



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

**REPORT OF  
THE SECOND MEETING OF IONOSPHERIC STUDIES TASK FORCE (ISTF/2)**

Bangkok, Thailand

(15 – 17 October 2012)

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**PART I – HISTORY OF THE MEETING****1. Introduction**

1.1 The Second Meeting of Ionospheric Studies Task Force (ISTF/2) was held at ICAO Regional Office, Bangkok, from 15 to 17 October 2012.

**2. Attendance**

2.1 The Meeting was attended by 18 participants from 7 Administrations (Cambodia, Hong Kong China, India, Japan, Malaysia, Republic of Korea, and Thailand) and an academic institution - Asian Institute of Technology (AIT). List of participants is provided at **Attachment 1**.

**3. Opening of the Meeting**

3.1 On behalf Mr. Awan, ICAO Regional Director, Mr. Sujan Saraswati extended warm welcome to all the participants and highlighted the objectives of the Task Force. Dr. Susumu Saito, Chairman of the Task Force, also welcomed the participants to the meeting and emphasized the need for further discussion on the data format and development of ionospheric models to support GBAS and SBAS implementation. He also expected fruitful discussions on the important tasks in order to achieve the goals of the Task Force.

**4. Officers and Secretariat**

4.1 Dr. Susumu Saito, Chief Researcher, Electronic Navigation Research Institute (ENRI) of Japan and Chairman of the Task Force presided over the meeting. Mr. Li Peng and Mr. Sujan K. Saraswati, Regional Officers, ICAO APAC Office, were the Secretaries of the meeting.

**5. Working Arrangements, Language and Documentation**

5.1 ISTF/2 met as a single body, the working language for the meeting was English inclusive of all documentation and this Report. Lists of Working/Information Papers and Presentations are provided at **Attachment 2**.

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**Agenda Item 1: Adoption of agenda (WP/1)**

1.1 The following tentative agenda, circulated along with the invitation, was adopted by the meeting without any change:

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Review outcome of relevant meetings/conferences

- APEC GIT 16/17
- CNS/MET SG/16 & APANPIRG/23
- IGWG – 13
- ICAO NSP

Agenda Item 3: Review status of State's activities

Agenda Item 4: Review Summary of Data Sources

Agenda Item 5: Review progress of Tasks

- 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

Agenda Item 6: Any other Business

Agenda Item 7: Future Plan, Review of Action Items

Agenda Item 8: Coordination Meetings

- a) Asian Institute of Technology
- b) King Mongkut's Institute of Technology Ladkrabang (KMITL)

**Agenda Item 2: Review of relevant meetings/conferences****Review outcome of CNS/MET SG/16 and APANPIRG/23 Meetings (WP/3)**

2.1 Secretariat presented a brief report on the outcome of CNS/MET SG/16 and APANPIRG/23 meetings relevant to ionospheric data collection, analysis and sharing tasks. The meeting noted following main points relevant to the work of the Task Force:

- APANPIRG adopted Conclusion 23/26 informing that ICAO is organizing an Asia/Pacific GNSS Landing System (GLS) Seminar to provide information on emerging GLS technology, airport and airline GLS planning, and the development of applicable standards. The Seminar will be held on 6-7 December 2012;
- The First Asia-Oceania Space Weather Alliance (AOSWA) Workshop was held in Chiang Mai from 22 to 24 February 2012 and the Multi-GNSS for Sustainable Development Workshop was organized by UN ESCAP in Bangkok on 21 and 22 March 2012. ICAO Regional representative had participated and contributed to the events; and

- The CNS/MET SG/16 adopted the revised Terms of Reference for the Ionospheric Studies Task Force (ISTF) as recommended by the Task Force in its first meeting. The approved TOR of the Task Force is provided in the **Appendix A** to this report (i.e. Appendix G to the CNS/MET SG/16 Report).

