International Civil Aviation Organization

THE FOURTH MEETING OF THE ASIA/PACIFIC GBAS/SBAS IMPLEMENTATION TASK FORCE (APAC GBAS/SBA ITF/4)

(*Video conference, 11-12 May 2022*)

Agenda Item 4: Action list

Indian SBAS-GAGAN Safety Assessment measures for anomalous Ionosphere

(Presented by India)

SUMMARY

This paper presents the information regarding steps taken by India for SBAS Safety Assessment relating to anomalous ionosphere as part of post-adoption activities of GAGAN.

1. INTRODUCTION

1.1 Indian SBAS- GAGAN is operational and certified for APV-I and RNP0.1 operations since 2015.

1.2 Since India lies in equatorial ionization anomaly region, where anomalous ionosphere is very frequent specially in solar active period, it is imperative to carry out the Safety Assessment of GAGAN on regular basis as per ICAO guidelines.

1.3 This paper presents the information regarding steps taken by India for SBAS Safety Assessment relating to anomalous ionosphere as part of post-adoption activities of GAGAN.

2. DISCUSSION

2.1 Airports Authority of India established Ionospheric monitoring network consisting of 25 stations, known as GAGAN-TEC Network in 2004. This was established to characterize the ionospheric behavior over Indian region in order to develop the suitable iono model for GAGAN.

2.2 Even after the implementation of GAGAN model (i.e. MLDF (Multi Layer Data Fusion), the ionospheric monitoring is continuously carried out using the GAGAN-TEC Network as well as GAGAN reference stations as per the SBAS Safety Assessment Guidance Document.

2.3 Regular monthly analysis is carried out for TEC Monitoring and Scintillation Monitoring of all the stations to detect any anomalous behavior of ionosphere.

2.4 In order to confirm the threat space is overbounding the real ionospheric anomalies, AAI has developed the Give Bounding tool as part of Operational Testing and Evaluation Tools.

2.5 Regular Periodic assessment is carried out by using the GIVE bounding tool on Indian Reference (INRES) station data.

2.6 Iono data from all the GAGAN reference stations is used to monitor the delay depletion depth on daily basis to validate the assumptions made in the GAGAN Iono model regarding maximum depletion depth.

2.7 No Integrity issue has been observed so far.

2.8 Since the hardware of GAGAN-TEC Network has aged, its upgradation is in process and planned to be completed in the year 2022. GNSS receivers with Multi-constellation Multi-Frequency capability are planned for this upgradation to provide Ionospheric parameters.

2.9 Once upgradation of Ionospheric monitoring network is successful, it is planned to carry out GIVE Bounding Analysis using these receivers, which acts as independent data source.

2.10 Since Solar activity is towards increasing trend and approaching the Solar maxima, it is also planned to carry out Safety Index analysis.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to do the following:

a) note the information contained in this papers; and

b) discuss any relevant matters as appropriate.

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