



International Civil Aviation Organization

THE FOURTH MEETING OF THE ASIA/PACIFIC GBAS/SBAS IMPLEMENTATION TASK FORCE (APAC GBAS/SBAS 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

Expert Group Outcomes – Structure of Guidance Document on Implementation Process for GBAS/SBAS and Timeline for Preparing the Guidance Reference Document

(Presented by Leads/Co-Lead of Expert Group)

SUMMARY

This paper presents outcomes from Expert Group regarding the structure of guidance document on implementation process for GBAS/SBAS and the timeline for drafting this guidance document for the Region.

1. INTRODUCTION

- 1.1 As per APAC GBAS/SBAS ITF/3 meeting Decision GBAS/SBAS ITF/3-2 regarding the task to draft a guidance reference document for implementation of GBAS/SBAS in the Asia/Pacific Region, an Expert Group with subject matter experts nominated from States/Administrations as members had been established to prepare the draft of this guidance document and a video teleconference meeting was held on 20 January 2022 to kick start the Expert Group. Members of the Expert Group looking after the guidance document are given **at Appendix A**, with members in key roles highlighted as follows:
 - (a) Mr George Wong (Chair)
 - (b) Dr. Takayuki YOSHIHARA (Lead-GBAS)
 - (c) Mr Ritesh Kapoor (Co-lead-GBAS)
 - (d) Dr. Takeyasu Sakai (Lead-SBAS)
 - (e) Mr Lambodar Mohanty (Lead-ATM-OPS)
- 1.2 Subsequent discussions under Expert Group have been conducted regarding the draft of guidance reference for implementation of GBAS/SBAS in the Asia/Pacific Region, and outcomes from those discussions were summarized in this WP for members' consideration.

2. DISCUSSION

Objectives and Scope of the Guidance Document

- 2.1 The objective of the guidance document is to provide reference materials for States on implementation process for GBAS/SBAS. The document will present a holistic view of implementation from the initial phase for the analysis of operational need to the phase for conducting post-implementation review. In addition to taking reference to relevant materials from ICAO/ international organisations / States / Administrations, specific consideration(s), such as ionospheric impacts in low altitude region, only particularly applicable to the Asia/Pacific Region and States' experience in implementation of GBAS/SBAS will also be incorporated in this guidance document to be prepared under the Expert Group of APAC GBAS/SBAS ITF.

Structure and Content List of the Guidance Document

- 2.2 Per the review and discussion among Leads/Co-Lead of Expert Group, the structure and content list of the guidance document, as well as phases and elements involved in GBAS/SBAS implementation, have been fine-tuned and given at **Appendix B**.
- 2.3 Regarding reference materials to be taken to prepare the draft of the guidance document, in principle, those relevant materials from ICAO/ international organisations / States / Administrations listed in **Appendix C** would be applied. However, States' contributions for sharing their internal guidelines/practice/experience in the implementation of GBAS/SBAS would be useful and valuable for Expert Group to prepare a comprehensive guidance document.

Timeline for Preparing the Guidance Document

- 2.4 The proposed timeline in preparing the draft of guidance reference for implementation of GBAS/SBAS in the Asia/Pacific Region is given at **Appendix D** for APAC GBAS/SBAS ITF's consideration.

3. ACTION REQUIRED BY THE MEETING

- 3.1 The meeting is invited to:
- a) Review the materials presented in the WP;
 - b) Discuss the content list of the guidance reference document and timeline proposed by Expert Group; and
 - c) Urge States/Administrations to share relevant materials with Expert Group for preparing the draft guidance reference document.