2.2 The meeting further noted that CNS/MET Sub-Group and APANPIRG had agreed with the following recommendations made by the ISTF:

- a) Task Force should first confirm if there is a need to develop more complex (compared to the existing model) ionospheric models in the Asia/Pacific region after analyzing the shared data and then go to the next step of developing the models if these are required;
- b) Shared data should be used only for the study and development of ionospheric models in the Asia/Pacific Region to support satellite based air navigation;
- c) Tasks and Task Leads were identified to progress the objective of developing regional ionospheric models for GBAS and SBAS;
- d) ISTF will meet twice a year during its initial phase in view of the forthcoming solar max and for developing a harmonized approach for data collection and analysis, to maximize the benefits;
- e) ISTF was of the opinion that a mechanism for sharing the data in the data archive should be worked out; and
- f) A suggestion was made to create a web-based forum to exchange information and ICAO APAC Office was invited to look into the possibility of accommodating this requirement in the regional website.

2.3 APANPIRG also adopted Conclusion 23/28 urging those States, which are not participating in the Ionospheric Studies Task Force (ISTF), to share ionospheric data from their national sources with the Task Force to support development of regional ionospheric models for GBAS and SBAS.

2.4 The meeting also noted that APANPIRG/23 formulated Decision 23/48 asking CNS and MET SGs to review the impact of space weather in the CNS and MET area and report to APANPIRG. The meeting noted close relation between the task assigned by the APANPIRG and the work being carried out by the ISTF.

2.5 Cambodia supported the need of guidance to be provided to the non-member States of the Task Force on prescribed forms and requirements of collection and provision of the two types of ionospheric data.

2.6 The meeting also noted that ISTF will report to the CNS Sub-group from 2013 onwards as the CNS and MET Sub-groups of APANPIRG will meet separately from next year onwards.

2.7 The meeting noted the limited scintillation monitoring facilities established in the region. Hong Kong, China recommended at the CNS/MET SG/16 and also urged the Task Force in ISTF/2 to develop guidance on installation of scintillation monitors at strategic locations of scintillation effect on GBAS in the ASIA/PAC region before the next solar storm peak in 2013. The meeting agreed that Chairman of the Task Force will prepare the first draft of the mentioned guidance material and make it available by the end of November of 2012 for comments, further discussion and agreement. India agreed to share its experience in collection of scintillation data and offered to

contribute to the guidance material. It was clarified that the guidance material would provide guidance on the required receiver performance, distance between the receivers, and siting criteria of receivers and how to collect scintillation data. Following action item was developed based on the outcome of the discussion 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 the recommended changes, should be available by December 2012.

#### **Outcome of APEC GIT 16/17 (WP/4)**

2.8 Through a Working Paper, Secretariat informed the meeting about the outcome of 16<sup>th</sup> and 17<sup>th</sup> meetings of APEC GIT held in 2012. The meeting noted significant outcome of the two GIT meetings.

2.9 The meeting discussed how to coordinate with the APEC GIT Co-chairs for sharing data derived from their testbed. Secretariat was requested to forward a copy of the template developed by the Task Force to the Co-chairs of GIT for the information required. The response of GIT Co-chairs is expected by the end of December 2012. The following Action Item was developed by the meeting based on the discussions:

**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.

#### **Outcome of NSP Working Group of the Whole (WGW) Meeting (IP/2)**

2.10 The meeting noted the significant relevant outcome of the Navigation Systems Panel (NSP) Working Group of the Whole and other NSP Working Groups and Sub-Group meetings held in Montreal, Canada in May 2012.

2.11 It was noted that the work for Development of Operational Requirements for Space Weather prepared by the ICAO Meteorology was on-going to derive operational requirements for the provision of space weather related services for international civil aviation. The work has been conducted by the International Volcano Operations Group (IAVWOPSG) and has resulted in the preparation and availability of the following documents on the IAVWOPSG website:

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

In accordance with the above, a State Letter was sent in January requesting comments from the States on the documents by 1 July, 2012. More information is available on the website [www.icao.int/safety/meteorology/iavwopsg](http://www.icao.int/safety/meteorology/iavwopsg). During discussions, NSP indicated that it would like to be involved in the preparation of such requirements in order to ensure the information distributed to the operational community on space weather in the future reflecting correctly the expected impact on navigation services.

