



International Civil Aviation Organization

**SIXTEENTH MEETING OF THE
COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND
METEOROLOGY SUB-GROUP (CNS/MET SG/16) OF APANPIRG**

Bangkok, Thailand, 23 – 27 July 2012

Agenda Item 5: Navigation

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

REPORT ON GNSS RELATED REGIONAL ACTIVITIES

(Presented by the Secretariat)

SUMMARY

ICAO APAC Office was invited to participate and contribute in three GNSS related regional activities during last one year. In addition to informing about the GNSS applicators for aviation, ICAO APAC Office sought regional support for its ionospheric model development initiatives. A number of informal agreements were reached for exchange of experience/information.

This paper relates to: -

Strategic Objective:

A: Safety - *Enhance global civil aviation safety*

C: Environmental Protection and Sustainable Development of Air Transport - *Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-11 RNP and RNAV AIDS and STARs

GPI-21 Navigation systems

1. Introduction

1.1 ICAO APAC Office was invited to participate and contribute to three GNSS related activities held during last one year in the region. These activities were mostly aimed at increasing cooperation and coordination in the matters related to the implementation of GNSS for multiple sectors of applications including transportation.

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1.2 ICAO APAC Office has been very active in the Asia Pacific Economic Cooperation (APEC) GNSS Implementation Team (GIT). Sixteenth meeting of APEC GIT (GIT/16) was held in Bangkok from 15 to 17 February, 2012. The meeting was attended by 24 experts from 8 APEC Member Economies, 1 International Organization and 2 Industrial Organizations.

1.3 First Asia-Oceania Space Weather Alliance (AOSWA) Workshop was organized in Chiang Mai, Thailand from 22 to 24 February, 2012. 13 Associates from 7 countries in the Asia Pacific Region participated in the workshop. The objective of the Workshop was to make progress in collaborative research and practical operations of space weather forecasting.

1.4 A Workshop on the Use of Multi-Global Navigation Satellite Systems for Sustainable Development was organized in United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), Bangkok on 21 and 22 March, 2012. The Workshop was attended by experts from Bangladesh, Bhutan, China, India, Japan, Lao People's Democratic Republic, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Viet Nam. Representatives from UN entities including Food and Agricultural Organization (FAO), International Civil Aviation Organization including Food and Agricultural Organization (FAO), International Civil Aviation Organization (ICAO) and international organizations including European Union (EU), Asian Disaster Reduction Center (ADRC), WMO/ESCAP Panel on Tropical Cyclones (PTC), ESCAP/WMO Typhoon Committee Secretariat (TCS) also attended the workshop. Nominated experts from academic institutions including Asian Institute of Technology (AIT), King Mongkut's University of Technology (KMUT) and Tokyo University of Marine Science and participants representing research organizations including Japan Aerospace Exploration Agency (JAXA), Remote Sensing Technology Center of Japan (RESTEC), Mobile Innovation Company Limited (MICL) and industry partners representing Hitachi Zosen Corporation, Mitsubishi Electric Corporation, Siam Shoreside Services Ltd also contributed to the Workshop.

2. Discussion

2.1 ICAO APAC Office participated in the three regional activities related to GNSS during last one year. Significant outcome of these three meetings are described in the following paragraphs.

APEC GIT/16

2.1.1 Sixteenth meeting of APEC GIT (GIT/16), hosted by Aeronautical Radio of Thailand (AEROTHAI) was held in Bangkok from 15 to 17 February, 2012. The meeting, co-chaired by Ms. Karen Van Dyke of US Department of Transportation and Mr. Noppadol Pringranich of AEROTHAI was organized to review the status of GNSS implementation in the region, exchange information/experience on the subject and to provide a platform for the APEC Member Economies to coordinate implementation GNSS related plans for all modes of transportation. Meeting also reviewed the status of the two Concept Proposals and Project Reports and noted the development of the other related projects. Meeting gave an opportunity to the participants to learn about global developments related to GNSS and its applications for different sectors of transportation.

2.1.2 Meeting developed a number of Recommendations and Action Items related to GNSS implementation. Conclusion/Action Items related to the presentation made by ICAO APAC Office are reproduced below:

- Conclusion 16/2:** The APAC GIT agrees to provide APEC GNSS Test-bed data to support ICAO Ionospheric Studies Task Force. Activities should be coordinated between ICAO APAC Office and APEC GIT Co-chairs.
- Action Item 16/7:** For the GIT member economies collecting single/dual frequency data – to provide the GNSS Ionospheric data to support activities by the ICAO Ionospheric Studies Task Force.
- Action Item 16/8:** For the project consultant of the PBNRREVP to cooperate with ICAO APAC Office through coordination with the APEC GIT Co-chair in the development of the questionnaire regarding the PBN and GNSS regulatory processes.
- Action Item 16/9:** For the APEC GIT Co-chair to make a presentation regarding APEC GIT activities to the ICAO APAC Office GNSS Seminar on 26 March 2012.
- (The presentation was made by APEC GIT Co-chair to the ICAO APAC GNSS Implementation Seminar held in ICAO APAC Office on 26 March 2012)
- Action Item 16/10:** APEC GIT Member Economies participation to consider making presentation to the forthcoming ICAO APAC Office GNSS Seminar on 26 March 2012.

