International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Sixteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/16)
Punta Cana, Dominica Republic, 28 March – 1 April 2011

Agenda Item 3: Performance framework for Regional Air Navigation Planning and Implementation
3.1 Global, inter-regional and intra-regional activities concerning air navigation systems in the CAR/SAM Regions

PROGRESS OF THE PROJECT RLA/03/902 – SACCSA PHASE III A

(Presented by the Secretariat)

SUMMARY

This information paper presents a summary of the first results on the Studies and demonstrations of the SACCSA Project, Phase III-A, as well as on the demonstration of broadcast of the SBAS/SACCSA signal through a geostationary satellite, that were presented in the RCC/7 Meeting of this project.

References:

- Report of the RCC/7 Meeting of the Project RLA/03/902, San Carlos de Bariloche, Argentina, 11 – 15 October 2010

1. Introduction

1.1 Project RLA/03/902 – SACCSA continue developing scheduled tasks, in accordance with the work packages contracted up to this date.

1.2 The first results of Phase III of the Project and of the Seventh Meeting of the Coordination Committee (RCC/7) held in San Carlos de Bariloche, Argentina, from 11 to 15 October 2010 have imposed a turning point and impulse to the Project, as it was the first time for the broadcast of signal SBAS / SACCSA by a geostationary (GEO) satellite, allowing the reception of the signal in real time in the CAR/SAM Regions, and also to verify and analyze the benefits obtained.

2. First results of Project RLA/03/902 SACCSA Phase III-A

2.1 Up to this moment, the expected milestones have been accomplished according to the contracting plan of the different work packages of the SACCSA Project Phase III. The following work packages have been submitted for their review:

PT 1100: Requirements of the monitoring network

2.2 The SACCSA monitoring network, based on the SACCSA reference stations (ERS) topology, has been defined and settled according to the availability of GPS observation stations of the different networks available in these regions (SIRFAS, IGS, etc.). Likewise, the data collection and functioning concepts, as well as their storage and necessary interface to send these data to the Process Central Unit (UCP) prototype and the SACCSA Web site have been defined.

PT 2210: Detailed SACCSA ionospheric analysis and PT 2220: Generation of support and IET scenarios

2.3 Ionospheric studies have been completed based on the data analysis from the IGS network available from 1998 to 2009. This analysis is continuance of those conducted during Phase II, which covered the probability analysis of GPS signal loss and ionospheric bubbles distribution, including their definition, algorithms of detection, occurrence, duration and intensity; existence of space scenarios with high total electronic level, under nominal and high solar and geomagnetic activity (ionospheric storms) scenarios; SBAS systems inospheric hypothesis, with error analysis for temporal variability, IGPs meshed space interpolation, use of MOPs mapping function and impact at user level for elevations above 5º; finally, a theoretic study of the ionospheric impact on future evolutions of the SBAS concept has been carried out, including double frequency and multi-constellation systems and ionospheric effects on geostationary satellites.

PT 2600: Topology of the SACCSA ground network

2.4 Based on the results of Phase II, the SACCSA reference stations ground network topology have been determined, optimizing the network, in order to eliminate part of spaces being detected with low coverage. Thus, three external stations (Madrid, Cabo Verde and Seattle) have been removed, bringing them within the coverage area, and some stations were relocated to optimize the provisions. The first simulations to determine the performance that could be achieved have also been made.

PT 2800: Interoperability analysis with SACCSA

2.5 Additionally, a comprehensive study on the analysis of SACCSA interoperability with WAAS, EGNOS, MSAS and GAGAN has been conducted, both at signal level, as well as messages and reference times, with special emphasis on adjacent areas.

PT 6100: Requirements for the Web site

2.6 Finally, the requirements for the SACCSA Web site have been specified, covering its design and its structure that will have contents, links, public and private areas, accesses and contacts.

2.7 The results of the studies and demonstrations conducted by the Project up to this date, under the conditions tested, are encouraging regarding the viability of the SBAS / SACCSA solution in the CAR and SAM regions; although it is necessary to wait for completion of all analysis to confirm viability of the system. It should be noted that different innovative solutions are being addressed in terms of SBAS solutions in these regions so that States and International Organizations can have all the necessary data for future decision making.