2.12 It was agreed that space-weather was very closely relevant to the activities of the Task Force. The meeting discussed this issue under Agenda Item 6 where a presentation from Japan was made on the subject. It was also agreed that the Task Force should make some contribution and recommendation to the CNS SG.

### **Brief Report on Iono Sub-group - IGWG/13 (Japan)**

2.13 The Chairman provided additional report on the outcome of the Iono Sub-group of CSG as part of the NSP meeting in May 2012. The information on activities in Japan (ENRI), Republic of Korea (Korea advanced Institute of Science and Technology – KAIST), FAA (Technical Center, Oklahoma City Programe Office), EuroControl, Thales and Stanford University were highlighted. The CSG meeting was also informed about the activities of ISTF in APAC Region and in particular brief outcome of the ISTF/1 was presented to the CSG meeting. The meeting considered necessary for coordination with the parties concerned and in particular with the IGWG on issues related to the subject of ionospheric studies. The meeting felt that the work in this regard should be complimentary to each other. IGWG is coordinated by FAA and EuroControl, with participants from service providers, airlines and aircraft manufactures in addition to the Administrations. The 12<sup>th</sup> meeting of IGWG recognized the need of data collection and set up Long-term Ionosphere Anomaly Monitoring (LTIAM) tool for the analysis of ionopheric characteristics which could be used in each region mainly for GBAS. It was informed that the IGWG would continue to work through e-mails.

2.14 Task Lead, Task – 2, was requested to coordinate with IGWG on behalf of ISTF for the use of the LTIAM tool by the ISTF member States and the following Action Item was formulated:

**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.

### **Agenda Item 3: Review status of States' activities**

#### **India (WP/9)**

3.1 Through a Working Paper, India informed the meeting about the current status of its GAGAN Project. It was informed that after the integration of the first GEO Satellite (GSAT-8) on 21 May 2011, GAGAN signal in space was available for use by the non-aviation users. The second satellite (GSAT-10) had already been launched on 29 September 2012 and the next step, certification of GAGAN, is expected to be completed by July 2013. As of now, GAGAN is providing Type 0 Navigation Message, which cannot be used by the aviation community. It was also informed that GAGAN was being considered by other sectors like Railways, Mining etc. for use in their applications.

3.2 Based on the data collection and analysis carried out, India supported IGM-Multi Layer Data Fusion (MLDF) algorithm as the model for equatorial region. India invited neighboring States of Sri Lanka, Pakistan, Afghanistan, Bhutan, Nepal and Bangladesh to derive benefits from the system. The meeting was of the opinion that Task Lead, Task - 5 could investigate whether MLDF model could be considered applicable for SBAS in the Asia/Pacific region as suggested in the Indian paper.

3.3 It was further informed that India was continuously monitoring the ionospheric changes in the wake of coming solar maxima and shared its experience during solar activities in September 2011. TEC and Scintillation observed during different periods of time in 2011 and 2012 were compared and analyzed.

### **Hong Kong, China**

3.4 Hong Kong, China briefed the meeting that there had been 13 data collection sites established in Hong Kong to collect data for ionospheric delay. Besides from recapping Hong Kong, China's working paper of CNS/MET SG/16 for sharing Hong Kong, China's experience in establishing ionospheric monitoring network within two years and recommendation for ICAO ISTF to provide guidance on installation of scintillation monitors at strategic locations for studies of scintillation effect on GBAS, Hong Kong, China also raised a concern for ISTF's attention that the issue for sending such high volume of archived data, which had been collected since 2000, in a secured and efficient manner to the data collection server should be resolved. The meeting was of the view that ISTF portal should be used for the purpose of further discussion on the subject and for sharing experience on data collection etc.

