INTERNATIONAL CIVIL AVIATION ORGANIZATION

SIXTH MEETING OF THE PERFORMANCE BASED NAVIGATION TASK FORCE (PBN/TF/6)

Hong Kong, China, 3 – 5 February 2010

Agenda Item 3: APAC Region PBN Implementation

3.2 REVIEW OF OUTCOME OF APANPIRG/20 ON PBN

(Presented by the Secretariat)

SUMMARY

APANPIRG, in its Twentieth Meeting reviewed the report of CNS/MEG SG/13 meetings, which included issues related to outcomes of PBN TF/4 and PBN TF/5 meetings. This paper presents the outcome of APANPIRG/20 meeting relevant to PBN implementation and the follow up actions taken on the Conclusions/Decisions adopted by the meeting.

1. INTRODUCTION

1.1 CNS/MET Sub Group of APANPIRG, in its Thirteenth meeting held from 20 to 24 July, reviewed the outcomes of Fourth and Fifth Meetings of the PBN Task Force. After discussing significant issues raised in the PBN Task Force reports, CNS/MET SG/13 developed its recommendations for the consideration of APANPIRG/20. The outcome of the fourth Meeting of PBN Task Force was also reviewed by the ATM/AIS/SAR SG/19 held in June 2009.

1.2 APANPIRG in its Twentieth meeting held from 7 to 11 September reviewed the PBN related portion of CNS/MET SG/13 report and developed its recommendation. Extracts of the APANPIRG/20 report relevant for PBN implementation in the region are placed as **Attachment A** to this paper.

2. DISCUSSION

2.1 Asia/Pacific Flight Procedure Programme and PBN Implementation Plan

2.1.1 The meeting was informed about developments that have taken place in establishing the Flight Procedure Programme (FPP) Office for Asia/Pacific Region in Beijing and Conclusion 20/35 was adopted by the meeting encouraging the States to participate in this Programme in order to build or improve their instrument flight procedure capabilities. In addition, the meeting was reminded that the States are required to develop their PBN Implementation Plan in accordance with ICAO Assembly Resolution 36 – 23 and complete their WGS-84 and Electronic Terrain and Obstacle Date (ETOD) implementation. Noting that some States had not taken action on these issues, APANPIRG adopted Conclusion 20/36 urging the States, who have not done so, to develop their State PBN Implementation Plan and complete the implementation of WGS – 84 and Electronic Terrain and Obstacle Data in their States. States were notified about this Conclusion through a State Letter dated 4 November, 2009.

2.2 **Review of ICAO Directives/Guidelines on Safety Assessment and Regional RAIM Prediction**

2.2.1 Appreciating the requirements of GNSS prediction service, a guidance material to translate GPS IFR approvals to corresponding PBN capabilities and guidance on PBN specific aspects of en-route safety assessment to facilitate PBN Implementation, the meeting adopted Conclusion 20/37 inviting ICAO to develop the mentioned guidance materials. To follow up the Conclusion adopted by APANPIRG, an Issue Form (the prescribed format for taking up the issues with ICAO HQ) on the subject was raised for the consideration of ICAO

2.2.2 APANPIRG also adopted Decision 20/38 tasking PBNTF to examine the feasibility of establishing a regional RAIM prediction system to facilitate PBN Implementation. The Task Force meeting is expected to progress examination of the feasibility of establishing a regional RAIM prediction system.

2.3 **RNAV Human Factors and Systems Safety**

2.3.1 After discussing the information, particularly on human factors issues related to RNAV operations, provided in the Cranefield University RNAV operations safety review report, the meeting was of the opinion that this information will be of immense value for the States implementing RNAV operations and hence agreed to adopt Conclusion 20/39 recommending distribution of the report to all operators involved in RNAV operations. The Report was circulated to the States through a State Letter dated 3 November 2009 requesting the States to distribute it to all the operators involved in RNAV in order to apply the lessons learnt from the report.

2.4 **PBN Implementation Progress Report Template**

2.4.1 Meeting endorsed the recommended Common Template developed by PBN TF for the presentation of Implementation Progress Report by the States to the PBN Task Force and adopted Conclusion 20/40 on the subject. The Template was circulated to the States through a State Letter.

