



Galileo Improved Services for Cadastral Augmentation Development On-field Validation



Co-funded by the Horizon 2020 programme of the European Union



European GNSS using High Accuracy Services

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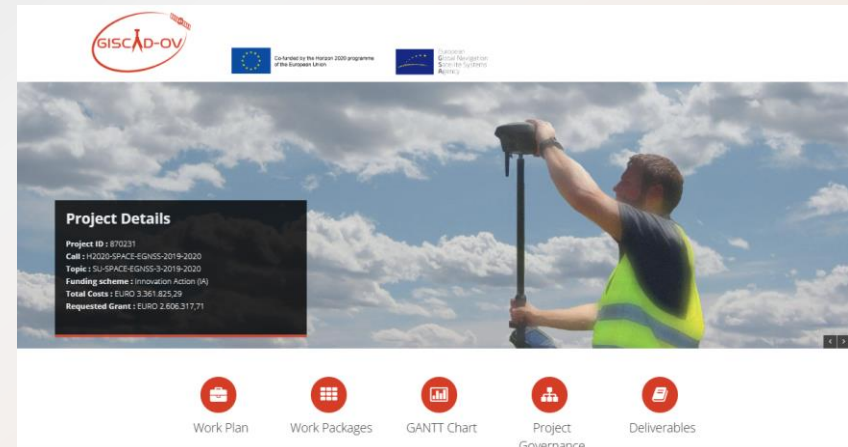
GISCAD-OV

Galileo Improved Services for Cadastral Augmentation Development On-field Validation

GISCAD-OV involves the whole value chain of the Cadastral domain. Its main scope is to design, develop and validate an innovative and cost-effective high accuracy service for Cadastral Surveying applications, based on European GNSS Galileo signals.

<https://giscad-ov.eu/>

[https://www.gsc-europa.eu/sites/default/files/site_s/all/files/Galileo HAS Info Note.pdf](https://www.gsc-europa.eu/sites/default/files/site_s/all/files/Galileo_HAS_Info_Note.pdf)



The screenshot shows the project details page for GISCAD-OV. At the top, there are logos for GISCAD-OV, the European Union, and the European Union Agency for the Space Programme. Below the logos is a large image of a surveyor in a high-visibility vest using a surveying instrument. A dark box on the left contains the following text:

Project Details
Project ID : 870231
Call : H2020-SPACE-ENGSS-2019-2020
Topic : SU-SPACE-ENGSS-9-2019-2020
Funding scheme : Innovation Action (IA)
Total Costs : EURO 3.361.825,29
Requested Grant : EURO 2.606.317,71

Below the image are five navigation buttons: Work Plan, Work Packages, Gantt Chart, Project Governance, and Deliverables.



The screenshot shows the H2020 Project GISCAD-OV description. It features a background image of a satellite in space. The text reads:

H2020 Project GISCAD-OV
Galileo Improved Services for Cadastral Augmentation Development On-field Validation

GISCAD-OV involves the whole value chain of the Cadastral domain. Its main scope is to design, develop and validate an innovative and cost-effective High Accuracy Service (HAS) for Cadastral Surveying applications, based on GPS+Galileo E6 HAS and Precise Point Positioning-Ambiguity Resolution (PPP-AR) quick convergence techniques.

There is a "READ MORE" button at the bottom.

PROJECT ID-CARD

- **Duration: 42 months (Dec 2019 – May 2023) – Budget: 3,23 MEUR**
- **CLGE part of the budget (9,1%) : 293 535.00 EUR – Reimbursement rate 100%**

