SONORA Project Successfully Concludes Second Round of U-Space Flight Tests

The second and final round of testing for the project made it possible to collect relevant data on the aerial mobility of unmanned aerial systems in urban environments.

The tests consisted of an exhaustive series of flight plans to assess the accuracy, availability, continuity, and integrity of GNSS receivers integrated with IMUs or other complementary technologies.

Brussels, 21 May 2024 – The SONORA (Support to Standardisation Actions for EGNOS and Galileo in the U-Space) project, an EU-funded initiative for the integration of EGNSS (European Global Navigation Satellite System) services into U-Space regulations, announces the successful completion of its second round of flight tests, which took place in Benidorm, Alicante province, Spain from 20 to 22 November 2023.

The project envisaged two sets of flight tests aimed to evaluate various GNSS (Global Navigation Satellite Systems) – one in an open environment and another in an urban setting. The open environment tests, held in November 2022 at the ATLAS center in Jaén, focused on collecting and analyzing GNSS data to support standard development, assess new EGNSS services - Galileo High Accuracy Service (HAS) and OSNMA (Open Service – Navigation Message Authentication) - and carry out real-world missions with unmanned aerial systems (UAS), including highway surveillance and intrusion detection.

Second round of flights, in Benidorm

The second round of flight was conducted in an urban environment and aimed to analyze the challenges of drone navigation in such a complex setting. Participants evaluated the capabilities and performance of GNSS-alone and hybrid GNSS solutions, which are navigation systems that combine GNSS technology with other sensors. These include cameras, lidar light detection and ranging technology to measure precise distances and movements in real time, IMUs (Inertial Measurement Units), odometers, and other possible. Such systems are used to improve the accuracy and reliability of navigation in urban and indoor environments, where the GNSS signal may be weak or interrupted.

The main goal of this second and final test was to collect relevant data on urban aerial mobility for unmanned aerial systems. To do so, the focus was put on assessing GNSS-alone solutions in different configurations, including the new EGNSS service HAS, as well as on analyzing the capabilities and performance of hybrid GNSS solutions; for the test the hybrid solution considered combines GNSS technology with inertial measurement units (IMU).

SONORA Project

(Support to Standardisation Actions for EGNOS and Galileo in the U-Space)

Trial 2 Results

Funded by the European Union

Results

The on-going result analysis has already led to certain interesting conclusions:

- **Urban Challenges and Multi-Constellation Solution:** Urban environments significantly impact satellite availability. Using multi-constellation (GPS and Galileo) was shown to improve both availability and DOP in such degraded reception conditions.
- **Single vs. Dual Frequency:** Switching from single to dual frequency configurations resulted in GPS performance degradation due to satellite availability loss, a situation expected to improve once GPS constellation is fully renewed. For Galileo, an improvement was observed when using dual-frequency measurements (E1+E5). This improvement is expected to further increase in these frequency bands as more GPS satellites transmitting in L5 become available.
- **EGNSS Augmentation and Cybersecurity Protection:** The Galileo HAS service showcased promising results, reaching decimeter-level accuracy. Moreover, Galileo OSNMA has shown protection against navigation spoofing attacks without a significant impact into other performances.
- **Position vs Autopilot errors:** Analysing UAS navigation errors, it has been observed that positioning error (NSE) is significantly larger than autopilot error (FTE) for this particular trial. A different usage of vertical references has also been identified, which could be a potential risk for operations if a CAR (Common Altitude Reference) is not used.
- **GNSS+IMU Hybridisation:** Hybrid solutions were shown to further improve on the accuracy and availability of the GNSS-only solution, which are key to ensure a smooth navigation in urban environment.

Based on further analysis of the test results, the project will provide feedback to the UAS regulatory agencies with the goal of streamlining the authorization processes for these kinds of medium-risk Specific Category operations (SAIL III-IV).

About SONORA Project

According to European Commission data, the drone services market in Europe could be worth €14.5 billion, and create 145,000 jobs, by 2030. The development of a resilient and autonomous European industry is at the core of the EU strategy in this domain. Within this context, the SONORA Project focuses on the integration of EGNSS services into U-Space regulations, while encouraging the implementation of GNSS-based solutions in the U-Space environment.

EGNSS comprises two primary components: Galileo system, a global navigation satellite system, and EGNOS, a regional system designed to enhance the precision and integrity of existing satellite navigation systems within Europe.

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Funded by the European Union's research, development, and innovation programme, the project is implemented by a consortium led by EY Belgium and including GMV, CATEC, RP Legal & Tax, and MCI.