2.5 **PBN Implementation Plan**

2.5.1 Version 1.0 of the Asia Pacific Regional PBN Implementation Plan was adopted by APANPIRG through its Conclusion 20/41 and this document was published and circulated to the States through a State Letter dated 4 November 2009.

2.6 **Asia/Pacific Regional PBN Programme Office**

2.7 While there was a general interest shown for IATA proposal to set up an Asia Pacific Regional PBN Office dedicated to developing PBN based regional routes, there were some oppositions to the proposal on the grounds of duplication of work, resource constraints etc. The meeting recommended that the issue may be taken up for consideration by South East Asia Route Review Task Force (SEA RR/TF) established by ATM/AIS/SAR SG. IATA, however, did not raise the question of the establishment of an Asia Pacific Regional PBN Office during the course of the SEA-RR/TF/1 meeting and as such, there was no discussion on this matter.

2.8 **RNP AR Flight Operational Safety Assessment (FOSA)**

2.8.1 While agreeing with PBN TF proposal to include presentation(s) on safety assessment as part of the agenda for the PBN Implementation Seminar to be held in Hong Kong, the meeting also agreed with the recommendation that ICAO should be requested to assist in addressing PBN Safety Assessment training needs in the region. Conclusion 20/42 to this effect was adopted by the meeting. The issue has been taken up with ICAO Headquarters through an Issue Form.

2.9 **RNP AR Approach Procedures**

2.9.1 APANPIRG agreed with PBN TF recommendation and adopted Conclusion 20/43 urging the States to carry out an operational, safety and cost benefit analysis before considering the implementation of RNP AR Approach Procedures. APANPIRG Conclusion was distributed to the States through a State Letter dated 4 November 2009.

2.9.2 Through its Decision 20/44, APANPIRG also agreed to continue the term of the PBN Task Force for two additional meetings in 2010 to continue its education and training role and to move from implementation activities to developing applications to facilitate achievement of gate-to-gate concept.

2.10 **Sharing of Information**

2.10.1 Appreciating the benefits of disseminating information on the activities of various ICAO Panels and Study Groups, APANPIRG agreed with the recommendation made by PBN TF and adopted Conclusion 20/45 on this subject. This recommendation has been conveyed to ICAO HQ through an Issue Form.

2.11 **PBN Implementation Progress Report**

2.12 Report on the PBN implementation progress in Australia, Bangladesh, DPR Korea, Hong Kong China, Indonesia, Japan, Maldives, Malaysia, Nepal, Pakistan, Philippines, New Zealand, Singapore, Sri Lanka and Thailand was presented to APANPIRG/20. Meeting was also informed about the benefits India had derived from implementing PBN in Mumbai, Delhi and Ahmedabad in August 2008. India also informed the meeting about the PBN Implementation Road Map they have proposed and about the in-house capabilities for designing PBN procedures they have developed.

2.13 **Linking PBN, CDO and ATC Infrastructure**

2.13.1 After discussing IATA's proposal of linking PBN, CDO and ATC infrastructure, the meeting noted that CDO/OPD can be an integral part of any new STAR whether using RNAV/RNP or conventional methodology, starting at the top of descent and terminating at the lowest point practical for the operation, whether that is a downwind point, a FAF, or DH. The meeting also noted that some aircraft are not equipped to carry out PBN based procedures and thus have to be processed using other means, including radar vectoring. Meeting was of the view that the feasibility of the four specific elements as suggested in paragraph 2.7 of IATA's paper should be further reviewed and assessed by PBN Task Force. Particular attention should be focused on the systematic implications of requiring linkages between arrival and approach, and the exclusion of ATC intervention at designated points outside the Final Approach Fix.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to review the outcomes of APANPIRG/20 meeting regarding PBN implementation and consider these in its work programme.