AOSWA/1 Workshop

2.2 The First Asia-Oceania Space Weather Alliance (AOSWA) Workshop was organized in Chiang Mai, Thailand from 22 to 24 February, 2012. AOSWA was established in 2010 with 13 Associates from 7 countries with an objective of making progress in collaborative research and practical operations of space weather forecasting.

2.3 Space weather conditions have been relevant for many of the aviation services. Effect of ionospheric conditions on radio propagation has been studied for its relevance to HF Comm. Now ionospheric effect has assumed an even bigger role because of its effects on GNSS performance. Participation in Workshop provided a very good insight into the theoretical aspects and provided information on the data collection activity undertaken in the region. Workshop also provided a platform to the experts for exchanging information/experience.

2.4 Session 2 of the Workshop on ‘Ionospheric Variations and their Effect on Radio Propagation’ included a number of presentations on theoretical aspects of ionospheric effect and included information on data collection/analysis activities that are going on in the region. ICAO APAC Office, through its presentation informed the Workshop about GNSS applications for aviation and sought support of the participating countries for the regional Ionospheric Studies initiatives. Some of the significant relevant outcomes of the Workshop are listed below:

2.4.1 ICSU World Data System: World Data System (WDS) is a global federated system of long term data archive and data related services covering a wide spectrum of natural science. It encourages inter-disciplinary science approach. WDS, operated by NICT in Japan can be a significant source of ionospheric data for the ISTF studies.

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2.4.2 Regional programmes on ionospheric studies: Ionospheric studies being carried out in China, Vietnam, Indonesia, Thailand, Republic of Korea, Japan and some other countries were discussed in the Workshop. It was learnt that the data collected for the studies being carried out in different countries could be a very significant data source for the development of a regional ionospheric model for GBAS and SBAS.

2.4.3 Australian Regional Ionospheric TEC Model: Australia proposed a new approach to regional Total Electron Content (TEC) modeling using Spherical Cap Harmonic Analysis (SCHA) and Empirical Orthogonal Function (EOF) techniques. The model was validated by analyzing 2010 data from Australian region.

2.4.4 Multi-GNSS Monitoring Network: It is predicted that more than one hundred positioning satellites (including GPS, GLONASS, GALILEO, COMPASS, QZSS and IRNSS) are going to be in the orbit shortly. Multi-GNSS applications were proposed by Japan to reap maximum benefits from these large numbers of satellites. JAXA is establishing 'Multi-GNSS Monitoring Network' by using 60 multiple frequency receivers. States were invited to join this campaign.

2.4.5 ICAO APAC Office invited: In a separate discussion with the AOSWA apex body, ICAO APAC Office was invited to join the Alliance as an Associate.

Workshop on Use of Multi-GNSS for Sustainable Development

2.5 Workshop on the Use of Multi-GNSS for Sustainable Development was held in UN ESCAP, Bangkok on 21 and 22 March, 2012. Workshop noted that the recent advances in Multi-Global Navigation Satellite Systems had enabled a high potential of utilization in the various applications for sustainable economic and social development. The Workshop aimed to facilitate sharing of experiences and information on multi-GNSS utilization for transportation, disaster risk reduction, environment monitoring and agriculture to increase awareness among the users.

2.5.1 Multi-GNSS compliant systems are expected to enable greater resolution and accuracy, which in turn will enable greater functionality in the transport sector, for instance, bringing more fuel efficiency for the air transportation.

2.5.2 Workshop suggested that a regional scintillation monitoring system could possibly be established under the guidance of ESCAP, to monitor the main error factors affecting accuracy for position, navigation and timing (PNT) of multi-GNSS. It was also noted that human resource capacity of the Multi-GNSS in the Least Developed Countries and in some Developing Countries need to be supported through international/regional cooperation mechanism. It was felt that the main barrier to make full use of the Multi-GNSS applications was the lack of capacity (both human and financial resources) of such countries. Workshop also recommended that the user fee of the augmentation services from Multi-GNSS should be kept affordable so as to enable its widespread usage and adoption, which in turn will lower the cost of Multi-GNSS capable receiver terminals.

3. Action by the Meeting

3.1 The meeting is invited to note the information provided in this paper and review outcome of the three regional meetings which addressed implementation of GNSS and GNSS related applications.