3.5 Hong Kong, China supported exchange of information on collection of ionospheric data, and also emphasized the necessity to develop guidance materials on collection and analysis of scintillation data.

### **Japan**

3.6 Japan is continuing to monitor ionospheric gradient in Japan and in Thailand (Bangkok). Data collected from 2008 onwards has been summarized and a large number of steep gradients have also been observed. In September 2012, on board scintillation observation was tried in collaboration with Japan Space Agency (JAXA). A mechanism for collection of data is being developed and data format for collection of data was proposed. Japan also described its association with other international organizations like ICAO NSP, IGWG etc. in the field of ionospheric studies.

### **Republic of Korea**

3.7 86 receivers, with a separation distance ranging from 20 to 50 km, are being used in the Republic of Korea for the purpose of data collection. Raw data collected is converted to RINEX format and can be provided by KASI and RRA. It was informed that five scintillations monitors are proposed to be set up next year. The meeting was assured that the Korea delegation will discuss with RRA for sharing of data.

### **Thailand**

3.8 It was informed that Aeronautical Radio of Thailand is responsible for collection of ionospheric data since 2009. At the end of 2012, one more station is expected to be set up in north of Thailand and by end of 2013, two more stations will be set up.

3.9 Other States including Cambodia and Malaysia did not present the status of data collection in their States.

## **Agenda Item 4: Review Summary of Data Sources**

### **Summary of Data Sources (WP/6)**

4.1 Task Lead, Task – 1 (Data Collection) presented a summary of ionospheric data sources nominated by the States/Administrations through the data collection template circulated in 2011 for analysis. It was clarified that most of the WAAS stations are from mainland USA and most of these are located in the mid region (except Hawaii in low latitude region and Alaska in the high latitude region). Amongst 200 stations in Japan, majority of receivers are located in the low-mid latitude region. Hong Kong, China expressed the view that geographical location of the receivers should be analyzed and taken into account while verifying the adequacy of data sources for analysis. The meeting was of the opinion that Task Lead, Task – 1 should categorize the ionospheric delay and



scintillation measurements into geographical regions to confirm an even spread of all the observation sites and hence it was decided to adopt the following Action Item:

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

4.2 In response to a query, the Chairman also urged the meeting that taking reference to Hong Kong, China's experience in establishing the ionospheric monitoring network, even though the State civil aviation authorities themselves may not be collecting ionospheric data, they can also arrange to get the data from some other national agencies, which have been engaged in the collection and analysis of ionospheric data.

4.3 The meeting also agreed that the nominated scintillation measurement sources were less in number and some geographical areas were not being adequately represented. Hence to achieve a uniform spread of scintillation measurement data stations for getting more accurate analysis, it was agreed that more data sources should be identified. Data sources like AIT and NICT could be explored. Information on data collection activity at Asian Institute of Technology (AIT) was also presented to the meeting.

#### **Agenda Item 5: Review progress of Tasks**

- 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

#### **Data Server (WP/5)**

5.1 Japan presented a plan of setting up a data server in ENRI Japan, for the collection, integration, administration and distribution of data collected from States and Administrations. It was estimated that quantum of data handling will be roughly 9 TB 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. It was, hence considered to use a data server and ENRI offered to host the server in its premises. Participants were invited to discuss data server design through ICAO ISTF Forum. Hong Kong, China appreciated ENRI's offer and highlighted two related issues; one regarding the volume of data to be delivered to the server and second regarding the handling of restrictions imposed by the data sources for the use of data. Options for transporting such high volume of archived data using mass storage devices like hard disk and maintaining security of data were also considered. The Chairman offered to be the point of contact for data transfer, in the interest of maintaining data security. Options of collecting event based data or collecting data for defined periods and other similar options were discussed in the interest of reducing data volume. Selection of data collection period was considered closely related to Task – 2 and Task Lead for Task-2 agreed to discuss this requirement on ISTF forum. 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 source and incorporate that in the data processing. Target date for this Action Item is January 2013.