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EXTRACTED FROM THE REPORT OF APANPIRG/20

Navigation

Review report of the Performance Based Navigation (PBN) Task Force

3.4.36 The meeting reviewed the outcomes of the work accomplished by the PBN TF over the course of two meetings. The work of the Task Force (TF) that was accomplished prior to the meetings of RASMAG/11 and ATM/AIS/SAR/SG/19 was coordinated with those bodies and their input was taken into consideration for the work programme of PBN TF. The Fourth meeting of the (PBN TF was held in Osaka, Japan from 4-6 March 2009 in conjunction with a successful PBN Seminar held on 2 and 3 March. The Fifth meeting of the PBN TF was held in Bangkok, Thailand from 15 to 17 July 2009 at the ICAO Asia/Pacific Office and was attended by 74 participants from 21 States and 3 International Organizations.

Asia/Pacific Flight Procedure Programme

3.4.37 The meeting noted that Flight Procedure Programme (FPP) Office for Asia/Pacific region will be located in Beijing, China. On March 26, 2009 ICAO signed a letter of intent with the CAAC regarding the establishment of the FPP Office in Beijing. ICAO State Letter T 6/13.1 1.2 - AP089/09 (FS), dated 26 June 2009, invited the States in the region to indicate their intent to participate in the Flight Procedure Programme. Initial FPP activities will include a PANS OPS initial course and a PBN Procedure Design Course to be held soon after establishment of the FPP. Both these courses are to be held at the Civil Aviation Flight University of China (CAFUC), Chengdu, China.

3.4.38 ICAO Secretariat encouraged States to participate in the Asia-Pacific Flight Procedure Programme (FPP) and urged States to take the prerequisite actions now that will prepare and enable them to make maximum use of the services of the FPP.

3.4.39 The meeting was informed that ICAO continues development of the FPP concept. The opening of FPP Office originally planned for October 2009, will be delayed for 2-3 months while various issues regarding establishment of the office are resolved.

3.4.40 Two alternatives were presented for funding the FPP. The first would calculate contributions based on the World Bank Income Category of the State and each State would be required to make a contribution taking into account their income category. The second proposal was from Australia, key elements of which are as follows:

- A core group of Asia/Pacific States would fund the entire FPP budget
- All States in the Asia/Pacific Region could then use the “free” services of the FPP as defined in the FPP Programme Document
- FPP would perform any additional services on a cost recovery basis
- The FPP Steering Committee would be composed of the funding States and would

    - Develop work plan in coordination with the FPP Manager
    - Prioritize work
    - Consider safety priorities

3.4.41 It was noted that funding of the budget under this proposal need not be restricted to States, but could include international organizations. The meeting agreed that, if the core group of States could be assembled, the way forward proposed by Australia would be preferable, as it

would allow access to FPP training and services by all States in the region. Australia indicated that they would consider being part of that core group. However, if the Australian proposal should turn out to be not feasible due to lack of sufficient participating States, then the proposal to calculate contributions on the basis of World Bank Income Category would be acceptable.

3.4.42 The FPP is an outstanding opportunity for the States in the region. There are substantial contributions, in cash and in-kind, from China, the host country, the U.S.A. and Hong Kong, China and other organizations over the initial 3-year life of the FPP. The following Conclusion was adopted to encourage States to take full advantage of the resources that are being provided, to build or improve their own instrument flight procedure capability and meet the goals of Assembly Resolution A36-23.

Conclusion 20/35 – Asia-Pacific Flight Procedure Programme

That, States be encouraged to participate in the Asia-Pacific Flight Procedure Programme in order to build or improve their instrument flight procedure capabilities, meet the PBN implementation goals of Assembly Resolution A36-23 and enhance flight safety, efficiency and environmental protection.

3.4.43 The meeting noted that States should start working on the prerequisite actions to prepare for implementation of PBN in accordance with the goals of Assembly Resolution A36-23 and the Asia-Pacific Regional PBN Implementation Plan and to receive maximum benefit from the FPP. Actions that States can take include developing their State PBN Implementation Plans and start work on compliance with WGS-84 and Electronic Terrain and Obstacle Data (ETOD) requirements, using the PBN implementation plan to prioritize that work. It was also noted that many States still lack the knowledge or capability to implement the ETOD requirements and that the Annex 15 Area 2 and 3 ETOD requirement had therefore been extended to 2012. It was noted that the FPP would provide an ETOD automated storage solution, but that some States may consider this data sensitive and not be willing to allow its storage by the FPP. In response to the concern, it was clarified that States were not required to use this service of the FPP, but States would need to at least provide that data required to develop the procedures requested. The meeting was reminded that WGS-84 is essential to PBN implementation and also that despite the technical challenges, ETOD will be an essential element of the quality system of the FPP and therefore States should take action on a prioritized basis to assemble this data. Some States have already taken these measures. The States that have not taken such actions are strongly encouraged to do so. The meeting accordingly adopted the following Conclusion:

Conclusion 20/36 – Preparation for PBN Implementation

That, States that have not done so, are urged to develop their State PBN Implementation Plans, and take action in accordance with those plans to implement WGS-84 and Electronic Terrain and Obstacle Data in their States.

