News

No. 88

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Galileo PRS service as an essential element of resilient PNT

INTERVIEW
Lieutenant Colonel Conrado Ávila Alexandre
Sub-Directorate General of Programs at the DGAM
Spanish Ministry of Defense

Resilient Assured **PNT**

Sensors

- GNSS
- LEO PNT
- Satellite signals of opportunity
- Terrestrial systems
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Services

- Time and frequency distribution
- Satellites based augmentation (SABAS, PPP)
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Letter from the president

In 2023, GMV celebrated successes that will prove strategic for the future of our company. We increased our revenues by more than 15% compared to the year before and significantly expanded our project portfolio, which will help us grow in the years to come. Our new projects include a contract awarded in mid-2023 to develop the ground control segment for the Galileo Second Generation satellites to be launched starting in 2025. This contract is in addition to our work for the Galileo First Generation satellites, for which GMV has been leading the development and maintenance of the ground segment since 2018, providing services for the 28 satellites currently in orbit. This new contract is a testament to the excellent work carried out by the consortium coordinated by GMV. The successful execution of large, complex contracts such as this one reinforces GMV's position as a leader in satellite navigation systems and one of the prime contractors in the European space industry.

Projects of this magnitude require smooth and proactive cooperation between all stakeholders. Cooperation is strong not only between GMV´s several contributing business units, but also with our partners in the European space industry. Success would not be possible without the mutual trust, commitment, and close and effective cooperation we have developed with our partners. By working together focused on our common goals, we are achieving outstanding results for the benefit of our customers. We count on our partners and associates as a fundamental part of our future success and look forward to all that we can accomplish together.

Mónica Martínez

No. 88

Published
GMV

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Magazine No. 88. Fourth Quarter of 2023

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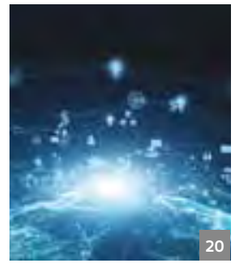
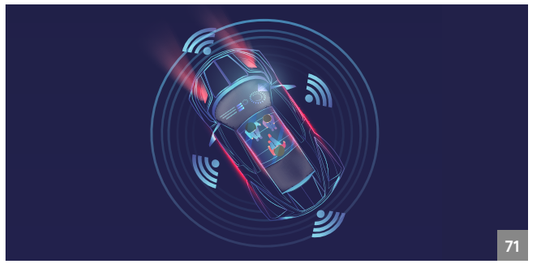




Galileo PRS service as an essential element of resilient PNT

In today's world, services and infrastructure in many economic sectors depend on position, navigation, and timing (PNT) services. This is the case of passenger and freight transportation traffic management, for example, and timing information in particular is crucial for communications, energy, and financial services. According to the European Commission, 7% of the European economy currently depends on navigation satellite signals, and Europe's GDP would drop at least 1% if they were to be unavailable for one week. The situation is even more critical in the case of military and security services, which need access to PNT even under the most adverse circumstances.

With the widespread use of services that depend on PNT information, there is greater awareness of "resilient PNT," or the need for accurate and reliable PNT to be available at all times, including in extremely challenging situations. Global navigation satellite system (GNSS) receivers are the foundation of PNT due to their ease of use and universality. In terms of resilient PNT, the most resilient GNSS services are the Public Regulated Service (PRS) in the European Galileo system and the Precise Positioning Service (PPS) in the American GPS system. And for the most adverse situations, resilient PNT means that they must be complemented by other signals and sensors, with the goal of maintaining PNT even if the GNSS signal is denied.

This article will explain the current conception of resilient PNT, the role of Galileo's PRS services, and GMV's work in this field.

Resilient PNT

Resilient PNT solutions must protect PNT service against all kinds of threats to the GNSS signal, whether unintentional (such as the local environment hindering the reception of the GNSS signals, or interference from other radio frequency sources or space weather) or intentional (such as jamming, spoofing, or other kinds of cyberattacks, all of them of great concern in the defense and security fields).

Some of the solutions that have been suggested or developed for the implementation of resilient PNT include:

- Technology to increase the availability of GNSS or radio frequency signals available under nominal or degraded GNSS signal reception conditions, such as:
  - Highly resilient GNSS services limited to authorized users such as Galileo PRS or GPS PPS, or spoofing detection technologies with authenticated GNSS services, such as Galileo OSNMA (Open Service Navigation Message Authentication), with more basic performances but openly available to any user.
  - Jamming mitigation technologies at GNSS frequencies, typically GPS and Galileo, through the use of CRPAs (Controlled Radiation Pattern Antennas).
  - Positioning and timing synchronization systems based on alternative radio frequency signals or complementing GNSS, such as eLoran, AIS, TACAN, DME, VOR, or new solutions such as R-Mode.
  -
- Alternatives to maintain operability in the event of degraded or denied signals:
  - Use for positioning and timing of communication networks, such as 5G, LTE, and Wi-Fi, and, generically, the use of signals of opportunity (SoOP), even broadcast from communications satellites.
  - Use of inertial, optical, magnetic, acoustic, and even quantum sensors.
  - Use of high-precision or atomic clocks.
- And to analyze for “situation awareness” the operational status of PNT service and the potential presence of threats, proposals have included the use of spectrum monitoring systems, machine learning, artificial intelligence, or blockchain.

