



INTERNATIONAL CIVIL AVIATION ORGANIZATION

**SEVENTH MEETING OF THE PERFORMANCE BASED NAVIGATION
TASK FORCE (PBN/TF/7)**

Bangkok, Thailand, 1 – 3 September 2010

Agenda Item 3: APAC Region PBN Implementation

**OUTCOME OF APANPIRG CNS/MET SG/14 MEETING ON ISSUES
RELATED TO NAVIGATION**

(Presented by the Secretariat)

SUMMARY

APANPIRG CNS/MET SG/14 meeting was held in Jakarta, Indonesia from 19 to 22 July, 2010. In addition to addressing other relevant issues, meeting also discussed the progress made in the implementation of PBN in the region. Meeting considered proposals made by different stakeholders and formulated a number of draft Conclusions/Decisions for the consideration of APANPIRG/21

Strategic Objectives: A - Safety; C-Environment Protection; D-Efficiency

Global Plan Initiatives: GPI - 5 RNAV and RNP (Performance Based Navigation)
GPI – 11 (RNP and RNAV SIDs and STARs)

1. INTRODUCTION

1.1 Fourteenth Meeting of APANPIRG Communication, Navigation and Surveillance/Meteorology Sub Group (CNS/MET SG/14) was held from 19 to 22 July 2010 in Jakarta. The meeting was attended by 103 participants from 24 States, IATA, IFALPA and SITA.

1.2 CNS/MET SG/14 meeting discussed implementation issues related to Communication, Navigation and Surveillance in the region and developed a number of draft Conclusions/Decisions for the consideration of APANPIRG/21 meeting. Full report of the CNS/MET SG/14 meeting is placed on ICAO APAC Office website and can be accessed on e-mail address http://www.icao.or.th/meetings/2010/cnsmet_sg14/cnsmet_sg14rpt.pdf Brief extract of the report, relevant for Navigation is placed as Attachment to this paper.

2. DISCUSSION

2.1 CNS/MET SG/14 was informed about re-scheduling of PBN TF/7 meeting and was presented a report on the outcome of PBN TF/6 held in Hong Kong China from 3 to 5 February, 2010.

2.2 After reviewing the works accomplished by the PBN TF, meeting agreed to recommend extension of the Task Force for a period of 3 to 5 years with the existing Terms of Reference and also recommended that the focus of the Task Force should be on implementation support with the routine and repetitious tasks being passed on other groups.

2.3 Meeting reviewed the report on PBN State Plan Harmonization and noted that only 21 States (out of 40) had submitted their State PBN Implementation Plans and out of these only 7 plans were found to be robust with another 5 rated marginal and additional 9 found incomplete. Meeting was of the view that those States, which have acquired experience in implementation and which have skills available on the subject should support those States which are not that well informed. It was also suggested that efforts should be made to find out as to why the remaining States had not submitted their State PBN Implementation Plan.

2.4 Meeting also considered the proposal to establish PBN Regional Development and Implementation (REDI) Team to identify implementation needs and organize resources for that.

2.5 It was informed that ICAO had commenced the revision of GNSS Manual Doc 9849 and had sought help from the regional groups to find hurdles to GNSS implementation so that the same can be addressed in the planned edition of the manual.

2.6 Issues related to the implementation of GNSS were discussed and the need to promote adoption of GNSS by the States was identified. Progress on ionospheric studies was discussed and further plans were developed.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) Review outcome of CNS/MET SG/14 meeting in respect of Navigation issues
- b) Further progress on the issues identified in the report.

**EXTRACTS OF CNS/MET SG/14 MEETING
RELATED TO 'NAVIGATION'**

Navigation

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

3.4.48 The meeting noted that the seventh meeting of the PBN TF had been delayed and now will be held just before APANPIRG/21 because of unavoidable circumstances. Due to the rescheduling of the seventh meeting, the ATM/AIS/SAR SG and the CNS/MET SG were not able to review report of the PBN TF/7 meeting. The meeting reviewed the report of the sixth meeting of the PBN TF which took place in Hong Kong, China from 3 to 5 February 2010. PBN TF/6 was preceded by an Implementation Seminar also held in Hong Kong.

3.4.49 The meeting was informed that PBN TF had recommended integration of the Implementation Tasks List and action items into the PBN Task Force Tasks List. The meeting reviewed the integrated Tasks List proposed by the PBN TF and agreed to endorse the following Draft Decision:

Draft Decision 14/14 – PBN Task Force Tasks List

That, the PBN Task Force Tasks List provided at **Appendix O** to this report be adopted.

Global PBN Implementation – Update

3.4.50 The meeting was informed about the significant global PBN initiatives and completion of the initial draft of PBN Operational Approval Manual and Continuous Descent Operations (CDO) Manual. The meeting also noted directions adopted by the PBN Study Group in September 2009 to harmonize the global PBN implementation efforts. Regarding the activities of APAC Flight Procedure Program, the Chairman PBN TF informed the meeting that the contribution by each active participating States is around US\$16,000 and in addition, non monetary contributions have also been assured by FAA, French DGCA/ENAC, Airbus Industries, Hong Kong China, and Jeppesen.

APAC Region PBN Implementation

3.4.51 States, which had not developed their State PBN Plan, were once again reminded about the requirement and an action item was adopted encouraging the States to consider implementation of CDO. State were also encouraged to attend various PBN related training and other programmes. Meeting was briefed about various issues related to PBN implementation in the region and about various action items adopted by the Task Force.