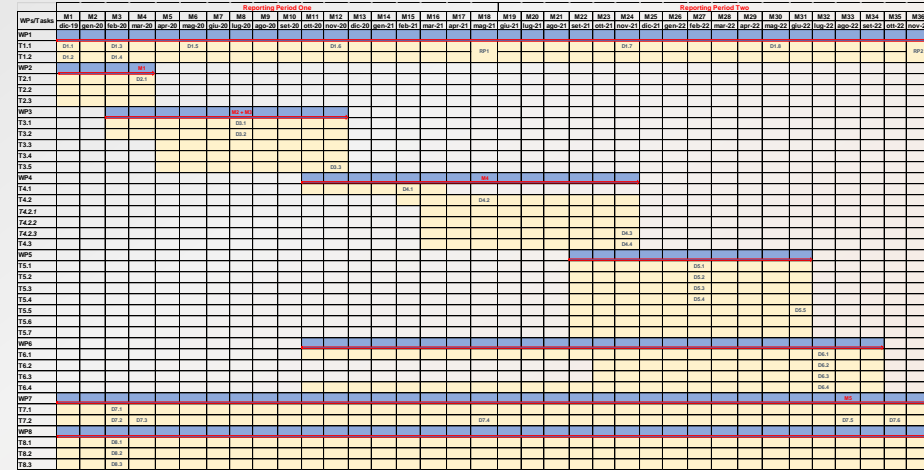
Personnel costs: 195,860 EUR – Other costs (travels): 42,854 EUR – Indirect costs: 59,678 EUR

- **GEOWEB SPA (IT) acting as Project Coordinator together with 13 partners from 3 categories:**

1. Service Providers: TERIA (FR), GEOFLEX (FR), SOGEI (IT), GEO++ (DE), NOVATEL (CA), TELESPAZIO (IT)
2. Prof. Associations of Surveyors: CLGE
3. Academic and research institutes: VUGTK (CZ), UNIPD (IT), York University (CA), Delft University of Technology (NL), Roma Tre University (IT)



Time line of GISCAD-OV project



Dec 2019 – Sept 2021

- Definition of GISCAD-OV Solution’s User Requirements

Sept 2021 – Dec 2022

- System and Service Architecture Development
- Test & Acceptance plan
- Cadastral Pilot Projects Execution (7 EU countries), incl. Infrastructural Monitoring & 3D Surveying Demonstrator

May 2022 – May 2023

- Services Validation
- Survey Results Analysis & Validation
- GNSS Performance Analysis
- Infrastructure Monitoring Validation
- Overall Validation



WP5 T5.4: Cadastral Surveyors and Professionals Validation

Outcomes and Main conclusions

Validation reports received from all countries

GISCAD-OV PPP-RTK meets regulated requirements in most of the Countries and allows a quick convergence for Cadastral Survey operations.

GISCAD-OV Galileo HAS Service Level 1 did not meet the required accuracy.

The significant impact of multipath and shadowing on the Galileo HAS performances has been recognized.

Galileo HAS with Service level 2 it is considered useful only for surveys in remote areas and in the absence of communication link.



WP6 T6.3 Operative procedure

Main conclusions

Cadastral Operational Procedures are minimally affected by the introduction of the GISCAD-OV solution.

A GISCAD-OV Result Adapter, able to transform NMEA GGA and GBS (or proprietary format) sentences to Cadastral Point survey output to be inserted into the Cadastral Elaborate

Whatever the technical solution used (PPP-RTK or Galileo HAS), the tasks to be implemented by the surveyor on the field require only adequate tools, operations only need minor changes

In the same concept, with the introduction of these two surveying methods, only few updates have to be made on the current regulations (for ex. Regulation update are required only in CZ IT and EE where surveying methods are strictly defined).





EUROPEAN GNSS (GALILEO) SERVICES
HIGH ACCURACY SERVICE (HAS)
 QUARTERLY PERFORMANCE REPORT
 APRIL – JUNE 2023



HAS, the free and global sub-foot positioning service of the Galileo constellation, is already being tested by GNSS manufacturers. Shown here, an Eos Arrow Gold and field mapping application. Source: Eos

HAS Potential

BY GAVIN SCHRACK

Free and Global: The new high accuracy positioning service (HAS) of the Galileo constellation and its advantages for GIS and asset mapping

If you consider field mapping applications, such as for GIS, asset inventory and management, and field operations for utilities, how wonderful would it be to have sub-foot positioning in real time, with no base needed, no network, and no subscription? And globally, anywhere, any time?

A new high accuracy service (HAS) of the European Galileo constellation shows promise for checking all of those boxes, and early testing shows that it could already be ready for adoption by quite a few industries. If you are looking for survey-grade accuracy, perhaps HAS is not for you. However, HAS could significantly disrupt mapping-grade markets and bring a boost in productivity for many applications. We hear the term "game changer" all too often, but this could be one.

