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THIRTEENTH AIR NAVIGATION CONFERENCE

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COMMITTEE A

Agenda Item 2: Enabling the global air navigation system

2.2: Integrated CNS and spectrum strategy

**ASECNA'S SBAS IMPLEMENTATION STATUS AND VIEW
ON THE APPROVAL AND USE OF DUAL FREQUENCY MULTI CONSTELLATION (DFMC)
SBAS ELEMENTS**

(Presented by the Agency for Air Navigation Safety in Africa and Madagascar
(ASECNA)²)

EXECUTIVE SUMMARY

This paper presents the status of ASECNA's own SBAS programme and which pursues the provision of L1 initial services, compliant with ICAO Standards and Recommended Practices (SARPs) and the European Organisation for Civil Aviation Equipment (EUROCAE)/ Radio Technical Commission for Aeronautics (RTCA) minimum operational performance standards (MOPS), from the 2021/2022-time horizon, with the aim to improve flight safety and efficiency for all phases of flight in the 16 million square kilometres of airspace under its responsibility, for the direct benefits of its airspace users. Provision of next generation Dual Frequency Multi Constellation (DFMC) SBAS services is expected beyond 2028-2030.

In this regard, ASECNA's view is that the use of DFMC SBAS for all phases of flight and operations in the airspace under ASECNA responsibility shall be limited to the approved SBAS elements which will be promulgated in the Aeronautical Information Publication (AIP). Solutions are to be further investigated to ensure that avionics only use the SBAS elements accepted by States for navigation purposes.

Action: The Conference is invited to:

- a) consider the implementation status of the ASECNA SBAS programme; and
- b) approve the need to further investigate, develop and implement solutions to ensure that avionics only use the DFMC SBAS elements accepted by States for navigation purposes.

¹ English and French versions provided by ASECNA.

² Member States: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Equatorial Guinea, France, Gabon, Guinea-Bissau, Madagascar, Mali, Mauritania, Niger, Senegal, Togo

1. INTRODUCTION

1.1 ASECNA, the Agency for Air Navigation Safety in Africa and Madagascar, is an international public organization composed of eighteen Member States (Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Equatorial Guinea, France, Gabon, Guinea-Bissau, Madagascar, Mali, Mauritania, Niger, Senegal, and Togo). Created in 1959, its main mission is to provide air navigation services within a single sky airspace of 16 million square kilometres, corresponding to the airspace under the jurisdiction of its Member States and to oceanic airspace in central Atlantic Ocean, Gulf of Guinea and Indian Ocean entrusted by the international community.

1.2 ASECNA is committed to the provision of SBAS services in its area of responsibility as per the resolutions taken by its Member States in 2005 and 2011 and has initiated in 2011 an own SBAS programme which pursues the autonomous provision of L1 initial services from the 2021/2022-time horizon for the benefit of its airspace users.

1.3 This programme aims also to contribute to the implementation of both Single Sky for Africa and African Union Space Policy and Strategy, for which it constitutes a key enabler, and is developed within the framework of the bilateral cooperation on satellite navigation between the Agency and the European Union (EU), and more globally of the Africa-EU Strategic Partnership.

2. DISCUSSION

2.1 SBAS does not require the installation and maintenance of local ground-based navigation aids or landing systems and the provision of related staff, and is particularly adapted to the African operational environment, where remote and isolated regions are vast and numerous. The benefits of its introduction are expected to be much more important than in any other part of the world.

2.2 SBAS in ASECNA airspace is intended to enhance performance-based navigation (PBN) and automatic dependent surveillance — broadcast (ADS-B) operations for all phases of flight, from en-route down to approach, and thereby to increase significantly flight safety and efficiency. It will improve availability for all area navigation (RNAV) routes and flexibility for new and more efficient routes and will provide an effective solution for CAT-I equivalent operations “everywhere every time”, especially in the very large number of runway ends, in international, regional and domestic airports, not served by precision approaches today. It will also enable to ensure service continuity during instrument landing system (ILS) maintenance and renewal periods and will overcome the known safety and operational performance limitations of lateral navigation (LNAV) / vertical navigation (VNAV) operations.