Review of ICAO Directives /Guidelines on APVs

3.4.44 The meeting was informed about the outcomes of the commercial study undertaken by Australia to review alternative technologies available for APV implementation. The study recommended using Baro-VNAV but at the same time noted that many aircraft were unlikely to be equipped for Baro-VNAV operations in the near future and that will make it difficult to meet the time schedule prescribed by the ICAO Assembly.

3.4.45 The meeting noted that the objective of Assembly Resolution A 36-23 on APV implementation will not be achieved in the timeframe of the resolution because many of the aircraft in the Region are not equipped to use Baro-VNAV Procedures and without other solutions available,

such as augmented GNSS no APV alternatives are available. The meeting requested to bring this to the attention of the ICAO Headquarters. The meeting also noted that to address this issue, CNS/MET Sub-group had made Decision 13/7 – Feasibility of establishing a regional SBAS capability which calls for a study by the Sub-group on the need for and feasibility of establishing a regional SBAS capability.

Review of PBN Manual

3.4.46 The meeting was reminded that GPS prediction service was a necessary part of GNSS approvals to allow for the fluctuations in service availability. Concern was also raised over the United States Government Accountability Office (GAO) *Global Positioning System: Significant Challenges in Sustaining and Upgrading Widely Used Capabilities* report on GPS availability and note was taken of USAF response that GPS service would not fall below that guaranteed by the specification (SPS). This concern was further addressed in the Information Paper presented by US on the same subject. It was expressed that guidance materials are necessary to address the requirement of GNSS reporting and prediction.

Guidance Material for PBN Implementation

3.4.47 The meeting noted that many States had significant number of aircraft that are GNSS (GPS) IFR approved. Though GPS systems, in general terms support RNP 0.3 operations, the actual installations in the aircraft vary considerably, predominantly depending upon the installation antiquity. It was therefore felt necessary to have guidance for translating the GPS IFR approvals to corresponding PBN capability.

3.4.48 The meeting also agreed with the requirement for guidance material on PBN specific aspects of en-route safety assessment to facilitate implementation of PBN.

3.4.49 Following discussion on the requirements expressed for GNSS reporting and prediction, the need to assess the GPS IFR aircraft in terms of their PBN capability and for PBN-specific aspects of en-route safety assessment proposal of the PBN TF recommending development of guidance materials was endorsed by the meeting. In view of the foregoing, the meeting adopted the following Conclusion:

Conclusion 20/37 - Guidance material for PBN Implementation

That, ICAO be invited to develop guidance materials on:

a) establishing common implementation rules and technical standards for GNSS reporting and prediction requirements;

b) assigning PBN capability to GPS IFR aircraft in the first instance without the need for recertification; and

c) PBN-specific aspects of en-route safety assessment.

3.4.50 To further facilitate implementation of a homogeneous PBN system in the Region, the meeting considered the PBN TF proposal to conduct a feasibility study on establishing a regional RAIM prediction system and adopted the following Decision:

Decision 20/38 - Regional RAIM prediction System

That, PBNTF be tasked to examine the feasibility of establishing a regional RAIM prediction system.

RNAV Human Factors and Systems Safety

3.4.51 The meeting was informed about Cranfield University RNAV operations safety review report highlighting a number of significant safety issues associated with RNAV operations. The report identifies a number of human factors issues that need to be considered for the conduct of RNAV operations. The meeting was of the opinion that the information provided in the report will be of immense value for the States implementing RNAV operations and hence adopted following Conclusion recommending circulation of the safety message placed in **Appendix J.** The Secretariat was also requested to facilitate to have the RNAV safety message published in the ICAO Journal.

