International Civil Aviation Organization

Asia Pacific First Meeting of the Asia/Pacific GBAS/SBAS Implementation Task Force

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(Video Teleconference)

AIRSPACE USER REQUIREMENTS FOR GBAS AND SBAS

(Presented by IATA)

SUMMARY

This Working Paper provides context on the current use of, and future demand for GNSS augmentation systems by Airspace Users and specifically airline members of IATA.

1. INTRODUCTION

1.1 To meet required performance for the more stringent navigational applications, such as approach with vertical guidance (APV) and precision approaches, augmentation of the GNSS signal is required in order to improve navigation accuracy and integrity.

1.2 This Information Paper presents an overview of IATA's positions on:

- Aircraft -Based Augmentation System (ABAS);
- Ground-Based Augmentation System (GBAS); and,
- Satellite-Based Augmentation System (SBAS)

1.3 IATA recognises the benefits through separate applications of different GNSS augmentation systems and supports the recommendation recognised by the Air Navigation Commission at AN-Conf/13 which includes that States, when defining their air navigation strategic plans and introducing new operations, take advantage of the improved robustness and availability made possible by the existence of multiple GNSS constellations and associated augmentation systems.

2. DISCUSSION

Aircraft-Based Augmentation System (ABAS)

2.1 The current IATA global position supports using Aircraft-Based Augmentation System (ABAS) as the preferred augmentation system for en-route and terminal-area navigation using GNSS.

2.2 In line with ICAO Assembly Resolution A37-11, for approach operations, ABAS should be used in combination with Baro-VNAV to provide horizontal and vertical guidance, respectively.

Ground-Based Augmentation System (GBAS)

2.3 Since early development, GBAS has evolved to provide geometric vertical guidance for precision approaches and also additional operational flexibility through provision of displaced thresholds and multiple glide path approaches.

2.4 From mid-2017, equipage with GNSS/GBAS Landing System (GLS) has expanded rapidly to include it as standard or optional in many airline fleets. GLS is a standard for B787-9, B747-8. It is optional for B737-8, A319/320/321, A330/340, A350, A359, A380, and A388. Retrofit option is being considered for B757/767. Other aircrafts such as Mi-8, RRJ-100, Yak-42 and IL-76 also have GLS functions.

2.5 As of November 2018, ICAO SARPs for GBAS were extended to support Category I/II/III precision approaches, landing, guided take-off, departure, and surface operations.

IATA Position on GBAS:

2.6 Support GBAS with geometric vertical guidance as a viable candidate to supplement ILS for Precision Approach Operations. GBAS infrastructure and GLS procedures should be implemented as appropriate based on a positive business case and consultation with airlines.

2.7 Airlines with GLS avionics should approach their regulators to obtain operational approval as necessary.

Satellite-Based Augmentation System (SBAS)

2.8 Current ICAO SARPs supporting the use of SBAS to augment single-frequency GPS are well matured and published.

2.9 The A320 family and A350 family offer SBAS equipage as an option. Boeing is advertising the availability of SBAS Multi Mode Receivers as options on some B737 models and the B777 with effect 2017/2018. Bombardier CS100 and CS300 are factory-fitted with SBAS receivers. Additionally, several manufacturers of regional commuters and business jets, such as Embraer and Mitsubishi, provide options to support SBAS in some of their aircraft.

SBAS for LNAV/VNAV vs SBAS for LPV

2.10 For any airspace under the satellite footprints of multiple SBASs, some SBAS avionics are unable to select a specific SBAS signal when flying LNAV/VNAV procedures. This can create a regulatory issue for Airspace Users if an unauthorized SBAS signal is inadvertently used to fly LNAV/VNAV procedures. States under the coverage areas of multiple SBASs therefore should not selectively authorize specific SBAS for LNAV/VNAV procedures and SBAS service providers need to ensure that their SBAS signals are meeting the integrity requirement of the ICAO Annex 10 for all areas within the satellite footprints.

2.11 This issue related to overlapping SBAS signals is associated only with SBAS for LNAV/VNAV procedures and does not apply to the use of SBAS for LPV procedures. As the latter contains the Final Approach Segment (FAS) data block which clearly specifies the appropriate SBAS to be used. Airbus and Boeing aircraft have a capability to restrict the use of SBAS to LPV operations only.

2.12 Future dual-frequency, multi-constellation (DFMC) SBAS avionics standards are being developed to include a selection capability for a suitable SBAS signal when not flying LPV procedures. The DFMC GNSS capability upgrades for SBAS are now being developed under ICAO.