Appendix A – Expert Group to Prepare the Draft of Guidance Reference Document for Implementation of GBAS/SBAS in the Asia/Pacific Region

- 1 Mr Jeff Bollard
- 2 Mr Ritesh Kapoor (Co-lead-GBAS)
- 3 Mr. Zhang Chao
- 4 Mr. Li Hongxiao
- 5 Mr. George Wong (Chair)
- 6 Mr. Fernando Leung
- 7 Mr. S.K. Sharma
- 8 Mr Lambodar Mohanty (Lead-ATM-OPS)
- 9 Mr. Siraj Khan
- 10 Mr. Sudesh Sharma
- 11 Mr. Taruna Jaya
- 12 Mr. Budi Fathoni
- 13 Mr. Herik Wahyu Bintarto
- 14 Mrs. Henna Nurdiansari
- 15 Mr. Chaidir Anwar
- 16 Mrs. Rufayda Abudan
- 17 Mr. Slamet Supriadi
- 18 Mr. Wahyu Widodo
- 19 Mr. Masato Nomiya
- 20 Dr. Takeyasu Sakai (Lead-SBAS)
- 21 Dr. Takayuki Yoshihara (Lead-GBAS)
- 22 Mr. Michael Rizada
- 23 Mr Joe Chua
- 24 Mr Gao Shu
- 25 Mr. Sarawoot Rungruengwajiake
- 26 Mr. Thamawoot Pocathikorn
- 27 Nguyễn Thế Hưng
- 28 Nguyễn Hữu Đức
- 29 Nguyễn Mạnh Tuấn
- 30 Thạch Cảnh Hải
- 31 Nguyễn Hải Việt
- 32 Lê Hoài Nam
- 33 Lê Vũ Trường Sơn
- 34 Nguyễn Minh Thắng
- 35 Mr John Moore

Appendix B – Structure and Content List of Guidance Reference Document for Implementation of GBAS/SBAS in the Asia/Pacific Region

1. *Objectives and Scope of the Guidance Document*
2. *Executive Summary*
3. *Roles and Responsibilities of Stakeholders*
4. *Performance Indicators*
5. *Implementation Process for GBAS*
 - a. *Overview*
 - b. *Framework, Phases and Elements of GBAS Implementation Process*
 - i. *Operational Need Analysis*
 - ii. *Cost-benefit Assessment*
 - iii. *Technical Feasibility Assessment*
 - *Siting Study*
 - *GPS Data Collection and Analysis*
 - *Ionospheric Impact Study*
 - *Site Constraint Study*
 - ***VDB Coverage Assessment****
 - iv. *Concept of Operations (CONOPS) Development*
 - v. *VDB Frequency Application and Assignment*
 - vi. *GBAS Solution Selection*
 - vii. *Site Deployment*
 - viii. *Airport Height Restriction Plan Amendment*
 - ix. *GLS Flight Procedure Development*
 - x. *Flight Check*
 - xi. *Safety Assessment*
 - xii. *System Certification*
 - xiii. *Development of Regulations Related to GBAS for Aviation*
 - xiv. *Training*
 - xv. *Operation Certification*
 - xvi. *Post-implementation Review*
6. *Implementation Process for SBAS*
 - a. *Overview*
 - b. *Framework, Phases and Elements of SBAS Implementation Process*
 - i. *Operational Need Analysis*
 - ii. *Cost-benefit Assessment*
 - *Full SBAS implementation (Implementation Type A)*
 - *Participating in existing SBAS (Implementation Type B)*
 - *Utilizing existing SBAS service (Implementation Type C)*
 - iii. *Technical Feasibility Assessment*
 - *Full SBAS implementation (Type A)*
 - *Satellite (transponder) deployment*
 - *SBAS PRN coordination*
 - *SBAS ID coordination*
 - *Coverage and service volume*
 - *Service level*
 - *Ground monitoring station siting*
 - *Uplink station siting*
 - *Ionospheric impact study*

