



*International Civil Aviation Organization*

**THE THIRD MEETING OF IONOSPHERIC  
STUDIES TASK FORCE (ISTF/3)**

15 – 17 October 2013, Seoul, Republic of Korea



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**Agenda Item 5: Review of progress of tasks and related actions items**

**REVIEW ACTIONS ITEMS FROM SECOND MEETING OF  
IONOSPHERIC STUDIES TASK FORCE (ISTF/2)**

(Presented by the Secretariat)

**SUMMARY**

Second Meeting of ISTF (ISTF/2) held in October 2012 developed a number actions items. This paper reviewed outcome of the ISTF/2 Meeting and actions items for updates and discussion by the meeting.

**1. INTRODUCTION**

1.1 Ionospheric Studies Task Force was created by CNS/MET Sub-Group of APANPIRG through its Decision 15/13, based on the recommendation of a Two Day Workshop on '*Ionospheric Data Collection Analysis and Sharing in Support of GNSS Implementation*' held in Bangkok on 5 and 6 May, 2011. First meeting of the Task Force was held in Tokyo, Japan from 27 to 29 February, 2012.

1.2 Second Meeting of Ionospheric Studies Task Force (ISTF/2) was held in ICAO APAC Office, Bangkok from 15 to 17 October, 2012. This paper reviews the significant outcome of the meeting. Full Meeting Report can be accessed on the ICAO Asia/Pacific Office website at the address <http://www.bangkok.icao.int/cns/meeting.do?method=listArchive#A2012>

**2. DISCUSSION**

2.1 Second Meeting of the Ionospheric Studies Task Force (ISTF/2) was attended by 18 participants from 7 Administrations and 1 Academic Institution. ISTF/2 meeting was informed that APANPIRG, through its Conclusion 23/28 had urged those States, which are not participating in the Ionospheric Studies Task Force, to share ionospheric data from their national sources with the Task Force to support development of regional ionospheric models for GBAS and SBAS.

2.2 In response to a request to develop guidance on installation of scintillation monitors at strategic locations, meeting agreed to prepare the first draft by November 2012 for comments. States agreed to share their experiences. It was clarified that the document would provide guidance on the required receiver performance, distance between the receivers, siting criteria of receivers and how to collect scintillation data. Following Action Item was developed based on the outcome of discussions on the subject:

**Action Item 1:** ISTF should develop a guidance material on collection of scintillation data at strategic locations. Preliminary draft of the guidance material should be available by November 2012 and the finalized guidance material, incorporating all recommended changes, should be available by December 2012.

2.3 The meeting is expected to further discuss the draft guidance material and review the progress.

#### APEC GIT 16/17

2.3.1 The ISTF/2 meeting discussed how to coordinate with the APEC GIT Co-chairs for sharing of data derived from the test-bed. Secretariat was requested to forward a copy of the template developed by the Task Force to the Co-chairs of GIT. Following Action Item was developed on the issue:

**Action Item 2:** Secretary to communicate with the APEC GIT Co-chairs regarding the data sharing template. Target date for receiving information from APEC GIT is end of December 2012.

2.3.2 Coordination with the Co-chairs of GIT was carried out. As a result, Co-chairs of GIT agreed to share data derived from the test-bed in any optional forms.

#### NSP Working Group of the Whole Meeting

2.4 ISTF was informed about the Space Weather related work that is being carried out by ICAO Meteorology and the following documents which were circulated to the States for comments:

- Draft Operational Requirements
- Draft guidance material; and
- Roll-out plan/milestones for a space weather service

2.4.1 In the NSP Working Group of the Whole Meeting held in Montreal, Canada in May 2012, it was indicated that NSP would like to be involved in the preparation of requirements related to Space Weather in order to ensure that the information is distributed to operational community on space weather in future reflecting correctly the expected impact on navigation services.

2.4.2 ISTF was informed about the related work that is going on in other forums like the CAT II/III Sub Group (CSG) of NSP, Japan (ENRI), Republic of Korea (Korea advanced Institute of Science and Technology – KAIST), FAA (Technical Center, Oklahoma City Programme Office), EuroControl, Thales and Standford University. Developments in the International GBAS Working Group (IGWG) were specifically discussed in detail, particularly with reference to the Long-term Ionosphere Anomaly Monitoring (LTIAM) Tool which they have developed. Following Action Item was developed requiring acquisition of the LTIAM Tool.

**Action Item 3:** Task Lead, Task – 2 to coordinate with IGWG Iono Group to acquire LTIAM Tool. Target date is by the end of December 2012.

2.4.3 A paper on the latest development IGWG/14 and status LTIAM Toll will be prepared for discussion at the ISTF/3 meeting.