PBN Implementation Plan

3.4.52 States were urged to review the draft PBN Operational Approval Handbook and provide feedback to the next PBN TF meeting scheduled for September 2010. The meeting was briefed about the limitations of earlier generation FMS and it was recommended that this issue should be taken up with Instrument Flight Procedure Panel (IFPP). Accordingly, the following draft Conclusion developed by PBN TF was endorsed by the meeting.

Draft Conclusion 14/15 – FMS (older generation) – limitations

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

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

State/Industry Contribution

3.4.53 The meeting was informed about the status of PBN implementation in various States, as presented to the PBN Task Force meeting. States, while informing the PBN TF about the status of implementation in their administration also described various benefits these implementations have provided. Based on the review of the status of implementation in various States, PBN TF revised APAC Regional PBN Implementation Plan. The meeting reviewed the revised plan developed by the PBN TF and decided to formulate following draft Conclusion for consideration by APANPIRG:

Draft Conclusion 14/16 – Revised APAC Regional PBN Implementation Plan

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

State PBN Implementation Plan

3.4.54 PBN Task Force urged the States to plan their PBN implementation efforts to ensure harmonized transition and implementation. The meeting also discussed State implementation plans and decided to endorse following draft Conclusion formulated by the Task Force:

Draft Conclusion 14/17 – Develop State PBN Implementation Plan

That, the States, which have not developed their State PBN Implementation Plans so far, be urged to develop the plan in accordance with the Asia/Pacific Regional PBN Implementation Plan at the earliest.

3.4.55 The CNS/MET SG was also informed about the discussions that took place in PBN TF regarding the display limitations related to the RNP operations to levels below 0.3. Based on the experience gained by some of the States, PBN TF recommended an alternate means of compliance and developed following draft Conclusion. The meeting after reviewing the recommendation endorsed the draft Conclusion:

Draft Conclusion 14/18 – Aircraft Equipage Requirements

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, which could be considered an alternate means of compliance if supplemented by appropriate flight crew training for RNP value of 0.3 RNP or greater.

PBN Implementation Progress Report

3.4.56 The meeting was informed about the discussion that took place in PBN TF meeting regarding the measurements proposed for assessing the benefits of PBN implementation. It was informed that PBN TF was of the view that PBN Progress Report Template should include the impact on safety, gains in efficiency, environmental savings and infrastructure cost reduction to synchronize them with the performance based measurements concept. After review of the PBN TF recommendation, meeting endorsed following draft Decision:

Draft Decision 14/19 – PBN Performance Metrics

That, CNS/MET SG and 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.

Feasibility of Establishing a Regional RAIM Prediction System

3.4.57 It was informed that 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. The meeting was briefed about the advantages that can accrue from generating harmonized regional RAIM prediction information. It was informed that AEROTHAI has been requested to develop more detailed technical architecture, operational concepts and administrative arrangements and an action item was developed by the PBN TF.

PBN Flight Planning Issues

3.4.58 The meeting was briefed about the PBN issues related to the Flight Plan Amendment, which becomes applicable in November 2012. PBN TF had developed action items to address these issues. The meeting appreciated the support provided by Hong Kong, China in hosting the meeting and conveyed its thanks to the Civil Aviation Department of Hong Kong, China for this help.

3.4.59 States and International Organizations appreciated the work done by the Task Force and expressed that the Tasks assigned to the Task Force will grow in future. The meeting also expressed that though GNSS has been there since past sixteen to seventeen years, yet there is some resistance in its adoption by some States. It was agreed that the concerted efforts are needed to develop a global acceptance of GNSS to support PBN implementation.

PBN Task Force Work Programme

3.4.60 Chairman, PBN Task Force, presented a comprehensive report on the PBN Task Force activities. It was informed that PBN Task Force had planned two meetings in 2010, but has been able to organize only one so far, the second meeting is scheduled in September 2010. He informed the meeting about various global and regional developments that have taken place in the implementation scenario. The meeting was also briefed about the future work program of the PBN Task Force and was informed that the 37th Session of ICAO Assembly will be presented a report and will be informed about the future programme on this subject. The meeting recognized the work accomplished by the PBN Task Force and the need for ongoing ICAO regional support to continue the PBN and APV tasks. The meeting was also urged to develop a recommendation that the Task Force be continued in the manner suggested above. Essentiality of continuing PBN Task Force for a longer duration was generally agreed to by the meeting.

3.4.61 The meeting considered the terms of reference of the PBN TF and the continuing contribution the TF can make to the implementation of PBN in the Asia/Pacific Region. The meeting considered that the existing terms of reference were appropriate to allow the PBN TF to focus on implementation and to move on from the planning phase of PBN to implementation phase. The meeting also observed that the TF should pass routine and repetitious tasks to other bodies more appropriate to undertake these activities such as education and training which can be transferred to aviation academies. The meeting was of the opinion that the PBN TF should be extended with a life of 3 to 5 years and developed the following Draft Decision:

Draft Decision 14/20 - PBN Task Force continuation

That, the PBN Task Force be continued for a period of 3 to 5 years with the existing Terms of Reference and the focus of the Task Force be on implementation support with routine and repetitious tasks being passed to other groups.

