International Civil Aviation Organization

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

15 – 17 October 2012, Bangkok, Thailand

Agenda Item 3: Review status of States' activities

CURRENT STATUS: GAGAN PROJECT

(Presented by India)

SUMMARY

With the integration of the first GEO launched on 21st May 2011 GAGAN SIS is available for Non-Aviation users. With the successful launching of the second satellite on 29th September 2012, the stage is set for complete system with all its redundancies to be tested for Aviation use. The steps required for certification of GAGAN is expected to be completed by July 2013.

As the data collection and analysis from INRES are in progress, the results are pointing to support the unique IGM-Multi Layer Data Fusion algorithm as the model for Equatorial Ionospheric Anomaly Regions. The results demonstrate the availability of APV 1 service within major areas of India's service volume. However, the efforts for fine tuning the algorithm and validating the threat model through the intervention of Technical Review Team of GAGAN is taken up as a continual process.

India is committed to contribute to the development of GAGAN for the provision of regional SBAS and supporting the ICAO-ISTF work program to standardize the iono model for the regional implementation of GNSS augmentation services.

1. INTRODUCTION

1.1 In continuation with the conclusions drawn from the ICAO GNSS workshop conducted by ICAO Bangkok in 2011, India brought to the members of BOBASIO states through the BOBASIO SWG-2 meeting the development and progress made by India on the GAGAN project and its possibility of regional expansion within Asia Pacific states.

1.2 The recently concluded APANPIRG 23 meeting, India brought out the requirements for the development of GAGAN procedures and its capability and intent for regional expansion of GAGAN. APANPIRG 23 agreed to issue the state letter for the states to examine the feasibility of expansion of GAGAN services within its footprint.

1.3 As per the conclusions of the first ISTF meeting, India has participated to share the data formats for mutual cooperation for developing and standardizing the iono- model.

2. DISCUSSION

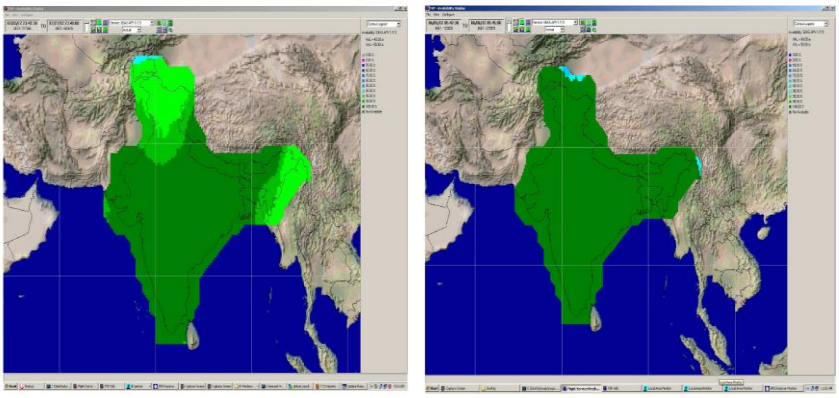
GAGAN system development progress: GAGAN –FOP architecture:

2.1 First GEO satellite carrying GAGAN payload (GSAT-8) was launched in May 2011 and after its integration with ground elements, GAGAN SIS (Signal-In-Space) is available for Non-Aviation users since December 2011.

2.2 GAGAN system is using the latest software N3.017LN build which is improvement over WAAS 8/9.2 build.

2.3 India has updated its unique Ionospheric Grid Model-Multi-layer Data Fusion (IGM-MLDF) model by adopting Kriging Algorithm to achieve higher APV 1.0 service availability over Indian Air Space. Based on the studies currently carried out, Model resulted in increasing availability contours by closed to 15% from the earlier planar fit model.

2.4 All the GAGAN ground elements are installed and the Final System Acceptance Test (FSAT) was successfully conducted on 16th July 2012 to demonstrate its capability of meeting APV 1.0 service requirements over Indian landmass and RNP 0.1 service over entire Indian Flight Information region as well as areas covered within its GEO footprint.



