

International Civil Aviation Organization



ICAO

**Twenty Fourth Meeting of the Communications/
Navigation and Surveillance Sub-group (CNS SG/24) of
APANPIRG**

Web-conference, 30 November – 4 December 2020

Agenda Item 5: Navigation

- 5.2 Review report of the First and the Second Meeting of GBAS/SBAS Implementation Task Force (GBAS/SBAS ITF/1 and GBAS/SBAS ITF/2);

**REVIEW OF REPORT OF THE FIRST AND THE SECOND MEETING OF ASIA/PACIFIC
GBAS/SBAS IMPLEMENTATION TASK FORCE
(GBAS/SBAS ITF/1 AND GBAS/SBAS ITF/2)**

(Presented by the Secretariat)

SUMMARY

This paper provides information on the outcomes of the ICAO GBAS/SBAS ITF/1 and GBAS/SBAS ITF/2 held through Video Teleconference (VTC) on 23-24 June 2020 and 9-10 September 2020 respectively for the review by the meeting.

1. INTRODUCTION

GBAS/SBAS ITF/1

1.1 As per CNS SG/23 meeting Decision CNS SG/23/9 regarding establishment of the APAC GBAS/SBAS Implementation Task Force, GBAS SBAS ITF 1 was held through VTC on 23-24 June 2020 in which 104 participants joined. The TOR of the Task Force as provided in Appendix J to the CNS SG/23 meeting report was discussed. It was decided that a draft task list for the group would be drafted by the Secretariat and would be shared with the participants for comments. Outcomes of the ICAO GBAS/SBAS Implementation Workshop in Seoul on 3-5 June 2019 were discussed in the meeting. To better capture the issues and challenges faced in GBAS/SBAS implementations, an exercise was conducted amongst participants in GBAS/SBAS ITF/1. The relevant presentations and documents are available at following link:

<https://www.icao.int/APAC/Meetings/Pages/2020-GBAS-SBAS-ITF1.aspx>

GBAS/SBAS ITF/2

1.2 The second Meeting of the ICAO GBAS/SBAS Implementation Task Force (GBAS/SBAS TF/2) was held through VTC on 09-10 September 2020 with attendance of 118 participants. In this meeting, Co-Chairs of the Task force were elected. Ten IPs by states and industry were presented on GBAS/SBAS activities in the region. The Action List of the task force proposed by

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the Secretariat was discussed. Description, relevance and priority of those action items were assessed by the meeting. Action owners were assigned with target date agreed in the meeting. The draft Action list is attached at Annexure A. The relevant presentations and documents are available at following link: <https://www.icao.int/APAC/Meetings/Pages/2020-GBAS-SBAS-ITF2.aspx>.

2. DISCUSSION**GBAS/SBAS ITF/1**

2.1 The Terms of Reference approved in CNS SG/23 in September 2019, given in Appendix J to CNS SG/23, were reviewed and accepted by the meeting. An exercise, based on the outcomes of the ICAO GBAS/SBAS Implementation workshop organized in Seoul on 3-5 June 2019 with the following objectives, was conducted:

- Ensure each participant has a clear understanding of the context of GBAS/SBAS implementation.
- Structure the work of the task force and identify needed deliverables.
- It was decided that a draft task list for the group would be drafted by the Secretariat and would be shared with the participants for comments.

2.2 The Secretariat presented the outcomes of the GBAS/SBAS Implementation Workshop, highlighting the following information:

- GBAS and SBAS are so far only available on GPS L1;
- Dual Frequency Multi Constellation receivers are expected in next 5-10 years;
- Future operations (APV I, Cat I, Cat II/III) need to be discussed with the airspace users;
- If States are interested in neighbouring SBAS, it needs to look into performance simulation and collection data;
- There is need to engage discussion with the regulator to agree on all the process for performance compliance demonstration, the certification of the CNS provider and update of national regulation as necessary;
- Difference in procedure design of GBAS/SBAS procedures with respect to APV Baro and ILS;
- Different strategies for ground/flight validation;
- Management of SBAS/GBAS channels;
- Safety assessment of the LPV / GLS operations for the integration of such change into the ATM environment
- Fleet readiness for GBAS and SBAS;
- SBAS (LPV function) mandates in several regions;
- GBAS could help to maintain better capacity than with ILS in low visibility conditions; and
- SBAS could improve access to airports and allow reduction of ILS Cat I systems.