Conclusion 20/39 - RNAV Human Factors

That, RNAV safety message provided in **Appendix J** to the Report on Agenda Item 3.4 be distributed to the States for further distribution to all operators involved in RNAV operations in order to apply the lessons learnt.

PBN Implementation Progress Report Template

3.4.52 The meeting agreed that the common template developed by PBN TF will help in harmonizing the reporting process and adopted following Conclusion.

Conclusion 20/40 - PBN Implementation Progress Report Template

That, States be urged to use the PBN Implementation Progress Report Template provided in **Appendix K** to the Report on Agenda Item 3.4 for all future reporting of their status of PBN implementation. The Report should be submitted at each of the future PBN Task Force Meeting.

PBN Implementation Plan

3.4.53 Interim Edition Version 0.3 of the Asia/Pacific Regional PBN Implementation Plan, updated by PBN TF incorporating RASMAG and ATM/AIS/SAR SG comments was presented to the meeting. The meeting, after reviewing the updated plan, adopted the following Conclusion.

Conclusion 20/41 - Asia/Pacific Regional PBN Implementation Plan

That, the Asia/Pacific Regional PBN Implementation Plan provided in **Appendix L** to the Report on Agenda Item 3.4 be adopted as Version 1.0

Asia/Pacific Regional PBN Programme Office

3.4.54 The meeting discussed a working paper from IATA, associated with the draft Conclusion formulated by the PBN Task Force (5/11) for the establishment of a Regional PBN Office or dedicated project to develop PBN based regional air routes. IATA advocated for the need for harmonized regional solutions to meet future regional demands and suggested Terms of Reference for the proposed office. IATA also brought out the need for developing regional plans to meet the predicted demand and considered the concept of a regional PBN office as a step towards a regional solution and that a roadmap will align strategies, processes, service and rules across the region. Objectives of establishing regional PBN office included linkages needed to establish PBN routes, facilitating application of uniform airspace organization, developing strategies to assist States in

optimizing TMA and en-route PBN etc. While there was a growing interest for the proposal to set up a separate office, at the same time it was opposed by several States citing duplication of work and resource constraints etc. as the reasons. Japan had expressed concern on the establishment of a PBN Office or a dedicated project because the demarcation between the PBN TF and RRTF has not been clarified. After discussing the issue at length, the meeting came to a conclusion that the proposal will be taken up for consideration by the South East Asia Route Review Task Force (SEA RR/TF) established by ATM/AIS/SAR SG under its Decision 19/1. Any recommendations resulting from discussions by that Task Force will be reported to the next APANPIRG meeting through the ATM/AIS/SAR SG.

RNP AR Flight Operational Safety Assessment (FOSA)

3.4.55 Requirement of having information on PBN safety assessments was noted by the meeting. After a brief discussion on the subject, meeting agreed with the proposal of PBN TF to include presentation(s) on safety assessment as part of the agenda for the PBN Implementation Seminar to be held in Hong Kong in February 2010. The meeting also agreed with the recommendation made by PBN TF requesting ICAO to assist in addressing the PBN safety assessment training needs in the region and agreed to adopt the following Conclusion.

Conclusion 20/42 - PBN Safety Assessment Training

That, ICAO be requested to assist in addressing the PBN safety assessment training needs in the region.

RNP AR Approach Procedures

3.4.56 While discussing the issue of deciding on the implementation of RNP AR Approach procedures safety concerns were noted if States were to proceed directly to RNP AR implementation without firstly considering public RNP approaches based on the RNP APCH navigation specification. RNP AR implementation requires an assessment of the benefits and safety of the proposed operation. The meeting came to a conclusion that the States should carry out a safety and cost benefit analysis for such implementation before a decision is taken in this regard and agreed to the following Conclusion formulated by PBN TF.

Conclusion 20/43 - RNP AR Approach Implementation

That, States be urged to give detailed considerations to the operational need, safety and cost benefits prior to deciding on RNP AR Approach implementation.

3.4.57 It was also agreed that focus of the PBN Task Force should now shift from the development of the implementation plan to developing applications to facilitate achievement of mentioned gate-to-gate concept. In addition, to continue its education and training role plus identify issues to be considered by the PBN TF, the meeting adopted following Decision.