PBN State Plan Harmonization

3.4.62 IATA, on behalf of Australia, Hong Kong China, New Zealand and Thailand presented a report on the PBN State Plan harmonization in the region. Highlighting the slow progress of PBN implementation in the region, it was informed that approximately half of the Asia Pacific States had not submitted their PBN Implementation Plan by the end of 2009 (as required by ICAO Assembly Resolution). Out of the plans submitted, only one third demonstrated a path towards timely and successful implementation. The paper also predicted that APAC Region will not be able to meet the implementation targets and stands at the risk of not meeting ICAO Resolution A36-23 requirements. It further described the review criteria and review methodology adopted in the assessment of State PBN Implementation Plans and provided an outcome of their assessment. In conclusion, the plans received were identified in three categories based on their quality:

- i) Robust – when 8 to 10 basic plan elements (BPE) are satisfied
- ii) Marginal – when 5 to 7 BPE are satisfied
- iii) Incomplete – when 4 or less BPE are satisfied

3.4.63 Out of the 21 plans assessed, 7 were rated as robust, 5 were rated as marginal and 9 were rated incomplete. It was informed that individual plan assessment letters will be issued through ICAO to each State, providing confidential feedback and suggesting improvements.

3.4.64 Tool used for the assessment of the State Implementation Plans was appreciated by the meeting and it was hoped that the States will benefit tremendously from the feedback and suggestions. It was also hoped that this assessment feedback will not be taken as criticism by the States. In response to a query, the meeting was informed that the assessment criteria was developed from PBN Manual and it was proposed that this tool should be passed on to ICAO Headquarters for its global usage. The meeting was of the view that those States, which have acquired implementation experience and which have the skills available on the subject should support the States, which are not that well informed in the implementation. Some participants were of the view that non-submission of the Implementation Plan should not be taken as deficiency, but efforts should be made to find out as to why these States have not submitted their plans in time and whether they need assistance to complete the plans. It was also suggested that the issue of non submission of plan should be taken up in APANPIRG and DGCA meetings.

Regional Support Strategy for PBN Implementation

3.4.65 IATA proposed a strategy for providing support to the States to achieve acceleration in the implementation of PBN. It was observed that the State progress on implementation of PBN is slow, though the Regional Plan providing guidance on PBN implementation has been delivered and a number of training programmes and seminars have been conducted on the subject. The strategy proposed includes but is not limited to:

- Establishing a PBN Regional Development and Implementation (REDI) Team to identify implementation needs and organize resources for that;
- Formulation of cooperative arrangements with volunteering States that are advanced in PBN;
- Develop additional support mechanism that creates skills and capabilities within States to implement and sustain PBN operations; and
- Promote PBN to decision makers.

Revision of the GNSS Manual Doc 9849

3.4.66 The meeting was informed that ICAO through the Navigation Systems Panel (NSP) has commenced the revision of the GNSS Manual Doc 9849 with the target of presenting the revised manual to the November 2010 meeting of the NSP for consideration. The Secretary of the NSP has sought input from regional groups to identify hurdles to the implementation of GNSS applications. The meeting was provided with examples of implementation hurdles already identified. The meeting discussed a range of hurdles and considered many of the institutional issues that could be addressed by authoritative information provided in the revised GNSS Manual.

Implementation of GNSS

3.4.67 While discussing updating of the GNSS Manual Rev 1 (2005), the Meeting noted the slow progress of aviation in implementing GNSS applications in some new ATM initiatives such as PBN, RNP approaches, etc where GNSS is a core technology. While the meeting recognized much progress had been achieved in the PBN initiative such as use of GNSS in the oceanic phase but it felt more could be achieved in the terminal and approach phases. Also the meeting noted that there is a lack of formal adoption of GNSS in most States. The meeting brainstormed ways for greater implementation of GNSS in the aviation field, including overcoming of existing hurdles and agreed that this slow implementation of GNSS applications in some aviation fields should be brought to the attention of the coming DGCA Conference in Macao, China as well as the 37th Session of the ICAO Assembly.

3.4.68 The meeting was briefed that Rev 1 of the GNSS Manual contains substantial information about GNSS implementation. From feedback received and based on the queries received from the States, it is felt that States may not be aware of the GNSS Manual. The meeting suggested a need to raise awareness of the existence of GNSS Manual among the aviation community by means such as presenting a copy of the Rev 1 GNSS Manual to each DG at the coming DGCA Conference etc. The meeting noted that a number of hurdles had been identified by the Navigation Systems Panel (**Appendix Q**). Rev. 2 of the GNSS Manual, expected to be out by end 2010, would provide guidance on how to deal with these hurdles and would become a more useful reference document in guiding the States in GNSS implementation. ICAO HQ is soliciting feedback from Regional Offices regarding this list of hurdles. In order to make Rev. 2 of the GNSS Manual a useful reference document and as Asia/Pac's contribution to the updated Manual, the meeting formulated a Decision asking Secretariat to circulate Appendix Q to members of CNS/MET SG and points of contact of the PBN Task Force to solicit feedback of additional hurdles encountered in the implementation of GNSS.

3.4.69 The meeting also brainstormed the possibility of forming Regional Development and Implementation (REDI) team to assist States in their PBN implementation as well as to facilitate Regional support. The mechanism of forming such a REDI team could be along the line of the set-up of the Beijing Flight Procedure Programme Office. The meeting discussed the tentative terms of reference and scope of the REDI team which is provided in **Appendix R** to this report.

3.4.70 In view of the above brainstorming exercise, the meeting developed following draft Conclusion for the promotion of greater implementation of GNSS applications in the aviation field.