2.3 The following suggestions for implementation were also discussed-

- Appoint a project manager and create specific national coordination group;
- Conduct workshop to develop awareness with airspace user's/ procedure designers / ATCO / engineers; and
- Get expertise from universities to support the validation/acceptance of the GBAS/SBAS system

2.4 To develop awareness among participants, as well as collecting needs from States for guidance or training, the Secretariat created an exercise; and all participants of the Task Force were split into four breakout groups. Each individual breakout group worked on an electronic wall for discussing participants' ideas in that particular group and a rapporteur then presented the main outcomes

in the debriefing session with all participants' attendance. This exercise captured issues and challenges regarding GBAS/SBAS implementations in the States.

2.5 With reference to information captured in the exercise and explanations provided by the four rapporteurs, the Secretariat proposed to structure the wrap-up in the following way:

- Training of the operational people Stakeholders (syllabus or training package)
- Knowledge/ Experience sharing / platform in respect of systems and procedures
- Review of the outcomes published by ICAO Ionospheric Study Task Force in 2016
- Organize a workshop for airspace users / CONOPS / Fleet readiness
- ATC Interface / NOTAM
- Guidance Material on implementation / safety assessment
- Involvement of regulators in the overall implementation process

2.6 The Task Force agreed that the Secretariat would propose a first version of action plan for the Task Force.

GBAS/SBAS ITF/2

2.7 The Secretariat received two nominations for chairperson of the Task Force: Mr. Susumu Saito from Japan and Mr. Wong, Tak Yuen George from Hong Kong China. After discussion within the Task Force, both nominated candidates were elected as Co-Chairs.

2.8 Australia presented the status of two currently functional GBAS Landing Systems at Sydney and Melbourne airports. There are more than 3000 GLS approaches conducted per fortnight at these two airports. Percentage of GLS equipped aircraft operating at Melbourne is 40% and that at Sydney is 29%. Australia and New Zealand have established a joint project to deliver a Satellite Based Augmentation System (SBAS) capability.

2.9 China presented that the Beidou (BDS) was one of the 4 core satellite constellations defined in Annex 10 and the validation of BDS was being discussed and promoted. BDS-3 constellation includes 24 MEOs, 3 IGSOs and 3 GEO3. The BDS will provide the worldwide service in 2020. The BD SBAS constellation and ground system will be completed in end 2020. The accuracy of BDSBAS SF Service satisfies the requirement of APV-I.

2.10 Hong Kong, China shared their strategy and experience in conducting a GBAS trial at the Hong Kong International Airport (HKIA), which aimed to assess the feasibility for GBAS implementation there and to identify potential impacts arising from local ionospheric effects as well as constraints induced by terrains/building structures around the HKIA.

2.11 The issue in VDB frequency assignment for GBAS was also raised by Hong Kong, China due to the VDB frequency using the same radio frequency band as other types of ground-based navigational systems, such as VHF Omni-directional Range (VOR) and Instrument Landing System (ILS), but with large (around 1MHz) channel space required from existing DVOR/ILS frequencies already in use. Hong Kong China drew States' attention to the need for the coordination with other State/Administration for the use of navigational facilities frequency, through collaboration with ICAO Spectrum Review Working Group (SRWG) and assistance from ICAO APAC Office, for the implementation of GBAS.

2.12 Japan presented that MSAS (Michibiki Satellite-based Augmentation Service) SBAS has completed satellites transition from MTSAT to QZSS in end March 2020. Various developments are being conducted to enhance the MSAS system, including MSAS LPV service expected to commence in 2023. JCAB updated the status of the CAT-I GBAS at Tokyo Haneda airport, for which

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a trial had been conducted since July 2020 to aim for formal operation commencement by the end of 1Q 2021. In addition, ENRI is conducting activities on GAST-D and GAST-E/F.

2.13 The Korea Augmentation Satellite System (KASS) will be completed by 2023 for the provision of the Safety of Life (SoL) service across the designated coverage. Republic of Korea (ROK) pointed out the difficulty to find Geo payload to rent for transmission of the SBAS signal.

2.14 IATA presented that GBAS infrastructure and GLS procedures should be implemented as appropriate based on a positive business case and consultation with airlines. Regarding SBAS, due to issues associated with overlapping satellite footprints States should not support the use of SBAS to fly LNAV or LNAV/VNAV minima and should publish LPV minima for all approach procedures to be flown using SBAS. Additionally, all procedures with SBAS LPV minima should also include ABAS Baro-VNAV LNAV/VNAV minima.

2.15 Activities of ICAO Navigation Systems Panel (NSP) GBAS working group (GWG) Ionosphere Gradient Mitigation (IGM) ad hoc group were introduced. It is working on enhancing GBAS performance in the low latitude region that shares the common interest with this task force related to the review of APAC GBAS guidance on the ionosphere threat mitigation.