5.2 It was agreed that initially, the data can be sent on-line through internet and if any difficulty is foreseen, then other media like hard disk etc. can be explored.

### **Data Format (WP/7, WP/8)**

5.3 Two Working Papers proposing data formats for ionospheric delay and scintillation measurements were presented by Japan. The format suggested for both ionospheric delay and scintillation data collection are quite similar to RINEX format and are compatible with it. Data structure in the proposed format for both types of data was discussed in detail using examples. Responding to a query, it was informed that primarily the conversion was being made from RINEX to the two formats (GTEX and SINTEX) and it was confirmed that conversion from RINEX to GTEX/SINTEX will be carried out in ENRI. Further it was clarified that the conversion tools were supporting RINEX Version 2 presently. Meeting congratulated Japan for developing the two formats and found that this development will be very much useful. India proposed that the parameters, satellite elevation and azimuth should be included in the format, as it will be useful for the analysis and identification of Ionospheric Pierce Point (IPP). It was also agreed that uploading of corrected data (after removing biases) will be more useful for the purpose of analysis. Further information on the format and mechanism to store, analyse and share data was provided to the meeting.

5.4 Meeting agreed to use the two proposed formats as the common data formats for the purpose of collection and analysis of the data. It was agreed that the formats will be further discussed on the ISTF Portal and will be finalized before the server is ready for use. Task Lead, Task - 2 agreed to use the suggested format for the purpose of data analysis.

### **Ionospheric Studies GAGAN (WP/10)**

5.5 Presenting updates on the ionospheric data collection and analysis activity, India invited the meeting to identify the criteria for nominal, moderate and stormy dates for the purpose of categorization. Clarifying the use of standardized  $K_p$  and  $D_{st}$  index to identify these dates, it was informed that most plasma bubbles were observed during quiet magnetic activity periods. The meeting therefore agreed that it had to be careful about identifying these periods. Though magnetic activity can be one of the key parameters, it should not screen out moderate and quiet magnetic activity periods. Additional parameters like solar flux and sunspot number etc. were also suggested.

5.6 It was suggested that the data could be categorized as interesting and not so interesting period also. Meeting agreed that this matter can be further discussed in relation to Task-2. Concluding all the discussions on the subject, the following Action Item was developed:

**ACTION ITEM 6:** Data server sponsored by ENRI should need to be ready to receive/compile the data. Period of analysis could start from discussing which key parameters could be used for identifying such periods. States like India and Japan, which have already carried out some level of analysis, are 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)

5.7 It was decided to discuss these issues further on ISTF Portal and complete the Action Item by end of January.

5.8 The Chairman, conducting a presentation on behalf of Korea, informed the meeting about data quality improvement attempts made by Korean Advanced Institute of Science and Technology (KAIST). Motivation of this effort is to reduce the processing time in both the automated procedures and manual analysis/validation by prescreening the process. It has been suggested to use manual validation to confirm data quality. In the example quoted, manual validation reduced the confirmed anomalies from 92 to 11 during a sample analysis.

**Agenda Item 6: Any Other Business****ISTF Portal (WP/2)**

6.1 A brief information was provided about ISTF Portal created on the ICAO website. It was informed that 26 members had already registered on the portal as on the day of the meeting. Meeting appreciated the arrangements made. It was agreed that the ISTF Forum created on the portal will be utilized for exchange of information and views on various issues like data format, data analysis period etc. The Chairman encouraged participants to actively utilize the forum created and encouraged participants to register for the ISTF Portal.