Decision 20/44 - PBN Task Force Activities

That, the PBN Task Force continues with the current TORs for two additional meetings in 2010.

Sharing of information

3.4.58 Sharing of information is considered essential for uniform and homogeneous development. Appreciating the benefits of disseminating information on the activities of various ICAO Panels and Study Groups, the meeting adopted following Conclusion.

Conclusion 20/45 - Sharing Information on ICAO Panels/SGs

That, ICAO be requested to consider sharing information on ICAO Panels and Study Groups activities/outcome regularly with regional planning/implementation groups**.**

3.4.59 However, this meeting did receive a brief on the work programme of ICAO Panels and Study Groups.

PBN Implementation Progress Report

3.4.60 A consolidated report on the progress of implementation of PBN in the region was provided to the meeting by the Secretariat. Progress report, presented in the tabular form contains information on the status of PBN implementation received from Australia, Bangladesh, DPR. Korea, Hong Kong China, Indonesia, Japan, Maldives, Malaysia, Nepal, Pakistan, Philippines, New Zealand, Singapore, Sri Lanka and Thailand. The meeting was informed that the following States also presented status report on PBN implementation at PBN TF/5 meeting: Thailand, China, Hong Kong China, Australia, Japan, Indonesia, Bangladesh, Republic of Korea, Pakistan and Myanmar. The consolidated report will be presented in the sixth PBN TF meeting for further review.

Linking PBN, CDO and ATC Infrastructure

3.4.61 IATA presented a paper recommending a strategy to link current efforts and infrastructure to optimize outcomes in the Terminal and Aerodrome environment. States were invited to consult with IATA and other Stakeholders about the User requirements for integration of PBN, CDO and ATFM. Linking PBN, CDO and ATC Infrastructure could be used as a short term case by case strategy to link RNAV/conventional STARS with the PBN concepts. Although, airspace designers and planners should always consider the impact to Safety, Environmental Protection, Efficiency, and Continuity, some designs are put into place to achieve terrain clearance, airspace (i.e. SUA), and other traffic flows. The meeting recognizes that maximum benefits of PBN implementation can be achieved through integrated ATM system design strategies and ATC procedures.

3.4.62 The meeting noted that CDO/OPD's can be an integral part of any new STAR whether using RNAV/RNP or conventional methodology, starting at the top of descent and terminating at the lowest point practical for the operation, whether that be a downwind point, a FAF, or DH. The meeting noted that some aircraft are not suitably equipped to carry out PBN based procedure and thus have to be processed using other means, including radar vectoring.

3.4.63 As result of discussion, the meeting was of the view that the feasibility of the four specific elements as suggested in paragraph 2.7 of IATA's paper should be further reviewed and assessed to be used as strategy by the PBN Task Force. Particular attention should be focused on the systemic implications of requiring linkages between arrival and approach, and the exclusion of ATC intervention at designated points outside the Final Approach Fix.

PBN Implementation Activities and PBN Roadmap in India

3.4.64 India provided information about the benefits that had been achieved through the implementation of PBN SIDs and STARs. It was informed that development of PBN procedures were started in 2006-07 with the primary objective of achieving effective and efficient utilization of TMA and this culminated into the implementation of RNAV Arrival and Departure procedures at international airports including Mumbai, Delhi and Ahmedabad in August 2008. The estimated fuel savings and reduction in carbon emissions after implementation of PBN procedures was noted. India also provided information on its Performance Based Navigation (PBN) Implementation Road Map. It

was informed that a collaborative and coordinated approach involving all stakeholders has been adopted in the development of the roadmap, starting from initial concept stage till implementation and post implementation preview. It was informed that India has also developed in-house capabilities (procedure designing and tools) for designing PBN procedures to achieve PBN implementation targets in accordance with ICAO Asia Pacific Regional guidelines.

Time and venue of next PBN TF meeting

3.4.65 A PBN Implementation Seminar is scheduled for 1- 2 February 2010 followed by the PBN TF/6 meeting on 3-5 February 2010. Both the seminar and the meeting will be hosted by Hong Kong, China.

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