2.16 The United States provided an overview of their research, design approval, commissioning, and oversight of GBAS, with highlights on benefits and technical differences between GBAS and ILS. US deployment plan for GBAS meeting GAST C standards was also presented. Discussion also highlighted the need to develop and apply a site specific ionospheric threat model for assessing risk to GBAS performance.

2.17 The Action List of the task force proposed by the Secretariat was discussed. Description, relevance and priority of those action items were assessed by the meeting. Action owners were assigned with target date agreed in the meeting. The draft Action list is attached at **Annexure A**.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) Note the information contained in this paper;
- b) Consider the endorsement of the draft Action List of the task force as presented in paragraph 2.17; and
- c) Discuss any relevant matters as appropriate.

Annexure A

ACTION PLAN

GBAS SBAS Implementation TF

Last Updated: 28/9/2020

NUME	ACTION ITEM	PRIORITY	OWNER	DUE	STATUS	NOTES (ICAO Document ref)
1 Develop awareness and information sharing						
1.1	Organize a workshop with airspace users of the APAC region (expected benefits, comparison with ILS and Baro VNAV, operational concept, coverage of SBAS and GBAS, programmes in the region, fleet readiness, cockpit interface, business case, retrofit, mandates, inviting air operators already using SBAS or GBAS procedures)	HIGH	ICAO/IATA	Early 2021		ICAO and IATA as main organizers, with the host State. First choice would be to have a face-to-face workshop, in India for example, as Gagan has been put in place. Second choice is to organize a small webinar. To be decided in Dec 2020.
1.2	Organize a specific meeting with APAC regulators interested in GBAS SBAS (update of regulation, certification of provider, certify pilot training and standard operating procedures., approval of procedures,...)	HIGH	ICAO and some States to conduct a survey first	To be discussed at the 3rd TF meeting		Australia is supporting
1.3	Create a brochure to summarize main aspects of GBAS and SBAS systems	HIGH	1) ICAO to collect information already available and put on the website 2)See whether we do need a	S1 2021		With input from other actions, may be combined with 1.4 Brochure In a second stage
1.4	Make reference to existing information about benefits of GBAS and SBAS vs ILS and APV Baro	MEDIUM	ICAO	12/31/2020		What is already available from ICAO or from other regions ? From FAA : https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/ https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/library/factsheets/media/RNAV_QFacts_final_06122012.pdf From ICAO EUR/NAT https://www.icao.int/EURNAT/EUR%20and%20NAT%20Documents/EUR%20Documents/EUR%20Documents/025%20-%20EUR%20RNP%20APCH%20Guidance%20Material/EUD%20Doc%20025%20RNP%20APCH.pdf
1.5	Develop a list of GBAS and/or SBAS focal points in each APAC State	HIGH	ICAO / Action of the GBAS SBAS ITF/2 for ICAO RO to send a State Letter	9/30/2020- for dispatch of SL		Information to be put on the website
1.6	Develop a synthetic list of the on going development of GBAS SBAS systems in the APAC region (coverage, date of entry into service)	HIGH	ICAO / Information to put on the website / Action Focal point to provide GBAS SBAS programme information to ICAO	12/31/2020		Reuse the format of the information presented at the workshop in Republic of Korea in 2019
1.7	Develop a synthetic list of GBAS and SBAS fleet readiness	MEDIUM	ICAO/IATA/Eurocontrol	End of Q1 2021		Public information from IGWG and aircraft manufacturers. The IGWG information is available at the EUROCONTROL's One Sky Team website (registration required).