Please keep in mind, as you read below about some early testing, that HAS is in an initial, call it "Beta" phase. In subsequent phases, that could come as early as 2024, performance should greatly improve, particularly in convergence times.

How HAS works is that essential clock, orbit, and bias model "messages" for precise point positioning (PPP) are delivered via the same GNSS satellites that provide the observation data used in determining position. While this is not a new concept—there are three such services delivered by the Japanese QZSS constellation (observable over Japan, south Asia, and Australasia)—there are aspects of HAS that position it as a first-of-its-kind among global positioning services.

There are regional satellite-based-augmentation-systems

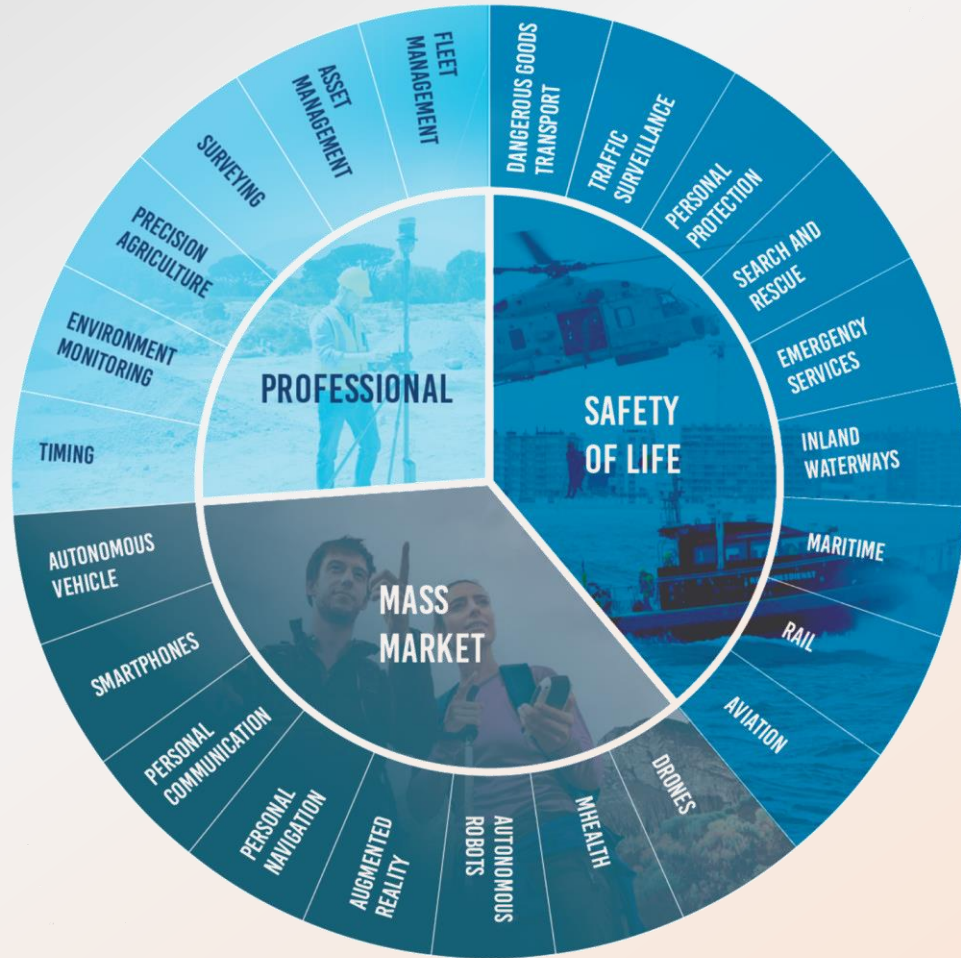
NEW oportunities

What new applications could result from GISCAD-OV solution, for the benefit of final users as for the European customers and citizens?



Outcomes

What new applications could result from GISCAD-OV solution, for the benefit of final users as for the European customers and citizens?