**Scintillation Effect on Integration (WP/11)**

6.2 India shared its experiences on the scintillation effect got during the process of integrating GEO satellite with GAGAN during July 2011 to January 2012. It included equinox period during which significant scintillation was observed. Presentation concluded that effect of scintillation on L5 was much higher as compared to L1 and the effect was much more significant when the carrier was modulated (probably because of higher chip rate). Threshold value had to be brought down in GPS receivers to reduce the frequency of 'unlocks'. Subsequently, after some software changes and receiver modifications by the supplier, the effect was observed to be much lesser during the last equinox period and it was possible to successfully complete the integration in spite of scintillations.

**Space Weather (Japan)**

6.3 Japan informed the meeting about NICT activities in the field of space weather and its influence on radio propagation. Presentation included information on the network used for TEC and scintillation data collection and the loss of lock caused by it. NICT is using more than 6000 receivers all over the globe provided by more than 20 providers. Difficulties observed in sharing GNSS data in some countries due to government or institutional policy were also discussed. Presentation was of the view that useful information could be generated if all the GPS receivers in the South East Asia were networked. NICT has developed a database of GTEX data for more than 6000 GNSS receivers. Presentation also introduced AOSWA. There was a discussion on the typical distance between the receivers. Although it is quite dense over Japan, US, and Europe, it is actually more than several hundreds kilometers in other region. Moreover, NICT has developed a tool working on Windows OS to convert RINEX to GTEX data and it is available to users with free of charge.

**49<sup>th</sup> DGCA Conference**

6.4 Secretariat informed the meeting that, the 49<sup>th</sup> DGCA Conference held in Delhi from 8 to 12 October 2012 appreciated India's presentation on GAGAN. GAGAN is expected to meet APV1 requirements over Indian land mass and RNP 0.1 over entire Indian FIR and the GEO satellite foot prints (with ground stations located at strategic locations). Current GAGAN configuration status was presented to the meeting. It was informed that the full configuration will be available in July 2013.

6.5 The meeting was informed that ISTF SBAS model will be validated through simulation after its development and will be uploaded if some benefits are expected.

6.6 Japan confirmed that a Working Paper (No. 111) will be presented to the 12<sup>th</sup> Air Navigation Conference on the approach to globally harmonize GNSS with discussion on ionosphere threat and space weather perspective.

**Agenda Item 7: Future Plan, Review of Action Items**

7.1 The meeting was reminded that ISTF/1 had proposed to meet twice in a year during its initial phase. ISTF/1 also proposed to have ISTF/2 in October 2012 and ISTF/3 in April 2013. Considering that ICAO Assembly is scheduled for September 2013 with all the regional meetings to be held in the first half of 2013, it was decided to schedule ISTF/3 tentatively for July 2013. Venue of the meeting will be decided and informed in due course.

7.2 The meeting was informed that Mr. Sujan Saraswati, Regional Officer, CNS ICAO APAC Office, who has been associated with the Task Force right from its inception, will be retired by the end of October 2012. The meeting recognized his achievements and recorded its appreciation for his services to the Task Force.

**Agenda Item 8: Coordination Meetings**

- a) Asian Institute of Technology
- b) King Mongkut's Institute of Technology Ladkrabang (KMITL)

8.1 On the last day of the meeting, coordination meetings were organized in the two reputed technical institutions of the city. The first meeting was held in Asian Institute of Technology (AIT) and the second meeting was held in King Mongkut's Institute of Technology, Ladkrabang. Both the meetings were attended by the Task Force members and the faculty and students of the two institutes.

**Asian Institute of Technology (AIT)**

8.2 Dr. Nitin Afzalpurkar, Dean Faculty of Engineering and Technology, Asian Institute of Technology welcomed the Task Force members and introduced his institution to them. ICAO presented a brief introduction about the organization and discussed role of GNSS in supporting aircraft movements. The Chairman of ISTF briefly explained ionospheric effects on GNSS performance and the mitigation techniques that have been adopted. Dr. Nitin Tripathi, Ass. Dean of Engineering described Scintillation Network Decision Aid (SCINDA) Project jointly sponsored by Tropical Marine Science Institute, National University of Singapore and Space & Earth Geodetic Analysis Laboratory, University of Beira Interior, Portugal. Project has been created with an objective of sharing data on VHF/GPS monitoring for S4 and TEC and model scintillation. Task Force also visited the monitoring site and was presented the arrangements made for data collection and analysis.

