**MOTIVATION**

In the scope of the EEGS2 project, a system has been developed to allow pilots to fly LPV procedures using the signal generated by magicSBAS.

The system is able to provide vertical and horizontal guidance to the pilot during the final approach phase.

The system provides the magicSBAS signal in the surroundings of an airfield via a radiomodem.

**THE COMPONENTS**

The components of the system are:

For the ground system, a laptop connected via ethernet to the transmitter radio modem.

An onboard system rack, including GPS & a radiomodem. The rack works with batteries, with an autonomy of more than 7 hours.

A tablet that communicates with the rack wirelessly.

Application SW, including real time data processing and graphical plots to provide monitoring and guidance to the pilot.

**KEY ADVANTAGES**

The benefits of system are:

- The possibility of flying LPV procedures in places where SBAS systems do not exist.
- Easy configuration and installation, on ground and onboard.
- Guidance for the pilot via a tablet without cabling.

The systems onboard work with batteries, therefore they are autonomous from power supply.

The EEGS2 project is aimed to demonstrate the benefits of EGNOS, EDAS and Galileo through applications in Eastern European countries. The project has the following three objectives:

- To promote EDAS, EGNOS and Galileo

**FLIGHT TESTS IN SPAIN**

During December 2012 and February 2013 several flight tests were conducted in Spain in order to test the EEGS2 equipment.

The main purposes of this test campaign were the following:

- To test the functionalities of the system and the communications between the radiomodem on ground and the rack onboard the aircraft.
- To test the coverage of the radiolink.
- To test the vertical and horizontal guidance of a procedure.

This test campaign proved very successful. The coverage of the radiolink was as expected, around 20 Km, and up to 50 Km with line of sight between both radiomodems. All the tests were conducted using the magicSBAS signal.

**System characteristics**

The system, called magicLPV, that was developed in order to conduct the flight trials has the following features:

- A plug and Play Modular System.
- The possibility of flying LPV procedures in areas where there are no SBAS systems.
- Vertical LPV Guidance via Cross Bar Plot.
- Real-Time, Standalone & Autonomous data processing.
- Processing of GPS + magicSBAS signal or SBAS signal.
- Easy comparison of magicSBAS and SBAS performances.
- Configuration with any LPV procedure defined in the airfield.
- Easy transportation, configuration and installation.
- An onboard rack, independent from power source with more than 7 hours of autonomy.
- Real time processing and post processing.
- Wireless installation.
- Graphical interface based on a touch tablet screen located in the cockpit.
FLIGHT TRIALS IN MOLDOVA

From the 12th to the 14th of March, the GMV team was in Chisinau testing and installing the systems in order to perform flight tests in Moldova. During the first day, the systems were received at the airport and tested on the ground. The purpose of the flight trials were explained to the Flight Training Organisation (FTO) in their offices.

Due to the bad weather conditions, the team went to the Air Club Vadu-lui-Voda to check the installation in the aircraft and at the airport.

The Moldovan partner was given an explanation of how the systems are configured and how they work, and all the problems that might arise and how to solve them.

The 13th of March, a meeting was held with the Moldavian ANSP to explain the purpose of the project, the flights, the safety case, process and the benefits of EGNOS.

FLIGHTS IN CHISINAU INTERNATIONAL AIRPORT

Finally the first two flights took place on the 1st of April at the International Airport of Chisinau. The radiomodem was installed in the control tower of the airport and the radiolink coverage was good during the flight.

Due to the L1/L2 receiver installed for the trial, it was possible to compute a precise trajectory that will be used to assess the SBAS performances.

On the 9th of April, two more flights were conducted at the Chisinau International Airport. The rack was installed as shown in the picture below and the L1/L2 receiver can be seen.
The third flight consisted of three missed approaches. The system performance was very good during the flight with full coverage from the station on ground being obtained. The picture shows the trajectory of the flight.

The protection levels were computed during the whole trajectory except for some small gaps. During the approaches the coverage was complete and the protection levels were computed continuously.

The number of satellites monitored by the magicSBAS signal was between 9 and 11. This is translated into a good DOP and a good trajectory accuracy. The picture below shows the results of the DOP over time.

The fourth flight took place around the area of the airport, and also had good results for coverage and computation of DOPs and PLs. The following pictures show the trajectory and protection levels achieved.

FLIGHTS IN MACULESTI AIRPORT
Two flights more were performed on the 10th of April at Maculesti Airport. The flights consisted of several circles around the runway. Due to the low visibility of the antenna (some parachutes exercises did not allow flying with better visibility), the results were not very good in terms of PLs computation. There was a big gap in those computations during the flight. The figures below present the trajectory of the flight and PLs computed.
Forthcoming Events:

Flights in Tulcea Airport
Bucharest, Romania
8th-10th of May 2013

Flights in Kharkov
Kharkov, Ukraine
27th-31st of May 2013

Flights in Deblin
Warsaw, Poland
10th-14th of June 2013

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FLIGHTS IN BALTI AIRPORT

On the 12th of April, two more flights were carried out at Balti Airport, 30 Km from Maculesti airport. This airport is currently closed and the flight consisted of installing the antenna at Balti Airport and flying from Maculesti. Three approaches were done during the flight to the Balti Runway with full coverage of the magicSBAS signal.

Protection Levels during both flights

The flights conducted in Moldova have been very successful and constitute a great milestone for the EEGS2 project and for the future usage of EGNOS in the eastern European countries.

NEXT FLIGHT TRIALS

The next flight trials will be conducted in other countries in the coming months. It is expected to complete all of them by the end of June.

The next flights are planned on the following dates:
- Bucharest (Tulcea Airport), from 8th to 10th of May, 2013,
- Kharkov, from 27th to the 31st of May, 2013,
- Warsaw (Deblin Airport), from 10th to the 14th of June, 2013

GLOSSARY OF TERMS

APV: Approach Procedure with Vertical Guidance
DOP: Dilution Of Precision
EDAS: EGNOS Data Access System
EGNOS: European Geostationary Navigation Overlay Service
LPV: Localizer Performance with Vertical Guidance
PL: Protection Level
SBAS: Space Based Augmentation System