International Civil Aviation Organization

THE SIXTH MEETING OF THE ASIA/PACIFIC GBAS/SBAS IMPLEMENTATION TASK FORCE (GBAS/SBAS ITF/6)

(Bangkok, 7- 9 May 2024)

Agenda Item 6: Any Other Business

CURRENT STATUS OF NAVIGATION SYSTEMS PANEL RELATED TO GBAS AND SBAS

(Presented by Co-Chair)

SUMMARY

This paper presents the status of discussion in the ICAO Navigation Systems Panel on GBAS and SBAS.

1. INTRODUCTION

1.1 ICAO Navigation Systems Panel (NSP) is working on developing standards and recommended practices (SARPs) and related documents on GNSS. The GBAS Working Group (GWG) is responsible for matters related to GBAS. The GNSS SARPs Working Group (GSWG) is responsible for matters related to GNSS core constellations and SBAS.

1.2 The 11th meeting of the ICAO NSP Joint Working Groups Meeting (NSP JWGs/11) was held from 28 November to 1 December and 5 December 2023. GWG was held from 28 November to 1 December 2024. While GSWG was not held, an ad hoc group on SBAS authentication under GSWG was held from 28 to 30 November 2024. This paper reports on the status of discussion in ICAO NSP on GBAS and SBAS in NSP JWGs/11.

2. DISCUSSION

GBAS

2.1 The main focus of the GWG is development of the dual-frequency and multi-constellation (DFMC) GBAS concept and standards. The main advantages of the DFMC GBAS include higher availability under severe ionospheric conditions and resilience to radio frequency interference and constellation failure.

2.2 The basic architecture has been agreed which is based on the combination of “sending measurement” concept (see references [1,2]) with integrity alarming technology as previously proposed in the SESAR activity. The new service type based of the DFMC GBAS is called “GBAS

Approach Service Type (GAST) E." It is deemed to be able to provide availability even under severe ionospheric conditions (see references [3,4]). The DFMC GBAS messages are designed to have extensibility for future applications, although standardization for the future applications are out of scope of the current standard development activities.

2.3 GWG is working on it with the following timeline for DFMC GBAS development

- Q4 2024: A high-level concept of DFMC GBAS agreed in ICAO and RTCA/EUROCAE
- Q4 2024: A detailed concept paper agreed in ICAO and RTCA
- Q4 2024: A baseline airborne MOPS and a baseline development DFMC GBAS
- 2030*: Operationally validated SARPs proposal ready for proposal to NSP

The baseline GBAS concept and standards are being developed by GWG to be delivered by Q4 2024. The delivery date for validated DFMC GBAS SARPs (2023* in the above list) has not been agreed across all stakeholders, and it is subject to change (could be earlier or later).

2.4 To support deployment of existing GBAS (GAST C and D), updates and maintenance of existing ICAO standards, guidance materials, and manuals. The Doc8071 Vol. II is being updated and will further be discussed in the next NSP JWGs/12 meeting. In addition, GWG will work on creating a GBAS manual.

SBAS

2.5 ICAO Annex 10 Vol. I including the standards and guidance materials for DFMC SBAS has been published in July 2023 and effective since 2 November 2023. The current focuses of GSWG related to SBAS are development of SBAS authentication concept of operations document and SARPs for the SBAS authentication. The SBAS authentication is a mechanism to ensure authenticity of received SBAS messages.

2.6 A mature version of the SBAS authentication concept of operations document is planned to be delivered by November 2024. For the SBAS authentication SARPs, there are remaining open items to be addressed.

GNSS Manual (Doc9849)

2.7 ICAO GNSS Manual (Doc9849) 4th Edition has been published in 2023. Major updates are on inclusion of DFMC core constellations and DFMC SBAS. Space Weather aspects have also been updated. Currently, an ad hoc group under the GSWG is working on the next phase update with one of the major updates on A-RAIM (Advanced Receiver Autonomous Integrity Monitoring).

Next Meeting

2.8 The next NSP JWGs/12 meeting is scheduled from 13 May 2024 to be held at ICAO Headquarter in Montreal.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and
b) discuss any relevant matters as appropriate.

References:

[1] Murphy, T., Harris, M., McGraw, G., Wichgers, J., Lavik, L., Topland, M., Tuffaha, M., Saito, S., "Alternative Architecture for Dual Frequency Multi-Constellation GBAS", Proceedings of the Institute of Navigation GNSS+ Conference, St. Louis Sept. 2021.

[2] Murphy, T., Harris, M., McGraw, G., Wichgers, J., Lavik, L., Topland, M., Tuffaha, M., Saito, S., "Managing Long Time Constant and Variable Rate Carrier Smoothing for DFMC GBAS", Proceedings of the Institute of Navigation GNSS+ Conference, Denver, 2023.

[3] Murphy, T., Harris, M., McGraw, G., Wichgers, J., Lavik, L., Topland, M., Tuffaha, M., Saito, S., "Ionospheric Gradient Monitoring for Dual Frequency Multi-Constellation GBAS", Proceedings of the International Technical Meeting, Long Beach, 2022.

[4] Murphy, T., Harris, M., McGraw, G., Wichgers, J., Lavik, L., Topland, M., Tuffaha, M., Saito, S., "Availability of Iono Gradient Detection with Alternative Architectures for DFMC GBAS", Proceedings of the Institute of Navigation GNSS+ Conference, Denver, 2022.

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