Annexure A

NUME	ACTION ITEM	PRIORITY	OWNER	DUE	STATUS	NOTES (ICAO Document ref)
1.8	Develop a list/map of published GBAS and SBAS procedures in the APAC region	MEDIUM	ICAO with input from focal points	Next meeting		The flygls.net website (Airbus/Eurocontrol) lists the GBAS stations worldwide SBAS : FAA LPV approaches: https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/approaches/media/LPVs.xlsx EGNOS LPV https://egnos-user-support.essp-sas.eu/new_egnos_ops/resources-tools/lpv-procedures-map Europe through Eurocontrol access https://www.eurocontrol.int/platform/performance-based-navigation-map-tool
1.9	Develop a list of APAC States' mandates (existing and planned) related to GBAS and SBAS	MEDIUM	ICAO with input from focal points	Next meeting		
2 Experience sharing						
2.1	Organize a discussion and a visit if possible of States/Airports who have already implemented Gbas or Sbas systems (all subjects including siting,performance demonstration, safety assessment..)	HIGH	ICAO / When possible	To be discussed in the next meetings		Could be done in : - Australia as Melbourne and Sydney have published procedures on GBAS stations. - Japan : a GBAS operational trial procedure has been published at Tokyo Haneda and is applicable from 16 July 2020.
3 Technical issues						
3.1	Review of the previous ionosphere studies published in 2016 (also look at how to use SBAS coverage for GBAS)	HIGH	Japan / Ad hoc group under GBAS SBAS ITF ICAO to send an email to get volunteers with Mr Susumu as States to contact ICAO to get the SBAS channel numbers as per SL 2019/87	Next meeting		Coordination/harmonization with the ad hoc group of ICAO NSP GWG (GBAS Working Group) working on iono guidance for GBAS in low latitude regions.
3.2	Management of SBAS Channel	MEDIUM				Handled by ICAO HQ SL 2019/87 from ICAO to States to nominate contact point and then can access the ICAO tool
3.3	VDB frequency assignement and coordination in APAC	HIGH	Hong Kong China to coordinate with other States and ICAO	Next meeting		ICAO Doc 9718 is under revision to include VDB frequency compatibility criteria. To coordinate with Spectrum Review WG and Navigation System Panel (NSP). Mr Susumu Saito offered to help in coordination with NSP.
3.4	ATC interface and NOTAM matters (both for GBAS and SBAS) (Ref essential navigation means in Annex 10 ??)	MEDIUM	ICAO/ WP and discussion for a future meeting	Next meetings		Based from ICAO provision and experience of other regions
3.5	SBAS coverage extension to neighboring States (simulation, adding ground station and associated costs, certification,Service Level Agreement)	HIGH	States operating SBAS should present WP	Next meetings		India / USA are willing to contribute to this WP
3.6	GBAS and SBAS safety assessment	HIGH	States to share their experience	Next meetings		
3.7	GBAS SBAS performance demonstration (acc,int,avail,cont,time to alarm, data collection, simulation,...)	HIGH	States to share their experience	Next meetings		Also addressed in IGWG
3.8	GNSS signal monitoring (legal recording,...)	MEDIUM	States to share their experience	Next meetings		Ref ICAO GNSS Manual

Annexure A

NUME	ACTION ITEM	PRIORITY	OWNER	DUE	STATUS	NOTES (ICAO Document ref)
3.9	GBAS siting criteria	MEDIUM				EUROCAE ED114B and FAA Order 6884.1 (http://www.faa.gov/documentLibrary/media/Order/6884_1.pdf)
3.10-	Information to be provided in the flight plan and information into AIP	MEDIUM				ICAO DOC 4444
3.11	Final Approach Segment Data Block : 1) Tool to elaborate the FAS DB ; 2) How to validate FAS DB during the ground and flight inspection	MEDIUM	States to share their experience	Next meetings		Same for SBAS and GBAS? Ref Eurocontrol tool to create FAS DB : EUROCAE ED114B for GBAS
3.12	Phraseology	LOW				ICAO DOC 4444
3.13	Lack of PRN numbers for SBAS Geo Satellites	MEDIUM	Mainly for new SBAS providers			Annex 10 / NSP and receiver standards RTCA DO229F
3.14	Interference management (but this is not only specific to GBAS SBAS)	MEDIUM	States to share their experience			
4 Quick guides and references						
4.1	ICAO and others document review (Top Down)	HIGH	ICAO / Website			Source : ICAO presentation given at the first workshop in ROK in 2019
4.2	Develop High Level guide on Implementation Process for GBAS and SBAS	HIGH	Co-chairs	WP/ Skeleton to be presented at the next meeting		What is already available from ICAO or from other regions ? Ref AIDC and ADSB High Level Guide
4.3	Technical support for system certification and operation certification	TBD				To be decided after meeting with regulators Linked with 1.2 and 3.6 above.
4.4	Complement the "PBN in a page"	LOW	ICAO to assess what could be done			https://www.icao.int/APAC/Documents/edocs/PBN-in-a-page%20V2.pdf GBAS is not part of PBN but rather comparable with ILS
5 Training						
5.1	Develop syllabus for ATCOs	MEDIUM	To be confirmed			
5.2	Develop one day/two day training workshop for ATCOs (Use of GBAS/SBAS for approach and landing : mixity of traffic, ATC interface, Notam,...)	MEDIUM	To be confirmed			
5.3	Deliver a training module on GBAS and SBAS instrument flight procedure design	MEDIUM	ICAO TCB Flight Procedure Programme (FPP)			Training conducted by FPP on 13-17 July 2020