Draft Conclusion 14/22 – Progress of GNSS Implementation & Awareness of GNSS Manual

That, ICAO

- a) highlight the slow progress of GNSS implementation in the aviation field at forums such as the coming 47th DGCA Conference in October in Macao, China and the 37th Session of ICAO General Assembly in September 2010; and
- b) raise the awareness of existence of the GNSS Manual among the aviation community

Ionospheric Data Collection

3.4.71 In the CNS/MET SG/13 and APANPIRG/20 meetings, it was agreed to develop a cooperative effort in developing a standard ionospheric model for the region to facilitate implementation of GNSS. As a first step, it was decided that Focal Contact Points in the States should be identified, who will coordinate in the matters of ionospheric data collection. The second step was to be discussed in this meeting. The progress that has taken place in the identification of Focal Contact Points was reported and meeting was invited to discuss the second step in the direction of developing the model.

3.4.72 Japan provided a comprehensive paper describing activities in monitoring and possible mitigations of ionosphere characteristics in the low latitudes. The paper noted that the Electronic Navigation Research Institute (ENRI) has successfully developed a prototype GBAS that provides Cat I performance in the Japanese ionospheric environment. The paper promoted the cooperative collection and sharing of ionospheric data particularly in the period leading to and during the next solar maximum which is expected to occur in 2013. Japan also suggested that a workshop be conducted by voluntary group to enhance the understanding of ionosphere issues.

3.4.73 Australia presented the findings of a historic review of ionospheric characteristics observed in the Australian mid latitude. The review found from the observed data that ionospheric excursions were well contained with the threat space developed for the contiguous United States. The methodology used in the Australian study is proposed as an evaluation tool for other States.

3.4.74 Hong Kong China informed the meeting on the installation of GNSS monitoring system and the commencement of ionospheric data collection by late 2010. Other States are invited to exchange data and jointly develop the regional ionosphere model with Hong Kong China.

3.4.75 The meeting agreed the worth of a coordinated ionospheric review and measurement campaign. Japan was invited to provide technical leadership with the ICAO providing support for development of a measurement campaign coordinated through the points of contacts nominated by States. The coordination is initially to be undertaken by correspondence and with option of a meeting to further progress the program.

Navigation Strategy

3.4.76 The Navigation Strategy for the Asia/Pacific Region was reviewed and was found to be appropriate without revision.

Sixteenth International Flight Inspection Symposium (IFIS)

3.4.77 The meeting was informed that the 16th International Flight Inspection Symposium, organized by the Flight Inspection Center of CAAC and the International Committee for Airspace Standards and Calibration (ICASAC) was held in Beijing, China from 21 to 25 June 2010. The Symposium was attended by 202 participants from the flight inspection/validation organisations, industry partners and 36 States/ Administrations including 10 Administrations in APAC Region. This was the first time that such Symposium was held in the APAC Region. The objective of the Symposium was to exchange technical information and experiences gained in flight inspection and validation and promote development of new technology.

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APPENDIX ‘O’ TO CNS/MET SG/14 REPORT

TASKS LIST – PBN Task Force

No.	Tasks/Strategy	Category	Status
C4/1	The APAC PBN TF encourages States to consider the GO Team visit.	Implementation	On-going. States are encouraged to consider the GO Team visit as required.
C4/2	The APAC PBN TF requests the Global PBN Task Force to consider providing assistance to States which currently are at the early stage of PBN implementation.	-	Closed.
C4/3	The APAC PBN TF agrees to provide progress report of PBN implementation in the Asia-Pacific to the Global PBN Task Force	-	Closed. The PBN TF has provided progress report to the Global PBN Task Force.
C4/4	The APAC PBN Task Force requested that the Interim Edition (V ‘0.2’) of the Regional PBN Implementation Plan be presented at the ATM/AIS/SAR/SG/19 Meeting (June 22-26, 2009) for review as required by APANPIRG/19.	-	Closed.
C4/5	The APAC PBN TF agrees to continue an annual review of the Asia-Pacific Regional PBN Implementation Plan	Reporting	Routine

No.	Tasks/Strategy	Category	Status
A4/6	Develop an up-to-date archive of all relevant guidance materials for each PBN implementation step as outlined in the PBN manual	-	Closed. Information on relevant guidance materials is currently available and can be downloaded from ICAO PBN web site. (http://www.icao.int/pbn) The Secretariat also provides a comprehensive CD containing important PBN guidance and resource materials.
A4/7	Arrange future annual PBN implementation seminars to serve as a forum for exchanging expertise and implementation experiences and invite interested States who would like to host future seminar to make a formal proposal at the next PBN TF meeting and to invite industry representatives to attend the seminar	Education	On-going. The PBN TF/5 accepted Hong Kong's offer to host the second PBN Seminar, planned for Feb 2010, subjected to APANPIRG approval. Vietnam and Thailand also offer to host future PBN seminars.
C4/8	In respect to the request by COSCAPs regarding the development of guidance material for APV, the APAC PBN TF recognized the work currently being conducted by the Global PBN TF to develop and review materials on the issues of APV and Non-Precision Approach as related to PBN	-	Closed.

No.	Tasks/Strategy	Category	Status
C4/9	The ICAO APAC PBN TF recommends that the PBNSG continue to review and revise the PBN Manual to achieve a more hierarchical and easily used structure to minimize the number and complexity of the airworthiness approvals required for PBN operations. The GPBNTF is considered to be an organization well placed to advise ICAO Regions on harmonization and the development of common standards	-	Closed. PBNSG noted the request from the APAC PBN TF. Materials and suggestions on structure of the PBN manual have been forwarded to PBN SG. Updated version of the PBN manual would be available in the second quarter of 2010.
C4/10	The APAC PBN TF agrees to continue coordination with other regional PBN task forces and the Global PBN Task Force to ensure harmonization of PBN implementation	Planning	On-going. Report on Global PBN Task Force activities are presented and noted by PBN TF/5.
A4/11	States are requested to provide progress report regarding PBN implementation at each Task Force meeting	-	Closed. Transferred to Action Item 5/08
A4/12	Mandate States to present their PBN Implementation Plan and to provide progress reports on the development of the State Plan at the next PBN TF meeting	Planning	Routine. States are requested to provide report on the developments of State PBN Implementation Plans.
A4/13	Request the Task Force Chairperson and Rapporteurs to develop a common template for State PBN Implementation Progress Report to be reviewed by the next PBN TF meeting	-	Closed. The TF/5 agreed on the report template.

