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 3: Progress on the work of Expert Groups constituted to:

- Review and revise the GBAS and SBAS safety assessment guidance document related to anomalous ionospheric conditions and to;
- Draft a Guidance Document on Implementation Process for GBAS/SBAS.

Review of SBAS Safety Assessment Guidance Document Related to Ionospheric Anomalies

(Presented by India)

SUMMARY

This paper reviews the SBAS safety assessment guidance documents related to anomalous ionospheric conditions and identifies items to be updated.

1. INTRODUCTION

1.1 The GBAS and SBAS safety assessment guidance documents related to anomalous ionospheric conditions were adopted by the ICAO Asia-Pacific (APAC) region in 2016.

1.2 It was decided to review and revise the GBAS and SBAS safety assessment guidance document related to anomalous ionospheric conditions by GBAS/SBAS ITF/3 vide Decision 3-1.

1.3 An expert group (Expert Group 3-1) was established by GBAS/SBAS ITF/3 to review and revise these documents. The first solo virtual meeting of Expert group 3-1 was held on 11 April 2022.

1.4 This paper reviews the SBAS safety assessment guidance documents related to anomalous ionospheric conditions and identifies items to be updated.

2. DISCUSSION

2.1 The contents of the ‘SBAS safety assessment guidance related to anomalous ionospheric conditions’ proposed to be amended are listed below. The highlighted text in Yellow indicates the insertion of new Sections/headings.

Chapter 1 Introduction

1.1 Background

1.2 Purpose and scope of this document

Chapter 2 Overview of GNSS

2.1 Overview of GNSS

2.2 Satellite-Based Augmentation System (SBAS)

2.3 Integrity requirements and threats

Chapter 3 Threat Mitigation Strategy Against Anomalous Ionospheric Conditions

3.1 Ionospheric characteristics

3.2 Definition of Nominal and Anomalous ionosphere

3.3 High level principles

3.4 Ionospheric correction by SBAS

3.5 Necessity of the threat model

3.6 Creation of the threat model

Chapter 4 Approval of SBAS

4.1 Approval: availability assessment

4.2 Evaluation of ionospheric conditions

4.3 Post-adoption activities

Appendix A Ionosphere Algorithms for WAAS/MSAS/GAGAN

A.1 Standard planar fit

A.2 Spatial threat model

A.3 Generation of spatial threat model

A.4 GAGAN MLDF model

2.2 In Section 2.2, information about new SBAS system under development/planned by States/Regions should be included. Several new SBAS systems have been launched since the publication of this guidance document.

2.3 A new Section 3.1 with the heading "*Ionospheric Characteristics*" is proposed to be included to briefly introduce about ionosphere and explain about the ionospheric behavior over the equatorial/low latitude region, mid latitude region and high latitude/polar region, since the ionospheric characteristics is different for different regions.

2.4 Another new Section 3.2 with the heading "*Definition of Nominal and Anomalous ionosphere*" is proposed to distinguish between nominal and anomalous ionosphere. Since the global

magnetic disturbance parameters – K_p and Dst are not always suitable to define the ionospheric anomaly especially over equatorial and low latitude region, a brief description about more relevant parameters like AATR, ROTI etc. needs to be included to define the anomalous ionosphere.

2.5 Section 4.3 describes the post-adoption activities for safety assessment of threat model after implementation of SBAS. It is proposed to update regular ionospheric monitoring by using independent data sources as they shall not be part of the live system. Additional update on requirement of Depletion monitor may be included as Depletions (Plasma bubbles) can be serious safety hazard over equatorial and low latitude region.

2.6 A new Appendix A.4 is proposed to include brief description about GAGAN iono model which is relevant over equatorial and low latitude region.

2.7 Other updates may be on DFMC SBAS and differences with respect to L1 SBAS.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to do the following:

a) review the material presented in the working paper; and

b) discuss any relevant matters as appropriate

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