC GIT. Australia, India, Japan and USA agreed to participate in the programme.

Action Item 6/18: The PBN TF requests AEROTHAI in conjunction with the project team to develop more detailed technical architecture, operational concept, and administrative arrangements for the RAIM Prediction System for review by the Task Force at PBN TF/7.

Flight Planning 2012 – PBN Flight Planning Issues

Meeting, after discussing issues related to Flight Plan Amendment, which becomes applicable in November 2012, identified following Action Items:

Action Item 6/20: Working Paper PBN TF/6 – W/7 be forwarded to the Flight Plan and ATS Messages Implementation Task Force (meeting now to be held in July 2010).

Action Item 6/21: States be requested to review the requirements of the State Letter on the implementation of 2012 flight plan format in the context of PBN implementation and report to PBN TF/7 meeting issues noted.

The meeting ended with thanks to Civil Aviation Department, Hong Kong China and Cathay Pacific for hosting the meeting.