No.	Tasks/Strategy	Category	Status
C4/14	The APAC PBN TF agreed to develop a regional PBN progress report to be reported annually to CNS/MET and APANPIRG and to be posted on ICAO APAC and ICAO Global PBN web site	Reporting	Routine.
A4/15	Request ICAO Headquarter to provide a presentation on the requirement for safety assessment for PBN implementation and overview of how to conduct proper safety assessment at future PBN TF meetings	Education	On-going. The TF referred to the PBN SG for the development of safety assessment criteria.
C4/16	The APAC PBN Task Force considers itself a suitable forum to facilitate and harmonize terminal and en-route PBN implementation in the Asia Pacific Region. Therefore, the Task Force requests APANPIRG to consider adding the following task into the Task Force’s TOR. <i>“Facilitate and coordinate the harmonized implementation of PBN for terminal and en-route applications in the Asia Pacific Region”</i>	-	Closed. APANPIRG/20 has a decision to establish a Route Review Task Force.
A4/17	Recognizing that the PBN planning activities for the Asia-Pacific are nearing completion and acknowledging the Task Force’s willingness to support actual PBN implementation, the APAC PBN Task Force request working papers regarding revision of the Task Force’s work structure to be submitted for consideration at PBN TF/5. Members of the PBN TF are encouraged to coordinate intersessionally to prepare the working papers.	Implementation	On-going.
A4/18	Request ICAO to provide status report of the work by PBNSG, SASP and IFPP	-	Closed.
C5/01	Confirmed the likely inability of many APAC states to meet the APV implementation goals of Assembly Resolution A 36-23 within the required timeframe. The PBN/TF/5 meeting requested that, APANPIRG while taking note of the limitation of many of the APAC States, consider conveying the same to ICAO with the recommendation that the Resolution be reviewed.	Planning	On-going.

No.	Tasks/Strategy	Category	Status
C5/02	As the authorized GNSS Service Areas, in which SBAS based APVs may be implemented are very limited in coverage, the PBN/TF/5 meeting requests that APANPIRG consider the feasibility of establishing a regional SBAS capability to support all aircraft types.	-	Closed. CNS/MET will consider the feasibility of establishing a regional SBAS capability.
C5/03	That, the concern raised by the US GAO report was noted; and this concern be forwarded to APANPIRG and ICAO HQs.	-	Closed. US Government has guaranteed availability of minimum GPS constellation in writing to ICAO HQ.
C5/04	The PBN/TF/5 meeting recommends that the PBN Study Group review the current PBN GNSS reporting and prediction requirements with a view to establishing common implementation rules and technical standards for such requirements.	Implementati on	On-going. APANPIRG Conclusion 20/37invites ICAO to develop the guidance materials.
C5/05	That, APANPIRG consider tasking the PBN TF with examining the feasibility of establishing a regional RAIM prediction system.	-	Closed. APANPIRG Conclusion 20/38 tasks the PBN TF with examining the feasibility of establishing a regional RAIM prediction system.
C5/06	That, the PBNSG consider the proposal to develop Guidance Material that provides a means to assign PBN capability to GPS IFR aircraft in the first instance without the need for recertification.	Education	On-going. APANPIRG Conclusion 20/37invites ICAO to develop the guidance materials.

No.	Tasks/Strategy	Category	Status
C5/07	That, States distribute the RNAV safety message and emphasize on all operators involved in RNAV to apply the lessons learnt on Human Factor issues, as discussed in the paper presented by New Zealand on RNAV Human Factors and System Safety.	-	Closed. APANPIRD Conclusion20/39 distributes the Report to the States for further distribution to all operators.
C5/08	That, States / Administrations be requested to use the PBN Implementation Progress Report Template for all future reporting on their status of PBN implementation. The Report should be submitted at each of the future PBN Task Force Meeting.	Reporting	Routine.
C5/09	That, States / Administrations be requested to submit their PBN Implementation Progress Report by 15 August 2009 for onward submission to APANPIRG/20 Meeting scheduled to be held from 7 – 11 September 2009.	-	Closed.
C5/10	That, the APAC Regional PBN Implementation Plan (Interim Edition Version 0.3) be presented at the APANPIRG/20 for approval.	-	Closed. APANPIRG Conclusion 20/41 adopted the APAC Regional PBN Implementation Plan (Interim Edition Version 0.3) as Version 1.0
C5/11	That, APANPIRG consider in conjunction with the proposal to establish a SEA RR/TF, acquiring the necessary resources to establish a Regional PBN Office or a dedicated Project to design PBN based regional air routes and facilitate their adoption by the States in the APAC region.	-	Closed.
C5/12	That, the PBNSG be requested to provide guidance on any PBN-specific aspects of en route safety assessment.	Education	On-going.