APV Availability Contours on different dates

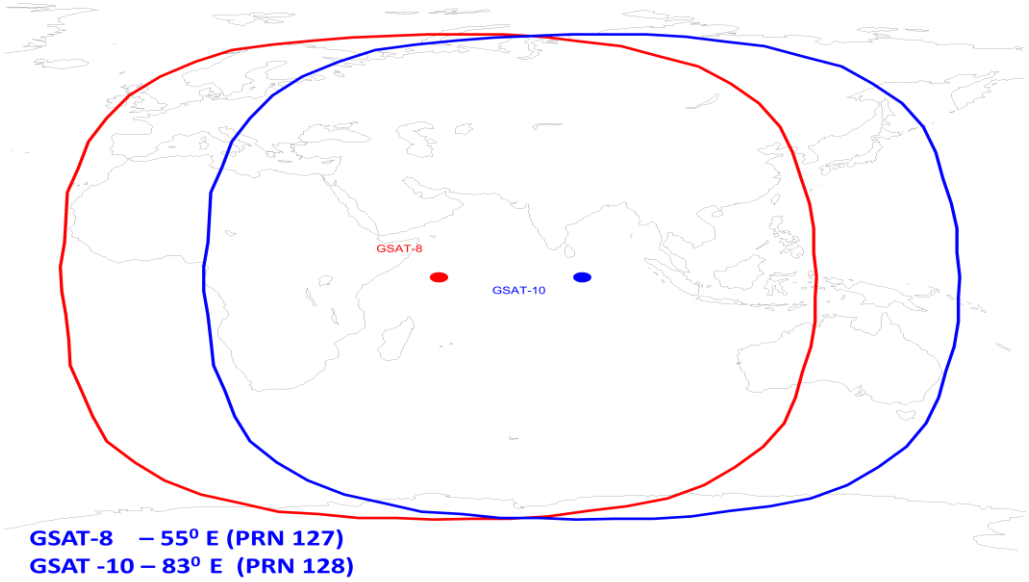
2.5 GAGAN certification process is in progress. Technical Review Team (TRT) meetings have completed the IONO model review and are reviewing the GAGAN artifacts. The task is accomplished using the experience of MITRE Corporation and their Designated Engineering Representatives (DER). TRT will also be looking into the various activities that could affect integrity and identify mitigation processes to make the algorithm more robust.

2.6 Second GEO satellite carrying GAGAN payload (GSAT-10) was launched on 29th September 2012, adding redundancy in the space segment. The testing and integration activities will be completed by March 2013.

2.7 GAGAN data collection is being carried out continuously for Hazardously Misleading Information (HMI) analysis and it is expected to be completed by June 2013.

2.8 **GAGAN 2013 and beyond:**

2.8.1 India is working towards attaining APV1.0 capability over the entire land mass. GAGAN is capable of processing data from 45 INRES stations. As the footprint of the GAGAN space segment covers large portion of the Asia-Pacific region i.e., the whole of Indian region and neighboring countries such as Srilanka, Pakistan, Afghanistan, Bhutan, Nepal and Bangladesh, all can derive benefit of the Indian experience to provide SBAS services by states appropriately augmenting ground segments.



2.8.2 Incorporate second civilian frequency as and when implemented by GPS

3. ACTION BY THE MEETING

3.1 The meeting is invited to note:

a) The India's effort for implementation of Space Based Augmentation System (GAGAN) over Indian Airspace by July 2013.

b) The GAGAN capability to extend its coverage beyond Indian FIR that would harmonize and be a driver for GNSS implementation programmes within the region to provide seamless Air Traffic Management.

c) And urge other states in the region to examine the utilization of GAGAN signal-in-space for provision of GNSS augmentation services based on the resolutions of the APANPIRG23 meeting.

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