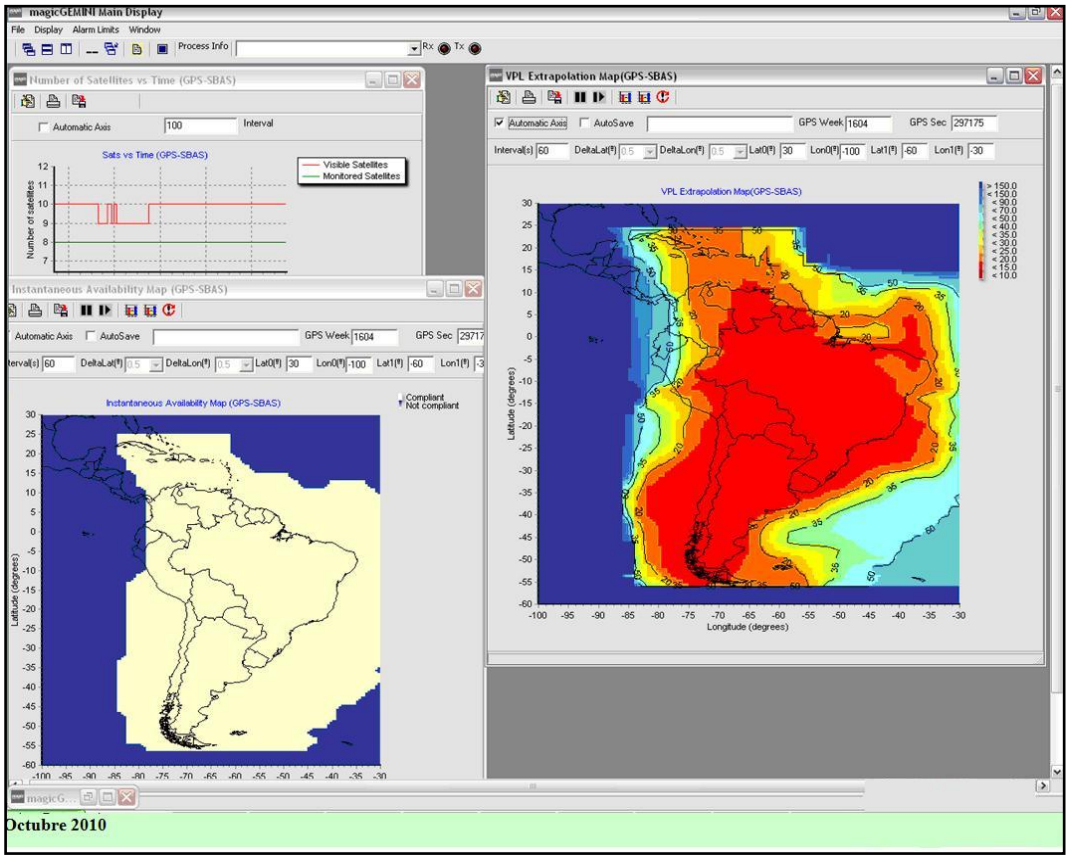
3. Demonstration of broadcast of signal SBAS/SACCSA by GEO satellite

3.1 During the Seventh Meeting of the Coordination Committee (RCC/7) of Project RLA/03/902 held in San Carlos de Bariloche, Argentina, from 11 to 15 October 2010, as result of the studies and demonstrations of Phase III-A of this project, a signal SBAS - SACCSA was broadcasted for the first time in the CAR/SAM regions. During 14 and 15 October 2010, this signal was transmitted in "Test" mode, disabled for SoL (Safety of Live) use.