No.	Tasks/Strategy	Category	Status
C5/13	That, presentation(s) on Safety Assessment be included in the Agenda for the PBN Implementation Seminar to be held in Hong Kong in February 2010.	-	Closed.
C5/14	That, ICAO kindly assist with addressing the PBN safety assessment training needs in the region.	Education	On-going
C5/15	Urged States to give detailed considerations to the operational need, safety and cost benefits prior to deciding on RNP AR Approach implementation.	-	Closed.
C5/16	That, APANPIRG agree to the PBN Task Force activities continuing for two additional meetings in the first half of 2010 using the Task Force's current TORs.	-	Closed.
C5/17	That, ICAO be requested to consider providing an annual summary of panel and working group activities to allow proper coordination amongst different groups (PBN/TF/4 Action Item 4/18)	Reporting	Routine.
A6/1	States are encouraged to consider implementing 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.	Implementati on	
A6/2	States are encouraged to attend to ICAO PBN Airspace Design Workshop in 19-22 April 2010 to enhance their expertise with airspace design relating to implementation of PBN	Education	
A6/3	States are encouraged to attend CDO workshop to be hold in Bangkok on the week of March 15 in conjunction with IFPP meeting.	Education	

No.	Tasks/Strategy	Category	Status
A6/4	IATA is requested to provide the progress on the development of global database for PBN approval at the PBN TF/7 Meeting.	Implementation	
A6/5	States are requested to list the challenges and impediments for PBN implementations to be reported at the PBN TF/7 Meeting.	Implementation	Routine
A6/6	A harmonization analysis report on State PBN Implementation Plans to be developed by IATA and volunteering States (Australia, Hong Kong, New Zealand and Thailand) and reported to the PBN TF/7 Meeting.	Planning	
A6/7	States are requested to review the draft PBN Operational Approval Handbook and provide feedback at future PBN TF meetings. States are also invited to contribute relevant material to be integrated into the Handbook.	Implementation	
A6/8	States are encouraged to participate in the PBN Operational Approval Training to be conducted under the auspices of COSCAPs in Singapore on during 26-30 April 2010. Invitation will be issued to select States by COSCAPs.	Education	
A6/9	ICAO Regional Office to inform IFPP, PBNSG and APANPIRG limitation of older FMS in inputting procedure identification within 6-digit alphanumeric. This limitation occurs when pilots attempt to select specific approach for an airport that has multiple runways and each of runways has multiple approach procedures of the same type of navigation system. ICAO is requested to provide guidance and standardized solution to the issue.	Implementation	
DC6/10	The proposed revision to the APAC Regional PBN Implementation Plan as shown in Appendix 'F' of the PBN TF/6 Meeting report be adopted.	Planning	

No.	Tasks/Strategy	Category	Status
DC6/11	ICAO provides 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.	Implementation	
DC6/12	Request CNS/MET SG, ATM/AIS/SAR SG, and APANPIRG 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).	Planning	
A6/13	ICAO Secretariat 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 are standardized.	Reporting	
D6/14	The PBN TF agrees to integrate its Implementation Task List into the PBN Task Force Task List and updates the PBN Task Force Task List as shown in an Appendix of the Meeting Report.	-	Closed.
A6/15	ICAO Secretariat to provide an update report on PBN TF activities to ICAO Route Review TF. The PBN TF also requested that activities of the RR TF to be reported to the PBN TF.	Coordination	
A6/16	States / Administrations to submit their PBN Implementation Progress Report by 20 February 2010 for onward submission to APANPIRG/21 Meeting.	Reporting	

No.	Tasks/Strategy	Category	Status
D6/17	The PBNTF agrees in principle to the establishment of a regional RAIM prediction system and cooperation between the ICAO PBN TF and the APEC GIT. Australia, India, Japan and USA also agreed to be part of the project team.	Implementation	
A6/18	The PBN TF requests AEROTHAI in conjunction with the project team to develop more detailed technical architecture, operational concepts, and administrative arrangements to be reviewed by the Task Force at the PBN TF/7.	Implementation	
A6/19	States are requested to develop Working Papers on back up requirements for PBN to be discussed at the PBN TF/7 Meeting.	Planning	
A6/20	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).	Coordination	
A6/21	States be requested to review the requirements of the State Letter on the implementation of the interim 2012 flight plan format in the context of PBN implementation and report to the PBN TF 7 meeting issues noted.	Implementation	

APPENDIX 'P' TO CNS/MET SG/14 REPORT



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

**ASIA/PACIFIC REGIONAL PERFORMANCE-BASED NAVIGATION
IMPLEMENTATION PLAN**

VERSION 2.0

September 2010

RECORD OF AMENDMENT

Version	Activity	Date
0	Adopted by APANPIRG/19 as Interim Edition	September 2008
0.1	RASMAG Proposal	December 2008
0.2	Amended/Finalized by PBN/TF/4	March 2009
0.3	Amended/Finalized by PBN/TF/5	July 2009
1.0	Adopted by APANPIRG/20	September 2009
1.x	PBN/TF/6 Proposal for Amendment	February 2010
2.0	To be adopted by APANPIRG/21	September 2010

Proposed Revision to Summary Table & Implementation Targets

Medium Term (2013-2016)*		
Airspace	Preferred Nav. Specification	Acceptable Nav. Specification
Route – Oceanic	RNP 2**, RNP 4	RNAV 10
Route – Remote continental	RNP 2	RNAV 2, RNP 4, RNAV 10
Route – Continental en-route	RNAV 1, RNP 2	RNAV 2, RNAV 5
TMA – Arrival	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
TMA – Departure	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
Approach	Expansion of RNP APCH (with Baro-VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations	
Implementation Targets <ul style="list-style-type: none"> • RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016 • RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016 • RNAV 1 or RNP 1 SID/STAR for 70% of busy domestic airports where there are operational benefits • Implementation of additional RNAV/RNP routes 		

* **Note 1:** In circumstances where affected States are agreeable to completing an implementation in advance of the timeline, early implementation is encouraged on the basis of coordination between affected States and airspace users.