2.13 IATA therefore does not support the use of SBAS to fly LNAV or LNAV/VNAV minima and

recommends States publish LPV minima for all approach procedures to be flown using SBAS.

2.14 Additionally, IATA recommends that all procedures with SBAS LPV minima should also include ABAS Baro-VNAV LNAV/VNAV minima.

Adoption & Mandates

2.15 Airlines are equipping with SBAS based upon their own requirements and business case. As there are several acceptable enablers for vertical-guided approaches in compliance with ICAO Assembly Resolution A37-11, airlines who are not equipping with or planning for SBAS have a significant concern about any unilateral mandate of SBAS equipage by States and any unjustified operational restrictions that States may impose due to the lack of SBAS equipment.

2.16 Retrofitting or equipping with SBAS avionics without operational need will incur substantial cost to airlines. Considering that airlines should not pay for costs related to services they are not using, operations and infrastructure for SBAS should not be funded through charges that are applied to all airlines, such as ANS charges.

2.17 IATA does not support mandates for any specific GNSS element, due to the additional costs and prohibitive outcome for those aircraft not equipped. Again, according to the recommendation recognised by the Air Navigation Commission at AN-Conf/13, ANSPs should carefully consider and assess if mandates for equipage or use of any particular GNSS core constellation or augmentation system are necessary or appropriate.

IATA Position on SBAS:

2.18 Airlines who are equipping with SBAS technology are doing so based upon their individual operational requirements and business case.

2.19 IATA member airlines who are not planning to utilize SBAS are concerned that they may be adversely impacted by its implementation. Three essential requirements for SBAS implementation are:

- no mandatory requirements by regulatory authorities to fit SBAS equipment to aircraft;
- no unjustified restrictions to operations due to a lack of SBAS equipment; and
- no costs related to SBAS being imposed directly or indirectly to airspace users who do not use such technology.

Signal Interference

2.20 A significant number of reports have been received on harmful interference to GNSS. Working Paper 188 presented to the ICAO 40th Assembly in 2019 asked that States:

- implement appropriate mitigation measures as contained in the Global Navigation Satellite System (GNSS) Manual (Doc 9849) as a matter of high priority and to report progress and any difficulties to ICAO;
- recognize the unintended impact of harmful interference to civil flight operations and to exercise caution to the maximum extent possible to protect the safety of civil aircraft during military exercises and operations;
- establish and ensure appropriate frequency regulations are in place and maintained to protect allocated GNSS frequencies from harmful interference in line with ITU Radio Regulations;
- ensure that contingency procedures are established in coordination with air navigation service providers and airspace users and that essential conventional navigation infrastructure, such as Instrument Landing System (ILS), are retained when operationally beneficial; and
- support the multi-disciplinary development of alternative positioning, navigation and timing (APNT) strategy and solutions to complement the use of GNSS in aviation in coordination with ICAO and airspace users.

2.21 The ICAO Assembly acknowledged this concerning issue and operational and potential safety impacts of the harmful interference to GNSS and recommended that the ICAO Council act with urgency on measures aimed at elimination of harmful interference to GNSS. It was noted that the actions for ICAO were within the scope of the existing work programme.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

i) note the information contained in this paper; and
ii) Particularly note the information in paragraph 2.23 regarding harmful interference to GNSS
iii) Discuss and agree the following Conclusions:

DRAFT Conclusion APAC GBAS/SBAS ITF/1xx
States should Support GBAS with geometric vertical guidance as a viable candidate to supplement ILS for Precision Approach Operations. GBAS infrastructure and GLS procedures should be implemented as appropriate based on a positive business case and consultation with airlines.

DRAFT Conclusion APAC GBAS/SBAS ITF/1xx
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.

DRAFT Conclusion APAC GBAS/SBAS ITF/1xx

As there are several acceptable enablers for vertical-guided approaches in compliance with ICAO Assembly Resolution A37-11 States should not implement mandates for any specific GNSS element, due to the additional costs and prohibitive outcome for those aircraft not equipped. The following requirements should be adopted:

- no mandatory requirements by regulatory authorities to fit SBAS equipment to aircraft;
- no unjustified restrictions to operations due to a lack of SBAS equipment; and
- no costs related to SBAS being imposed directly or indirectly to airspace users who do not use such technology.

iv) discuss any relevant matters as appropriate.

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