



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

**STRATEGY FOR SUPPORTING GROUND-BASED AUGMENTATION SYSTEM (GBAS)
IONOSPHERIC STUDIES IN ASIA AND PACIFIC REGIONS**

(Presented by Hong Kong, China)

SUMMARY

This paper presents the strategy and experience of Hong Kong, China in collecting and sharing of GNSS data to support GBAS ionospheric studies in Asia and Pacific Regions.

This paper relates to –

Strategic Objectives:

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-5 RNAV and RNP (Performance-based navigation)

GPI-11 RNP and RNAV SIDs and STARs

GPI-21 Navigation systems

1. Introduction

1.1 GBAS is one of the key satellite-based GNSS applications to supplement and eventually replace the existing terrestrial-based Instrument Landing System (ILS). Comparing with ILS, installation of GBAS is relatively easier and has less stringent siting criteria in terms of antenna system, equipment, critical and sensitive areas requirements. One GBAS could support precision curved-in approach for multiple runways using PBN procedures. However, ionospheric storm and scintillation are the ionospheric effects that have adverse impacts on the continuity, integrity and availability of this safety-critical precision landing system.

1.2 Although threat model (i.e. CONUS model) has been established to overcome the effect of ionospheric storm on GBAS and SBAS, it was developed using the data collected in continental United States situated in mid-latitude region during the last solar peak in around 2001 ~ 2003. As most of the States in the Asia and Pacific (APAC) Regions are at low latitude where both

Agenda Item 5

23/07/12

the ionospheric storm and scintillation are more pronounced, the validity of the CONUS model for GBAS and SBAS operations in the region need further studies and validation.

1.3 Recognising the need for characterisation of the ionosphere in the Asia and Pacific Regions to support GNSS applications including GBAS and SBAS, CNS/MET SG/14 directed ICAO APAC Office to organise in May 2011 a workshop on ionospheric data collection, analysis and sharing in support of GNSS implementation (the “Workshop”) for States/Administration in the region to plan the way forward. In response to the recommendation of the Workshop, CNS/MET SG/15 supported the establishment of an Ionospheric Studies Task Force (ISTF) to pursue the objective of characterising the ionosphere in the APAC Regions, with the first ISTF meeting (ISTF/1) held in February 2012.

2. Discussion

2.1 Since the civil aviation community in the APAC Regions may not have a dedicated ionosphere monitoring network to capture GNSS data in the last solar storm, Hong Kong, China advocated in the Workshop the concept of obtaining GNSS data from other communities in the region for data sharing. GNSS data collected by other organizations could be used for ionospheric studies purpose.

2.2 In the case of Hong Kong, China, liaison has been made with the local lands authority for sharing of the GNSS data captured by their Satellite Positioning Reference Station Network since October 2000, covering the last solar storm period. The Civil Aviation Department of Hong Kong, China also set up a monitoring station at the Hong Kong International Airport (HKIA) in December 2010 to collect GNSS data where GBAS will be installed. The network comprising a total of thirteen monitoring sites in the territory of Hong Kong, China is shown in Figure 1 below.

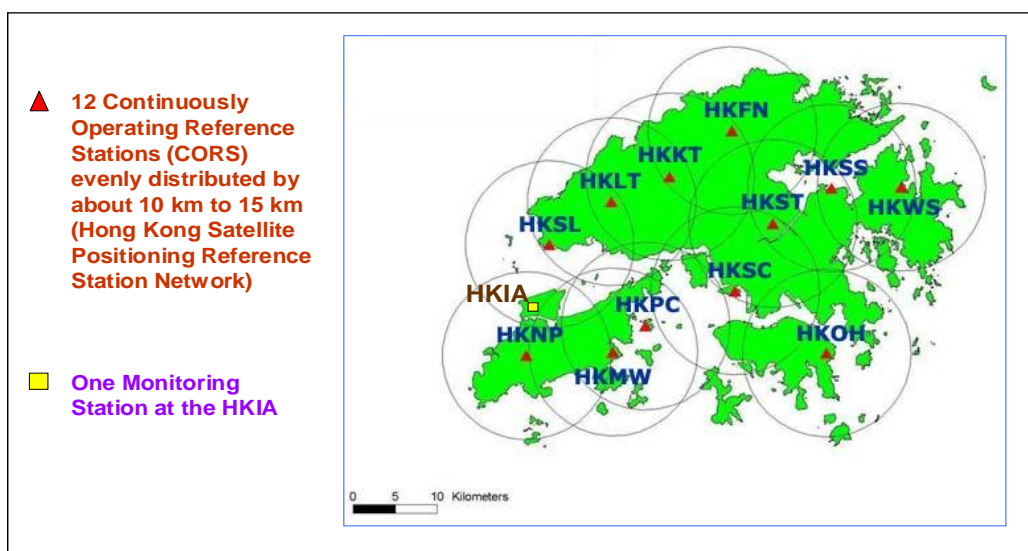


Figure 1 - Satellite Positioning Reference Station Network and Monitoring Station at the HKIA

2.3 In the ISTF/1 held in February 2012, Hong Kong, China shared with the meeting the experience and effort made for gathering data from the local lands authority to establish a monitoring network for supporting GBAS ionospheric studies in the APAC Regions. Hong Kong, China also stressed the importance and urgency for States in the APAC Regions to collect and share GNSS data before the forthcoming solar storm peak in 2013. The data so collected will be useful for studies on the ionospheric model for the APAC Regions.

2.4 A data sharing agreement signed by Hong Kong Civil Aviation Department with the local lands authority was also shared in the ISTF/1 for reference by other States in the region. The document was adopted by the ISTF as the guidance material and sample memorandum of understanding (MOU) for States to enter into similar legal agreement with their national organizations for data sharing. The conditions highlighted in the agreement on purely using the shared data for the study and development of ionospheric model in APAC Regions for satellite-based air navigation was accepted by the ISTF as the standard wording in similar MOU or agreement to be made by States in the region.

2.5 The ISTF has already identified five set of tasks for ionospheric studies, viz Data Collection, Iono Analysis, TEC Generation, Scintillation Data and Iono Model. Whilst there are GNSS data available for TEC generation, Hong Kong, China recognizes the limited scintillation monitoring facilities in the APAC Regions and would invite ICAO to give guidance on installation of scintillation monitors at strategic locations for studies on scintillation effect to satellite communications during solar storm.

3. Action by the Meeting

3.1 The meeting is invited to :

- a) note Hong Kong, China's strategy and experience in expediting the establishment of monitoring network to capture GNSS data for supporting ionospheric studies in Asia and Pacific Regions; and
- b) note the limited scintillation monitoring facilities in the region and recommend ICAO to provide guidance on collection of scintillation data for ionospheric studies in the Asia and Pacific Regions before the next solar storm peak in 2013.