** **Note 2:** Related CNS requirements and operational procedures for RNP 2 application in Oceanic Airspace are yet to be determined.

Proposed Revision Note 3

*** **Note 3:** When establishing the implementation targets in accordance with Assembly Resolution A36/23, the States should first conduct an analysis of the instrument RWY eligibility for APV approach. This analysis should include the feasibility of the APV at a particular location, the presence of regular commercial operations and the current or projected user fleet capability for APV. Locations where APV approach is either not feasible or where the regular operators cannot realize the benefit of APV within the

set implementation timeline, need not be included. Where APV is not implemented, States should consider implementation of RNP APCH with LNAV minima instead of APV to provide the safety benefits of straight-in approach procedures.

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APPENDIX ‘Q’ TO CNS/MET SG/14 REPORT



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

3) Discuss issues related to implementation of GNSS and review developments that have taken place in the Region

GLOBAL NAVIGATION SATELLITE SYSTEM MANUAL (DOC 9849) – REVISION

(Presented by name of State/Organization)

SUMMARY

First Edition of GNSS Manual (Doc 9849) was published in 2005 to provide guidance on the implementation of GNSS. There has been a significant change in the global GNSS environment and hence the need has been felt to update the Manual should to reflect those changes. It has also been decided to provide guidance on the hurdles identified by the States in the implementation process. This paper presents a list of hurdles already identified and invites comments. Paper also invites information on additional hurdles faced by the States to supplement the list so that guidance on those also can be included in the Manual.

This paper relates to:

Strategic Objective:

- A. Safety – Enhance global civil aviation safety
- D. Efficiency – Enhance the efficiency of aviation operations

Global Plan Initiative:

- GPI –5 RNAV and RNP (Performance Based Navigation)
- GPI – 21 Navigation

1. Introduction

1.1 The Standards and Recommended Practices (SARPs) for Global Navigation Satellite Systems (GNSS) were developed by the Global Navigation Satellite Systems Panel (GNSSP) and were introduced as part of Amendment 76 to Annex 10 to the *Convention on International Civil Aviation – Aeronautical Telecommunications, Volume I (Radio Navigation Aids)* in 2001. Guidance on the technical aspects and the applications of GNSS SARPs are provided in Attachment D to Annex 10, Volume I.

1.2 Subsequently a guidance manual was developed by the GNSSP to provide information on the implementation aspects of GNSS in order to assist the States in the introduction of GNSS operations. First Edition of *Global Navigation Satellite System (GNSS) Manual* (Doc 9849, AN/457) was published in 2005. The document is generally aimed at air navigation service providers (ANSPs) responsible for fielding and operating GNSS elements, and at regulatory agencies responsible for approving the use of GNSS for flight operations. It also provides GNSS information to the aircraft operators and manufacturers.

1.3 With the rapidly changing GNSS operating environment, it was found necessary to review the contents of Doc 9849 and amend them in line with the changes that have taken place. Working Group 2 (WG2) of Navigation Systems Panel (NSP), in its meeting held in November 2009 agreed to draft text for specific sections of the GNSS Manual and Secretariat agreed to coordinate a full review of the manual with the intent of presenting the final draft at the November 2010 NSP meeting.

1.4 Secretariat now requires information from States on the current hurdles to the implementation of GNSS due to the lack or inadequacy of guidance or due to any other factors.

2. Discussions

2.1 Navigation Systems Panel Secretariat, through a Working Paper presented at the NSP Working Group of the Whole meeting held from 17 to 28 May 2010 in Montreal, informed the Meeting that information on hurdles to the implementation of GNSS operations will be solicited from the ICAO Regional Offices and from specific States to support the action of reviewing and updating *Global Navigation Satellite System (GNSS) Manual* (ICAO Doc 9849). Secretariat also invited members and Advisors of the Navigation Systems Panel to provide information, based on their experience and knowledge on hurdles to GNSS implementation by 30 June 2010. A draft version of GNSS Manual proposing changes was also presented by the Secretariat for review by the meeting.

2.2 Subsequent to the publication of GNSS Manual in 2005, implementation activities of Performance Based Navigation (PBN) started globally and Third significantly revised Edition of the Performance Based Navigation (PBN) Manual (Doc 9613, AN/937) had been published in 2008. It was agreed that implementation of PBN, to a large extent is dependent on GNSS. A need therefore has been felt to provide a linkage between GNSS and PBN implementation in the GNSS Manual and avoid duplication of information in the two documents. Also information provided in the manuals needs to be updated to take into account the introduction of new constellations like Galileo etc.

2.3 While updating the manual in line with the observations made above, it has been suggested to incorporate guidance on the issues and hurdles which have been faced by the States while implementing GNSS in their administrations.

2.4 A list of the hurdles, compiled based on the information already available is attached for reference. The meeting is invited to review the list and comment. The meeting is also invited to bring out additional issues, which have been faced during implementation.

3. Action required by the Meeting

3.1 The meeting is invited to:

- (a) review the list placed at **Attachment** identifying the hurdles in the implementation of GNSS and provide comments; and
- (b) identify additional hurdles based on their knowledge and experience in implementing GNSS in their administrations.