### Status of States' activities

2.5 Status of ionosphere related activities in the region were taken up for discussion in detail. India informed the meeting that GAGAN signal in space was available for use by non-aviation users, after the integration of the first GEO Satellite (GSAT-8) on 21 May 2011. The second satellite (GSAT-10) was launched on 29 September 2012 and the certification of GAGAN was expected to be completed by July 2013. India invited neighboring States of Sri Lanka, Pakistan, Afghanistan, Bhutan, Nepal and Bangladesh to derive benefits from the system. Task Lead, Task – 5 was invited to investigate if IGM Multi Layer Data Fusion (MLDF) algorithm used in GAGAN can be considered applicable for SBAS in the Asia/Pacific region (as suggested by India). Hong Kong China informed about their 13 data collection sites and invited ISTF to resolve the issue of sharing/transporting massive data collected from 2000 onwards. ISTF agreed that the portal created should be used for further discussion on the subject. Japan shared their experience of data collection activity and their collaborative arrangements with other agencies like Japan Space Agency (JAXA) etc. Republic of Korea informed about their arrangement of 86 receivers with a separation distance ranging from 20 to 50 km. It was also informed that five scintillation monitors will be set up by ROK shortly. Thailand informed ISTF about addition of one more station set up in the northern part of the country and the proposal to set up two more stations.

### Review Summary of Data Sources

2.6 Task Lead, Task – 1 (Data Collection) explaining the geographic distribution of data collection centers, explained that most of the WAAS stations in USA are located in the mainland and most of these are located in the mid latitude region (except one in Hawaii located in the low latitude region and one in Alaska located in the high latitude region). Amongst 200 stations in Japan, majority of these are located in the low-mid latitude region. It was suggested that graphical location of the receivers should be analyzed and taken into account while verifying the adequacy of data sources for analysis. ISTF was of the opinion that Task Lead, Task – 1 should categorize the ionospheric delay and scintillation measurement into geographical regions to confirm an even spread of all the observation sites and hence it was decided to adopt following Action Item:

**Action Item 4:** Task Lead, Task – 1 should categorize the ionospheric delay measurements and scintillation measurements into geographical regions to confirm an even spread of all the observation sites in the region. Target date for the Action Item was agreed as January 2013.

2.6.1 ISTF/2 meeting agreed that the nominated scintillation measurement sources were less in number and some geographical areas were not being adequately represented. To get better results, it was agreed that more data sources should be identified.

### Review Progress of Tasks

2.6.2 Progress of Tasks assigned to the following Task Groups was reviewed:

- a) Task 1 – Data Collection
- b) Task 2 – Iono Analysis
- c) Task 3 – TEC Generation
- d) Task 4 – Scintillation Data
- e) Task 5 – Iono Models

2.6.3 Japan presented a plan of setting up a data server in ENRI, Japan for collection, integration, administration and distribution of data collected from the States and Administrations. It was estimated that quantum of data handling will be around 9TB per year. Cost of handling this volume of data on a commercial data handling service was expected to be much higher than the cost of maintaining a server. Participants were invited to discuss server design through ICAO ISTF Forum. The meeting highly appreciated Japan's offer to host the server and discussed issues related to the handling of huge quantum of data and restrictions imposed by the contributing States regarding the use of their data. On the issue of developing a mechanism to support data usage restrictions imposed by the data sources, following Action Item was developed by the meeting:

**Action Item 5:** Task Lead, Task – 1 to prepare a mechanism to identify the terms of use of data as proposed by the data sources and incorporate that in the data processing. Target date for this Action Item is January 2013.

2.6.4 The meeting is expected to review the proposed access, authorization procedure for sharing the data collected and means of data collection.

2.6.5 Data Format proposed by Japan, both for ionospheric delay and scintillation measurements are similar to RINEX and are compatible with it. Data structures in both the formats (called GTEX and SINTEX) were discussed in detail and modalities for conversion and handling were agreed upon. The meeting agreed to use the two formats proposed.

2.6.6 The meeting after discussing the criteria to categorize nominal, moderate and stormy dates agreed that standardized  $K_p$  and  $D_{st}$  index should be used. The meeting agreed that additional parameters and the mechanism can be discussed further on the portal and adopted following Action Item:

**Action Item 6:** Data server sponsored by ENRI should need to be ready to receive/compile data. Discussions on period of analysis could start from analyzing which key parameters could be used to identify such periods. States like India and Japan, which have already carried out some level of analysis, were requested to suggest these periods/parameters based on their experience. Data formats need to be reviewed and updated for their applicability for the purpose of analysis:

- a) Setting up of Server – Japan (January 2013)
- b) Finalizing data format – Japan (January 2013)
- c) Key parameters to categorize data – Republic of Korea (January – 2013)

2.6.7 ISTF noted information on the scintillation effects observed during different periods (including equinox period) and that the effect was more severe on L5 as compared to L1. Other observations and remedy for some of the adverse effects were also discussed in the meeting.

#### Coordination Meetings

2.7 On the last day of the ISTF/2, coordination meetings were organized at the following two reputed technical institutions of the city:

- a) Asian Institute of Technology (AIT); and
- b) King Mongkut's Institute of Technology, Ladkrabang (KMITL)

2.7.1 ISTF was briefed about the related activities that had been taken up in the two institutes. ISTF members also visited the technical sites, where the ionosphere monitoring facilities had been set up. Both the institutions readily agreed to share their experience with the ISTF and assured to provide full support to ISTF in its objectives.

2.7.2 ISTF was informed about the portal created on ICAO website and that 26 members had already registered on the portal by ISTF/2 meeting. The members were encouraged to make full use of this service and use it for exchange of information/data etc.

### **3. ACTIONS BY THE MEETING**

3.1 The meeting is invited to review the outcome of ISTF/2 meeting. The meeting is also expected to discuss and update the status of completion of the Action Items developed in the ISTF/2 meeting.

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