International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Seventeenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/17)
(Cochabamba, Bolivia (Plurinational State of), 21 to 25 July 2014)

Agenda Item 4: Regional air navigation planning and implementation performance framework: Review of programmes and projects.

4.1 Projects of the PBN programme

GBAS (Ground Based Augmentation System) implementation in Brazil

(Presented by Brazil)

SUMMARY

This information paper aims to present the status of GBAS (Ground Based Augmentation System) implementation for precision approach in Brazil.

References:

- ICAO Annex 10;
- SIRIUS Program from Brazil;
- GREPECAS/16-IP/15;
- SAM/IG/8-WP/18.

1. Introduction

1.1 Since 2003, Brazil, through Brazilian Department of Airspace Control (DECEA) in cooperation with FAA (Federal Aviation Administration), has been making efforts to evaluate the use of GBAS system in Brazilian airspace.

1.2 Initially, a GBAS prototype from FAA was installed at Galeão International Airport (Rio de Janeiro - SBGL), which allowed initial studies regarding the capabilities of the system.

1.3 The behavior of a GBAS station in Rio de Janeiro is of great interest, considering it is located in a region of low latitude, subject to intense ionospheric activity with the occurrence of phenomena such as severe gradients, plasma bubbles and scintillation.

1.4 In July 2011, a Honeywell SLS-4000 SmartPath station was acquired and installed also at SBGL in order to allow the evaluation of the behavior of a station already certified by FAA for use in mid-latitudes environment, when subject to the characteristics of the ionosphere near the geomagnetic equator during the period of maximum solar activity.

1.5 Data collection from SLS-4000 lasted from July 2011 to April 2014 and will provide subsidies for the implementation of the system at low latitudes.

2. **Discussion**

2.1 In March 2012, through the PCA 351-3 (National ATM Implementation Plan)[1], DECEA, updating the same document from May 2009, created the SIRIUS[2] Project, aligned with the Global Air Navigation Plan (GANP) and ASBU (Aviation System Block Upgrades) methodology, which presents projects and activities required to implement the ATM Operational Concept in Brazil.

2.2 Covered by SIRIUS, there are programs and projects that encompass the areas of CNS, ATM, MET, AIS/AIM and SAR. Within the Program **Improvement of Navigation Systems** is the project **GBAS Implementation**, which has the objective of implementing a GBAS station in the severe ionospheric environment of low latitudes.

2.3 Among the potential benefits of GBAS system, we can mention:

- ✓ Lower ceiling and visibility minima for straight-in approaches;
- ✓ Improved takeoff guidance in low visibility conditions;
- ✓ Improved ceiling and visibility minima for complex approaches;
- ✓ Increased capacity from closely spaced parallel approaches;
- ✓ Qualitative description of several potential efficiency benefits, including variable glideslopes, missed approach guidance, and surface navigation;
- ✓ Eliminates capacity constraints due to ILS critical areas;
- ✓ Enabling technology for high precision terminal area navigation services (4-dimensional dynamic trajectories);
- ✓ Supports offset landing thresholds for high density airports helping to implement wake turbulence avoidance procedures pertaining to arrivals;
- ✓ Provides the capability to use continuous descent approaches (CDAs) and curved-segmented approaches in extremely low visibility conditions

2.4 To perform test flights, Brazil has 10 aircrafts from Flight Inspection Group (GEIV) - 04 HAWKER 800 XP and 06 EMB-110 Bandeirantes aircraft - equipped with multimodal receiver (MMR) GNLU-930 integrated into the flight inspection system UNIFIS 3000, from the Norwegian company NSM.

2.5 Approach procedures (**for testing purposes only**) for runways 10, 28, 15 and 33 were designed and inserted into SBGL GBAS.

2.6 Initially, the station was sensitive to ionospheric scintillation in Rio de Janeiro, affecting the availability of the station. Because of this, and to allow continuous data collection, many station monitors were disabled.

2.7 It is noteworthy that SLS-4000 SmartPath is already operating at airports like Bremen (Germany), Newark (USA), Houston (USA), Malaga (Spain) and Sydney (Australia), all located in the mid-latitudes.

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[1] Available in http://publicacoes.decea.gov.br/?i=publicacao&id=3731.

[2] Available in http://www.decea.gov.br/novo_sirius/.

2.8 The instability in the operation of the station showed that the threat model used for the mid-latitudes did not apply fully to the low latitude regions and new parameters according to the data collected should be entered.

2.9 Thus, Airpace Control Institute (ICEA) from Brazil was assigned to develop an ionospheric threat model and certify the SLS-4000 station to make it usable in Brazil.

2.10 ICEA implemented a network of GPS receivers around SBGL able to collect data on the frequencies of GPS L1 and L2, and also to identify the occurrence of scintillation (PolarRxS Septentrio, Trimble and NetR8 GPStation NOVATEL-6 receivers).

2.11 In October 2013, the Brazilian foundation Defense Services and Process Technologies (SDTP), signed a contract with the American company Mirus Technology, to develop an ionospheric threat model for Brazil, using data collected by SLS-4000 station and the GPS receiver network from July 2011 to April 2014. This work has the support of organizations such as DECEA, ICEA, FAA, Stanford University, Boston College, Institute for Space Research (INPE), Institute of Advanced Studies (IEAv) and several Brazilian universities.

2.12 The phase of data collection, analysis and development of a preliminary threat model was completed. Tests to validate the final ionospheric threat model will be completed by October 2014.

2.13 ICEA initiated in May 2014 a joint work with FAA to certify Honeywell SLS-4000 SmarthPath using the ionospheric threat model in development for use in low latitudes (Block II). The schedule sets July 2015 as the date for System Design Approval, followed by Facility Approval and Service Approval. The plan is to start GBAS operation in Brazil in the first quarter of 2016.

3. Suggested actions

3.1 The meeting is invited to:

a) Note the information presented;

b) Identify that Brazil has been developing, in cooperation with the FAA, an ionospheric threat model to low latitudes and certification of SLS-4000 GBAS SmartPath station that may facilitate the use of GBAS systems in SAM Region.

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