- *Participating in existing SBAS (Type B)*
 - *Ground monitoring station siting*
 - *Coordination with the SBAS provider*
 - *Review of existing SBAS services*
 - *Coverage and service volume*
 - *Service level*
 - *Ionospheric impact study*
- *Utilizing existing SBAS service (Type C)*
 - *Coverage and service volume*
 - *Service level*
 - *Available services*
 - *Coordination with the SBAS provider*
- iv. *Concept of Operations (CONOPS) Development*
- v. *SBAS Solution Selection*
- vi. *System Deployment (For Implementation Type A and B)*
- vii. *SBAS Flight Procedure Development*
- viii. *Flight Check*
- ix. *Safety Assessment*
- x. *System Certification*
- xi. *Development of Regulations Related to SBAS for Aviation*
- xii. *Training*
- xiii. *Operation Certification*
- xiv. *Post-implementation Review*
- 7. *Post-implementation Activities*
 - a. *Operation and Maintenance Activities*
 - b. *Performance Indicators*
- 8. *Appendix*
 - Appendix 1 - Terminologies and Definition*
 - Appendix 2 – Reference*
 - Appendix 3 – Experience shared by States/Administrations*

Notes:

** New element newly added per Expert Group's review*

Appendix C – Relevant Materials for Preparing Guidance Reference Document for Implementation of GBAS/SBAS in the Asia/Pacific Region

1. *Relevant ICAO documents covering different aspects in GBAS implementation:*
 - a. *Global Strategy – Global Air Navigation Plan (Dec 9750)*
 - b. *Regional Strategy – Asia/Pacific Seamless ATM Plan*
 - c. *General Concept - Global Navigation Satellite System (GNSS) Manual (Doc 9849)*
 - d. *System Requirements and Testing*
 - i. *Annex 10 Vol I – Radio Navigation Aids*
 - ii. *Doc 8071 Vol II – Testing of Satellite-based Radio Navigation Systems*
 - e. *Procedure Design and Validation*
 - i. *Doc 8168 Vol II – Construction of Visual and Instrument Flight Procedures*
 - ii. *Doc 9906 Vol V – Validation of Instrument Flight Procedures*
 - f. *Operation*
 - i. *Doc 8168 Vol I – Flight Procedures*
 - ii. *Doc 9613 – PBN Manual*
 - iii. *Doc 9849 – GNSS Manual*
 - iv. *Dec 4444 – Air Traffic Management*
 - v. *Doc 9734 – Safety Oversight Manual*
 - vi. *Doc 9859 – Safety Management Manual*
 - g. *Ionosphere*
 - i. *GBAS Ionospheric Threat Model for APAC Region (APAC)*
 - ii. *GBAS Safety Assessment Guidance Related to Anomalous Ionospheric Conditions (APAC)*
 - iii. *Ionospheric Effects on GNSS Aviation Operations (ICAO NSP)*
2. *Relevant documents published by international organisations / States / Administrations relevant to GBAS implementation:*
 - a. *RTCA DO-246E Change 1 - GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-in-Space Interface Control Document (ICD)*
 - b. *RTCA DO-253D Change 1 - Minimum Operational Performance Standards (MOPS) for GPS Local Area Augmentation System (LAAS) Airborne Equipment*
 - c. *EUROCAE ED-114 - Minimum Operational Performance Standards (MOPS) for GBAS Ground Facility*
 - d. *FAA Order 6884.1 - GBAS Ground Facility Siting Criteria*
 - e. *FAA-E-3017 - Non-Fed LAAS Specification*
3. *Relevant ICAO documents covering different aspects in SBAS implementation:*
 - a. *Global Strategy – Global Air Navigation Plan (Dec 9750)*
 - b. *Regional Strategy – Asia/Pacific Seamless ATM Plan*
 - c. *General Concept - Global Navigation Satellite System (GNSS) Manual (Doc 9849)*
 - d. *System Requirements and Testing*
 - i. *Annex 10 Vol I – Radio Navigation Aids*
 - ii. *Doc 8071 Vol II – Testing of Satellite-based Radio Navigation Systems*
 - e. *Procedure Design and Validation*
 - i. *Doc 8168 Vol II – Construction of Visual and Instrument Flight Procedures*
 - ii. *Doc 9906 Vol V – Validation of Instrument Flight Procedures*
 - f. *Operation*
 - i. *Doc 8168 Vol I – Flight Procedures*
 - ii. *Doc 9613 – PBN Manual*
 - iii. *Doc 9849 – GNSS Manual*
 - iv. *Dec 4444 – Air Traffic Management*
 - v. *Doc 9734 – Safety Oversight Manual*

