International Civil Aviation Organization
South American Regional Office
Twenty Second Workshop/Meeting of the SAM Implementation Group (SAM/IG/22) - Regional Project RLA/06/901
(Lima, Peru, 19 to 23 November 2018)

SAM/IG/22-IP/10
13/11/2018

Agenda Item 4: **Assessment of operational requirements in order to determine the implementation of communication, navigation and surveillance (CNS) capabilities improvement for en-route and terminal areas operations**

STATUS OF GBAS IMPLEMENTATION IN BRAZIL

(Prepared by Brazil)

SUMMARY

This Information Paper presents the status of the GBAS technology implementation project (Ground Based Augmentation System) in Brazil, including the results obtained to date.

References:

- Annex 10, Volume I, to the ICAO Convention
- SIRIUS Program from Brazil
- SAM/IG/7 – WP/7
- SAM/IG/8 – WP/18
- GREPECAS/16 – IP/15
- SAM/IG/14 – WP/20
- Final Report from Seminar to Implementation of Navigation Infraestructure to support PBN in NAM/CAR/SAM Regions (15-17/08/16)
- SAM/IG/15 – WP/22
- SAM/IG/19 – IP/13

ICAO strategic objective:	A – *Safety* D - *Efficiency*

1 Introduction

1.1 Since the second half of the 1990s, DECEA (*Departamento de Controle do Espaço Aéreo*) has been studying the various methods of GPS (Global Positioning System) signal augmentation as a way to improve its availability, continuity, accuracy and integrity in the different phases of the flight.

1.2 Beginning with tests of the SCAT I (Special Category I) technology, which today is only used in Norway, and following with tests of the SBAS (Satellite Based Augmentation System) through the ICAO Project RLA/00/009, which allowed the identification of the ionosphere as a challenge for the implementation of satellite approach systems for instrument landing.

1.3 As of 2003, DECEA began its studies with the GBAS CAT I (GAST C) technology, with the implementation of an FAA (Federal Administration Aviation) prototype station at Rio de Janeiro International Airport (SBGL).

1.4 The tests with this prototype station were inconclusive and DECEA decided to install an SLS-4000 station at the SBGL Airport in 2011 for tests during the peak of the solar cycle 24, to evaluate its behavior during the maximum activity of the ionosphere and, possibly, start operation.

1.5 Based on the data collected between 2011 and 2014, it was concluded that the threat model used for the SLS-4000 station does not guarantee the availability and integrity required for CAT I operation in low latitudes (including South America), as presented during SAM/IG/15 (NE22).

1.6 In April 2017, a Memorandum of Cooperation was signed between DECEA and FAA for ionosphere research, guaranteeing the participation of FAA technicians specialized in satellite navigation, ionospheric data collection and data analysis in the process.

1.7 In addition, in August 2016, the North American company Mirus together with the Brazilian Foundation SDTP, with the support of the USTDA (US Trade and Development Agency), signed an agreement for the development of a Safety Case for GBAS operations in Brazil.

1.8 In Brazil, the GBAS project is part of the SIRIUS Program, which, aligned with the Global Air Navigation Plan (GANP) and the Aviation Systems Block Upgrade (ASBU) methodology, provides for the modernization of the air navigation service in areas such as CNS, ATM, AIS/AIM, SAR, MET, among others (https://www.decea.gov.br/sirius/).

2 Discussion

2.1 From the data obtained between 2011 and 2017 from various GPS receiving stations installed throughout Brazil and from the SLS-4000 station, an analysis work was developed involving DECEA, ICEA (*Instituto de Controle do Espaço Aéreo*), FAA, Boeing, Stanford University, Boston College, Honeywell, INPE (*Instituto de Pesquisas Espaciais*), MIRUS and SDTP.

2.2 During the week of March 19th to 23rd, 2018, a meeting was held in Rio de Janeiro among the institutions listed above, where the final configuration results of the SLS-4000 station and its restrictions for use in Brazil were presented and discussed, as well as information about the behavior of the ionosphere over the Brazilian territory.

2.3 Among the conclusions obtained from the data and studies carried out, the following stands out:

- The SLS-4000 station can be configured for use in Brazil for precision approach only between 6AM and 6PM (local time) using the CONUS (Continental United States) threat model, with possible discontinuities during the operation due to the arrangement of geometry of the satellites;
- Outside of these hours, the operation cannot be guaranteed in accordance with the requirements of the ICAO SARPs of Annex 10 vol. 1;
- The ionosphere above all Brazil (from north to south) presents severe behavior, and the same operating restrictions must be applied in all its territory;
- Each GBAS installation requires performing a specific Safety Case to guarantee the safety of the operation;

- It is advisable to maintain a signal monitoring and analysis infrastructure to ensure that possible ionosphere events are within the threat model installed in the station.

2.4 The final report with the work developed as well as the results and the Safety Case should be ready until March 2019.

2.5 Given the results obtained, DECEA decided to continue studies of GBAS technology, data collection and analysis, as well as to keep up with its development in the world, not deploying, yet, the System in operation in Brazil and awaiting the increase in the performance of that technology.

3. Suggested actions

3.1 The meeting is invited to note the information presented.