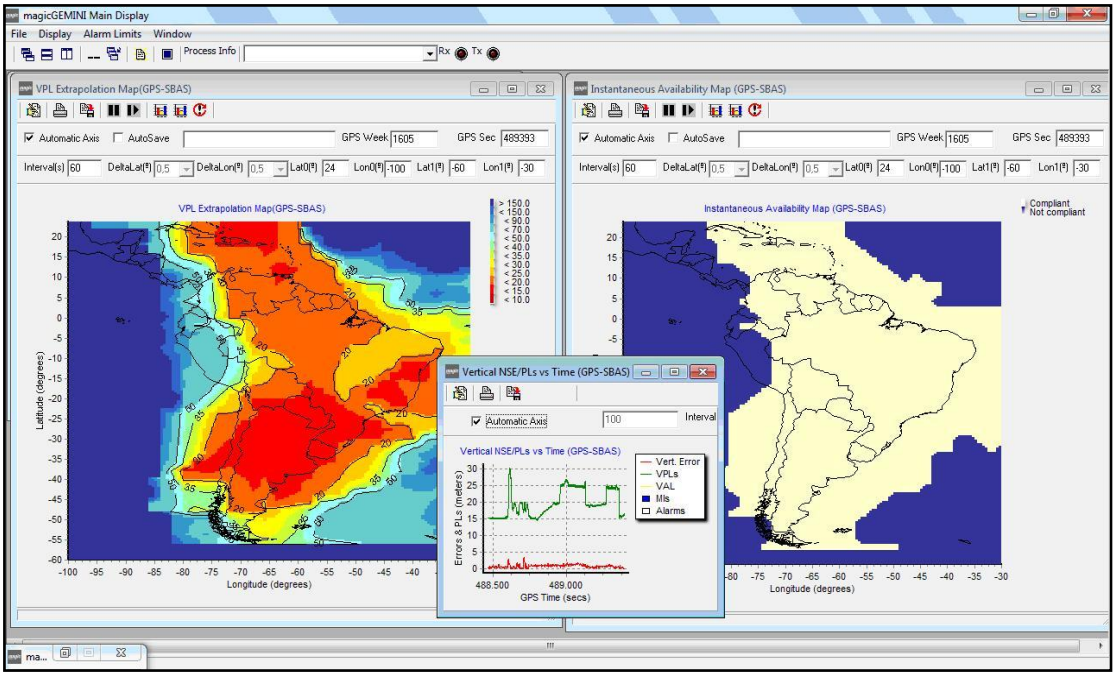
3.2 The achievement of this demonstration is a collaborative effort of GMV and Inmarsat, which have integrated their different technologies. GMV (www.gmv.com) contributed with its SBAS processing center, magicSBAS (www.gmv.com/magicSBAS/magicsbas.htm), which receives and processes GPS data from monitor station network GPS receivers existing in these regions, which were selected during the testing of Phase III of the Project. Inmarsat (www.inmarsat.com) contributed with a ground station for Inmarsat communications access located in Fucino, Italy, with its SBAS signal generator and space capacity, particularly with the navigation transponder on the Inmarsat-3F4 (PRN 122) geostationary satellite, located in a privileged location to service the Americas region. It was also supported by AENA (Spain), the GESA laboratory of the Faculty of Astronomy and Geophysics Science of the Universidad Nacional de La Plata, Argentina, as well as by the representatives of the Argentine State through ANAC (Civil Aviation Administration) and ICAO. The costs of this demonstration did not repel on the Project budget nor of the States: inasmuch as it was a contribution in kind of GMV and INMARSAT, who assumed all the associate expenses.