Attachment to CNS/MET SG/WP/2

**Review of GNSS Manual (ICAO Doc 9849)
Current hurdles to the implementation of GNSS operations**

1. The Secretary of the Navigation Systems Panel (NSP) is coordinating a revision of the GNSS Manual (Doc 9849). To ensure that the revised manual meets the goal of supporting GNSS implementation at the national level, the Secretary requires information from Regional Offices and States on current hurdles to the implementation of GNSS due to the lack or inadequacy of available ICAO guidance, or to any other factors.
2. At the NSP Working Group of the Whole Meeting in Montreal 17-28 May 2010, participants developed a partial list of hurdles (below), but it is expected that Regional Offices are in the best position to identify other hurdles and to validate the list.
3. The Secretary has asked Mr. Ross Bowie, who retired from NAV CANADA in 2009 and who chaired the NSP working group that developed the current GNSS Manual, to coordinate this work. It would be appreciated if you would provide your comments and suggestions to the NSP Secretary (ACapretti@icao.int) and to Mr. Bowie (ross.bowie@sympatico.ca) via e-mail at your earliest convenience.
4. Preliminary list of hurdles:
 - There is uncertainty about NOTAM requirements. The meeting agreed that it was feasible to provide NOTAMs about potential service outages for Basic GNSS Receivers (GPS RAIM) and for SBAS and GBAS to be used as a tool by operators to make operational decisions. The meeting also agreed that the wide variety of avionics implementations that support RNP dictated that aircraft operators should use aircraft-specific tools to predict service outages for their fleets. To do this, operators need basic information about GNSS component planned and actual outages. The meeting went on to discuss ways to address this hurdle in the manual revision. The manual needs to demonstrate the link between NOTAM provision and safety.
 - The meeting noted that the GNSS Manual was developed before PBN Manual development started, and that having these two manuals creates confusion. This can be resolved by ensuring compatibility between the two manuals.
 - Documentation does not support the requirement of some States to develop a safety assessment. The meeting recommended that the manual describe safety assessments that were used by States to support current operations and to encourage the acceptance of these assessments by other States, while noting any geographical or traffic-related issues that could dictate a differences analysis.
 - Some States feel that there is an institutional problem because the current core satellite constellations are operated by the military. The manual needs to stress the commitments to civil aviation by Russia and the United States of America.
 - Some States are worried about vulnerability. The current manual addresses this issue and includes mitigation techniques, but this material needs to be emphasized. The manual needs to stress that availability is the issue, spoofing is not an issue for aviation.
 - The meeting noted that States do not always use the GNSS Manual as a reference to support implementation.

- States require a business case analysis to support implementation, and the manual does not provide enough information to support identification and quantification of benefits. The meeting agreed that examples would be useful and might obviate the necessity for States to complete their own business cases for simple applications like Basic GNSS non-precision approach operations.
- The implementation of GNSS-based terminal area operations in some States faces the requirement for an environmental assessment including extensive public consultation, all at great cost. This is a difficult institutional issue that has no easy solution.
- Some States do not know how to address aircraft certification, in part because there are currently different standards applied globally.
- Some States perceive there is a barrier to APV implementation because of the lack of currency and consistency among ICAO publications. The meeting agreed that the manual should clearly show that APV is possible despite these issues, perhaps including a documentation map and that the NSP should work within ICAO to resolve inconsistencies.
- The meeting noted that there is a lack of GNSS knowledge within some regulatory agencies, and that this is exacerbated by inconsistencies in ICAO documentation. The meeting agreed that the manual should be revised to support the education of regulators. Once the manual is revised there should be a program to provide material and support to regional offices to allow them to provide pertinent information to States.
- Some States have difficulties meeting survey requirements because responsibilities are split between ANS providers and airport operators.
- A major hurdle to full implementation in most States is avionics equipage. Aircraft operators face major costs to equip their fleets, and to equip a large fleet can take five years or more. At the same time, different mandates, different airspace requirements and different mandate deadlines in different areas make it difficult to decide when to equip. As an example, in Europe there is a mandate for ADS-B that can be supported by C129 avionics, and a mandate for APV that requires more advanced avionics. There is a requirement for a vision developed among ANSPs and aircraft operators.

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APPENDIX 'R' TO CNS/MET SG/14 REPORT

DRAFT TERMS OF REFERENCE

PBN Regional Development and Implementation Teams (PBN REDI Teams)

It was recognized that PBN implementation has not kept pace with ICAO objectives and timelines. From a review of State plans, it is evident many States are struggling and increased efforts need to be made to provide direct support.

To support this effort, APANPIRG is requested to:

- a) Identify States within the region that are further advanced in PBN and request their commitment to provide support to other States as part of a regional support program;
- b) Formulate cooperative arrangements with these volunteering States to leverage knowledge and experience already gained and to assist developing States;
- c) Develop additional support mechanisms that create skills and capabilities within States to implement and to sustain PBN operations;
- d) Further promote PBN to decision makers within States to create the political will to invest and devote the necessary resources for PBN implementation;
- e) Establish PBN Regional Development and Implementation Teams (PBN REDI Teams); and
- f) Establish a mechanism to ensure appropriate resourcing is available.

Draft Terms of Reference:

PBN Regional Development and Implementation Teams (PBN REDI Teams)

The objective of the PBN REDI Teams is:

- 1) To identify implementation needs and to direct and/or organize the appropriate resources that will deliver PBN solutions to States;
- 2) To meet this objective the REDI Team shall directly assist States to achieve:
 - a) completion and improvement of PBN implementation plans;
 - b) conducting safety assessments;
 - c) collection of required data and practices to maintain data integrity; and
 - d) guidance to establish the regulatory framework, approvals process and other mechanisms necessary for implementation and sustainment of PBN capabilities.

— END —