- vi. *Doc 9859 – Safety Management Manual*
- g. *Ionosphere*
 - i. *SBAS Safety Assessment Guidance Related to Anomalous Ionospheric Conditions (APAC)*
 - ii. *Ionospheric Effects on GNSS Aviation Operations (ICAO NSP)*
- 4. *Relevant documents published by international organisations / States / Administrations relevant to SBAS implementation:*
 - a. *RTCA DO-229F - Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment*

Appendix D – Proposed Timeline for Preparing Guidance Reference Document for Implementation of GBAS/SBAS in the Asia/Pacific Region

Period	Activities	Outcomes
May – October 2022	States sharing with Expert Group their internal guidelines/practice/experience in the implementation of GBAS/SBAS <i>(Action: States/Administrations)</i>	States' relevant contribution for their internal guidelines/practice/experience in the implementation of GBAS/SBAS
May – June 2022	Sub-team working meetings and writing up draft of guidance document <i>(Action: Expert Group Members and Leads/Co-Lead)</i>	Sections of draft write-up
End June 2022	Expert Group Leads/Co-lead Meeting with Chair <i>(Action: Leads/Co-Lead and Chair)</i>	Milestone dates for completing draft write-up of individual section and progress reporting on draft write-up
July – September 2022	Sub-team working meetings and writing up draft of guidance document <i>(Action: Expert Group Members and Leads/Co-Lead)</i>	Sections of draft write-up
End September 2022	Expert Group Leads/Co-lead Meeting with Chair <i>(Action: Leads/Co-Lead and Chair)</i>	Progress reporting on draft write-up
October – December 2022	Sub-team working meetings and writing up draft of guidance document <i>(Action: Expert Group Members and Leads/Co-Lead)</i>	Sections of draft write-up
End December 2022	Expert Group Leads/Co-lead Meeting with Chair <i>(Action: Leads/Co-Lead and Chair)</i>	Progress reporting on draft write-up
January – March 2023	Sub-team working meetings and writing up draft of guidance document <i>(Action: Expert Group Members and Leads/Co-Lead)</i>	1 st draft write-up for all sections
End March 2023	Expert Group Leads/Co-lead Meeting with Chair <i>(Action: Leads/Co-Lead and Chair)</i>	Progress reporting on draft write-up and review on the 1 st draft write-up for all sections
APAC GBAS/SBAS ITF/5	Presenting the 1 st draft of guidance reference document for implementation of GBAS/SBAS in the Asia/Pacific Region <i>(Action: Expert Group)</i>	Comments consolidated from APAC GBAS/SBAS ITF for fine tuning the draft guidance document
Beyond APAC GBAS/SBAS ITF/5 and up to APAC GBAS/SBAS ITF/6	Fine tuning the draft guidance document to address comments collected in APAC GBAS/SBAS ITF/5 <i>(Action: Expert Group Members, Leads/Co-Lead and Chair)</i>	Final draft of guidance reference document for implementation of GBAS/SBAS in the Asia/Pacific Region
APAC GBAS/SBAS ITF/6	Presenting the final draft of guidance reference document for implementation of GBAS/SBAS in the	Finalised the 1 st issue of guidance reference document for implementation of GBAS

Period	Activities	Outcomes
	Asia/Pacific Region in APAC GBAS/SBAS ITF/6 for endorsement (<i>Action: Expert Group</i>)	/SBAS in the Asia/Pacific Region