2.3 The signal-in-space will be compliant with corresponding SARPs from ICAO contained in Annex 10 — *Aeronautical Telecommunications*, Minimum Operational Performance Standards (MOPS) published by the Radio Technical Commission for Aeronautics (RTCA) and European Organisation for Civil Aviation Equipment (EUROCAE), and the regulations of the Member States which will proceed to the required certification.

2.4 The services provision strategy is to meet user needs with an incremental approach in terms of coverage and performances, considering expendability towards the next generation of DFMC. ASECNA plan is to autonomously provide airspace users with L1 early services from 2021/2022 and DFMC services beyond 2028-2030.

2.5 The infrastructure will be owned and operated by ASECNA and is developed using the European Geostationary Navigation Overlay Service (EGNOS) technology and assets. It will comprise a network of Reference Integrity Monitoring Stations (RIMS), Mission Control Centre(s) (MCC), Navigation Land Earth Stations (NLES), a SBAS wide area transport network supported by AFISNET (African Indian Ocean Satellite Network, larger aeronautical VSAT network in the world), and a space segment.

2.6 Feasibility studies were performed from 2011 to 2015, especially in the field of ionosphere characterisation and optimisation of EGNOS model for ASECNA area. A joint initiative between ASECNA and the French Space Agency (CNES), so-called SAGAIE, processed global navigation satellite system (GNSS) data collected through a dedicated network of GNSS stations deployed in ASECNA countries, using dedicated ionosphere correction algorithms, and showed the feasibility of APV-I service in compliance with SARPs during the high ionospheric activities of 2015.

2.7 The architecture preliminary definition study (Phase B) is under procurement, with a selection of the contractor by October 2018. System Requirements Review (SRR) and Preliminary Design Review (PDR) are planned by beginning and end of 2019 respectively. Critical Design Review (CDR) and Acceptance Review (AR) are expected by 2020/21 and 2021/22 respectively, these timelines for phases C/D will be refined as the development and qualification plan is endorsed during the phase B.

2.8 ASECNA SBAS programme is fully-fledge initiative supported by its Member States which aims to improve significantly and sustainably flight safety and efficiency in the large ASECNA airspace for the direct benefits of its airspace users from 2021/2022-time horizon.

2.9 While DFMC SBAS services provision by ASECNA is expected beyond 2028-2030, the use of DFMC SBAS for all phases of flight and operations in the ASECNA airspace shall be limited to the approved SBAS element(s) which will be promulgated in AIP.

2.10 The current practice to leave avionics to determine the appropriate set of GNSS elements to be used within a given airspace on the basis only of performance criteria, without limiting use only to the elements certified by the designated authority for the concerned airspace, can create institutional and regulatory issues with DFMC.

2.11 While acknowledging the desirable long-term goal to ensure all GNSS elements that are compliant with SARPS and have been accepted by ICAO can be used in all States for lateral navigation to facilitate interoperability, improve safety and increase effectiveness, the ability of States to commission GNSS services in respect to their mandates and obligations, and thereby to control the use of GNSS elements in their airspace, shall be considered.

2.12 The process of acceptance of GNSS elements by States can be complex and run into hurdles, and the States' requirements for the use of specific GNSS elements should be properly addressed. In this regard, as far as SBAS is concerned, the following concept of operations is to be addressed:

- a) when only specific SBAS elements are accepted for use, DFMC avionics should only use the SBAS elements that have been accepted by State managing airspace where the aircraft is flying; and
- b) when all SBAS elements are accepted for operations or there is no State declaration of SBAS element acceptance, DFMC avionics should select for lateral navigation the SBAS elements to be used subject to compliance with applicable SARPs, PBN navigation specifications and airworthiness approval requirements.

2.13 Solutions for the implementation of this concept are to be investigated through interaction between industry and States through ICAO, EUROCAE and RTCA, to ensure that avionics only use the DFMC SBAS elements accepted by States for navigation purposes.

3. CONCLUSION

3.1 The Conference is invited to consider:

- a) the implementation status of the ASECNA SBAS programme; and
- b) the need to further investigate, develop and implement solutions to ensure that avionics only use the DFMC SBAS elements accepted by States for navigation purposes.

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