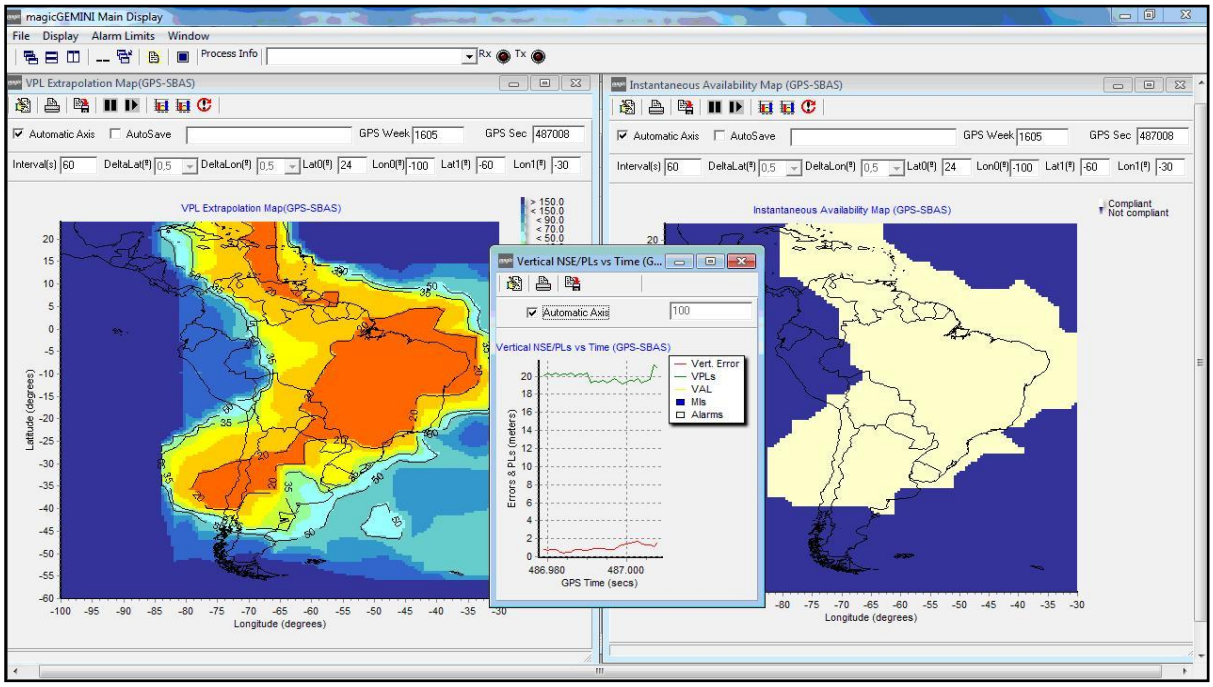
3.3 This demonstration of SBAS/SACCSA was presented to participants at the RCC/7 Meeting of the following States and International Organizations: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Guatemala, Panama, Spain, Venezuela, COCESNA and IFALPA. In a session of this meeting held on October 14, 2010, the results were analyzed. During the demonstration, a video was filmed at the premises of GMV in Spain, Inmarsat in Fucino, as well as sessions of the RCC/7 Meeting of SACCSA Project in San Carlos de Bariloche, Argentina, where the demonstration was shown. This video can be seen from the following Web link: http://www.gmv.com/magicsbas/gallery/gallery.html

3.4 The results and graphics that could be observed are represented in the following figures, which show the excellent level of performance that was obtained:



Best results observed during the testing





Worst results obtained during the testing

3.5 It should be noted that performance is conditioned to the availability of receiver stations, so in the area of Peru and Ecuador none was obtained, and in the area of Central America it was only possible to use two. Likewise as data is downloaded from servers through the Internet, some receivers do not provide information on an ongoing basis, sometimes they are sending information and sometimes not, which caused the worst results.

4. Other results of the Project RLA/03/902 - SACCSA

4.1 The strategy of the Project RLA/03/902 – SACCSA is to study the viability of implementing a SBAS system using the available GPS constellation capabilities (GPS L1), that is monofrequency and monoconstellation, but conditioned to its scaling up to multifrequency and multiconstellation, and keeping the capacity to initially operate in the event of loss of frequency and supplementary constellations.

4.2 This development and implementation strategy enables promoting the gradual use of available GNSS capabilities and the obtaining of short and medium term benefits by States and International Organizations, aeronautical sector and non-aeronautical sector. Likewise, it would provide a sound based knowledge and experience in the use of GNSS that also would help the rapid use and achievement of benefits of the future new constellations and frequencies when they become available, thus, increasing benefits.

4.3 The results of the studies and demonstrations conducted by the Project to date are encouraging regarding the feasibility of the SBAS – SACCSA solution in the CAR and SAM regions under the conditions tested, although it is necessary to wait completion of all studies and analysis of Phase III in order to confirm the viability of the system. It should be noted that different innovative solutions are being addressed regarding SBAS solutions in these regions. Additionally, SACCSA Phase III will complete financial viability and institutional studies, in order to analyze the costs, return formulas, possible operating institution and service provider, as well as issues about ownership of the system.

4.4 By analyzing the results of Phase III the viability of implementing a SBAS in the CAR / SAM regions could be determined, confirming the technical - financial viability of the SACCSA Project that enables a sound basis for decision making by States and International Organizations in these regions.

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