**King Mongkut's Institute of Technology Ladkrabang (KMITL)**

8.3 In KMITL, Dean Faculty of Engineering welcomed the Task Force members and introduced his institution and its activities. It was claimed that KMITL is one of the biggest engineering institutes in the country with more than 8000 students enrolled for 41 courses. Dr. Pornchai Supnithi, Head Telecommunication Department briefly explained the monitoring work they have taken up in association with ENRI (Japan) and AEROTHAI. Monitoring set up was explained with the stations located at 12 km (Stamford International University) and Suvarnabhumi Airport (4 km) from the station at KMITL. Observations made and the results achieved were explained. Task Force members then visited the Telecommunication Department and was presented the very impressive infrastructure (including an anechoic chamber) available with the department and equally impressive innovative activities of the students. Task Force members also visited the monitoring sites and observed the arrangements with four independent set ups (Javad, NovAtel, GP-Solutions and 150/400 MHz beacon receiver) being used for the monitoring of scintillation.

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**REVISED TERMS OF REFERENCE OF ISTF**

1. Take the responsibility for identification of the available GNSS data source
2. Make recommendation on sharing scenario for Ionospheric data collected
3. Make recommendations on selecting ionospheric data sources and sharing scenario for the collected data
4. Steer process for evaluation of the data analysis
5. Study the need for development of Regional Ionospheric Threat Models for GBAS and SBAS
6. Development of Regional Ionospheric Threat Models for GBAS and SBAS if the need is identified
7. Establish rules for use of shared data and the result of study for non-commercial purpose

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## Second Meeting of Ionospheric Studies Task Force (ISTF/2)

**Bangkok, Thailand  
15 – 17 October 2012**

Attachment 1 to the Report

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### LIST OF PARTICIPANTS

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*International Civil Aviation Organization*

**THE SECOND MEETING OF IONOSPHERIC STUDIES TASK FORCE (ISTF/2)**

15 – 17 October 2012, Bangkok, Thailand

**LIST OF WORKING/INFORMATION PAPERS AND PRESENTATIONS**

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WP/2	6	ISTF Portal	Secretariat
WP/3	2 (b)	Review of CNS/MET SG/16 & APANPIRG/23 Outcome	Secretariat
WP/4	2 (a)	Review Outcome of APEC GIT 16/17	Secretariat
WP/5	5 (a)	Data Server for Ionospheric Data Collection, Analysis and Sharing	Japan
WP/6	4	Summary of Ionosphere Data Sources Identified through a Data Collection Template	Japan
WP/7	5 (a)	Data Format for Sharing Ionospheric Scintillation Measurements	Japan
WP/8	5 (a)	Data Format for Sharing Ionospheric Delay Measurements	Japan
WP/9	3	Current Status: GAGAN Project	India
WP/10	5	Ionospheric Studies for GAGAN	India
WP/11	4	Effect of Scintillation on the GAGAN Geo signals – Challenges in Integrating Geostationary Satellite with Uplink station	India

<b>WP/IP SP No.</b>	<b>Agenda Item</b>	<b>Subject</b>	<b>Presented by</b>
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**LIST OF INFORMATION PAPERS**

IP/1	-	Meeting Bulletin	Secretariat
IP/2	2 (d)	Review of Outcome of ICAO Navigation Systems Panel Working Group of the Whole (WGW) Meeting	Secretariat

**PRESENTATIONS**

SP/1	5	Data-Quality Improvements and Applications of Long-Term Monitoring of Ionospheric Anomalies for GBAS	Republic of Korea
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