AGRICULTURE

- Guidance
- VRA-Low applications
- Farm machinery positioning
- Site-specific data analysis applications



RAIL

- Cold Movement Detection
- Odometer Calibration
- Door Control Supervision
- Infrastructure surveying
- Gauging surveys
- Structural monitoring



GEOMATICS

- GIS/Mapping
- Cadastre in rural areas (Land consolidation)
- Hydrographic survey
- Offshore exploration



CONSUMER SOLUTIONS

- LBS
- Gaming
- Health
- AR for leisure
- Geo marketing and advertising
- AR Professional
- Robotics- High GNSS use



ROAD

- Autonomous driving
- Safety-critical applications



AVIATION/DRONES

- Drones: Positioning System (Urban)
- Drones: Navigation System (Urban)
- Drones: Geo-awareness System
- Airport – integrated surface management systems



MARITIME

- Port operations
- Port bathymetry
- Riverbed survey
- Coastal Seabed survey
- Offshore supply vessels with dynamic positioning
- Autonomous Surface Vessels



SPACE

- Precise Orbit Determination
- Attitude Determination
- Civilian Launchers



Markets Applications



GEOMATICS

Geomatics is the segment with the most stringent accuracy requirements, but for certain applications dm-level is sufficient:

- GIS/MAPPING
- CADASTRE IN RURAL AREAS (LAND CONSOLIDATION)
- HYDROGRAPHIC SURVEY
- OFFSHORE EXPLORATION

The performance offered by the HAS through E6b is expected to give a new boost to GIS applications, further supporting the creation of new services thanks to free access to high accuracy, from lane marking to utilities and points of interest connected to extended reality applications.



AVIATION

GNSS's role is becoming more and more prominent, since automated drone functions are becoming increasingly accessible and a HAS service with 20cm positioning accuracy can be relevant for the applications below. New airport surface management systems will also benefit from increased accuracy:

- DRONES: POSITIONING SYSTEM (URBAN)
- DRONES: NAVIGATION SYSTEM (URBAN)
- DRONES: GEO-AWARENESS SYSTEM
- AIRPORT – INTEGRATED SURFACE MANAGEMENT SYSTEMS

Specialised functions such as “return to home” or flight planning are now available even in budget models, and for new emerging applications such as parcel delivery using drones with beyond line-of-sight, etc. the accuracy provided by HAS is desirable.





CONSUMER SOLUTIONS

The addition of free high-accuracy positioning with dm-level precision can benefit the following applications in consumer solutions:

- LBS
- GAMING
- HEALTH
- AR FOR LEISURE
- COMMERCIAL (GEO-MARKETING AND ADVERTISING)
- AR PROFESSIONAL
- ROBOTICS - HIGH GNSS USE

For smartphones, HAS may enable a wealth of new apps, such as augmented reality. Robotics is widely reported to be one of the fastest growing market sectors, driven by the developing capability of robots to navigate complex environments thanks to local sensors such as LIDAR that are critical to understanding the robot's immediate surrounding but also, with the inclusion of GNSS sensors, necessary for open environment navigation.



AGRICULTURE

There is a wide range of precision farming applications for certain type of crops that can benefit from dm-level accuracy such as:

- GUIDANCE
- VRA-LOW APPLICATIONS
- FARM MACHINERY POSITIONING
- SITE-SPECIFIC DATA ANALYSIS APPLICATIONS

These applications can be used for farming activities such as soil condition monitoring, cultivation, spraying, seeding and fertilising, etc. Also, HAS can be relevant for Common Agricultural Policy (CAP) applications, e.g. a geo-tagged photo app with 9 million EU farmers as potential users.



OUR benefits

- Experience acquired through our participation in a European H2020 project
- Test our ability to use our members' capabilities in a Europe-wide campaign
- Participation in a consortium of high-level participants
- Thanks to all those who participated in and supported the project (institutional partners, project committee, surveyors in test countries, members).

The Galileo Open Service (OS), the Galileo High Accuracy Service (HAS) and the Enhanced Search and Rescue (SAR) Service Performance Reports for Q2 2023 are available at the GSC Electronic Library.



#EUSpace 

The Reports for Q2 2023 are available on our website in the [Performance Reports](#) section, providing the status of the Galileo constellation and the achieved performance.