The first goal in using these techniques is, the detection and mitigation or recover from interferences. And ultimately to maintain available the PNT service if any GNSS signals, including those supplied by Galileo's PRS service, have been denied. For timing synchronisation services, high-precision or atomic clocks are used. These clocks are able to autonomously provide timing references with low accuracy degradation, even in intervals of days, from the moment the GNSS signal is denied.

Given the wide range of possible operational scenarios in the military case and of crisis situations in civilian contexts, standards, protocols, and regulations to guarantee the quality and security of PNT are being developed at the international level. Their objective is the categorization of the use cases based on threats, as well as the potential combinations of the different technologies within an optimum balance of performances and cost.

GNSS as a key element in resilient PNT

Global navigation satellite system (GNSS) receivers are the foundation of PNT solutions. Their advantages are unquestionable,they can be used in any geographic location, and under normal satellites signal reception conditions they allow the user's position and time to be determined with high accuracy.. The different GNSS systems, such as Galileo in Europe, provide various services in multiple bands of the radio spectrum and openly to all users. But these signals are vulnerable to so called “jamming” attacks: interference in the bands in which GNSS operates, which degrades the receivers’ PNT performance, even leading to a denial of service when the interference power is sufficiently high. An even more serious vulnerability is “spoofing,” when an intentional cyberattack creates false signals that supplant the real satellite signals, leading GNSS receivers to provide erroneous PNT solutions. As a protection technique, a GNSS receiver can simultaneously use several bands and several constellations to mitigate the effects of jamming and spoofing as long as some signals are not affected. This strategy would not work in case the attacker consistently jammed and spoofed across all GNSS systems and bands.

Greater levels of protection can be achieved when the receiver integrates GNSS with other sensors that don't depend on radio frequency signals. These sensors can either validate the GNSS solution or generate positioning solutions autonomously with inertial systems or timing solutions with atomic clocks. However, this hybridization is complex in particular when GNSS is operating under undetected degraded conditions. In this case the performance obtained through the alternative sensors may get degraded beyond the requirements for accuracy and stability. That’s why GNSS systems incorporate services specifically designed to provide superior resistance to jamming and spoofing, which are the foundation for resilient PNT solutions to be used in the defense field and for critical services and infrastructures.

The PRS service in Galileo

The European global navigation satellite system, Galileo, incorporates the Public Regulated Service (PRS) as a service with greater resilience. PRS transmits its signals over the E1 and E6 bands of the L-band, with a robust modulation design and with encryption of the signals and the data they contain.

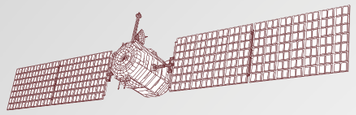
According to Decision 1104/2011/EU of the European Parliament and Council, access to PRS is restricted to the EU Member States of the European Union, the Council, the European Commission, the European External Action Service (EEAS), and several European Union agencies. The Decision also allows for the possibility of third countries and international organizations granting access to PRS through specific agreements.

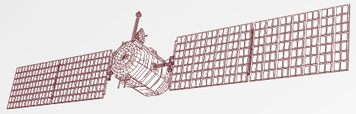
Within the European Union, these regulations grant each Member State sovereignty when it comes to authorizing users to access PRS. PRS is meant for users such as defense, security forces, emergency services or critical infrastructures. In order to exercise this sovereignty, the regulations require any EU Member State that want to use PRS to designate a Competent PRS Authority (CPA), which is in charge of managing users of the service and monitoring the PRS receiver fleet, as well as the industrial activities linked to the development and deployment of the service. Spain has designed a CPA since 2012, and the National Institute for Aerospace Technology (INTA) is currently performing this role.

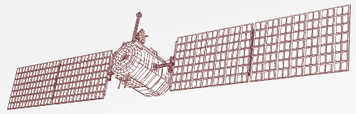
The minimum requirements that must be met within Europe in order to access the service are defined in the Common Minimum Standards (CMS), with the agreement of all the EU Member States.

PRS guarantees high availability and continuity of signals, even under interference conditions. Its encryption ensures the integrity and authentication of the received signals, making PRS immune to spoofing. The role of PRS in resilient PNT is to provide a source of reliable and robust PNT, which fullycomplement or replace the open signals of GNSS systems when they are degraded denied.

Galileo system is currently providing the Initial Services (IS) of PRS, which allows the EU Member States to complete the first generation of user receivers and PRS-based applications and to test the operation of PRS







services. The Galileo plan is to declare the PRS Initial Operational Capability (IOC) in the near future.

PRS National Program in Spain

The Spanish armed forces use a wide range of systems and platforms including PNT. The specification of PNT solutions is the responsibility of the procurement programs managed by the Ministry of Defense. Nowadays, for the most critical cases, the military GPS PSS (Precise Positioning Service) system is used, integrating complementary sensors.

In recent years, both Spain's CPA and the Directorate General of Weapons and Material (DGAM) in the Spanish Ministry of Defence (MOD) have been supporting the Spanish industry's efforts in the last years to develop PRS receivers and solutions, with 100% domestic technology.

The DGAM's familiarity with PRS, together with its knowledge of the operational requirements for using PNT, as well as the resilient PNT doctrine that is being consolidated within NATO, have allowed to the Spanish MoD to define a strategy for the capabilities to be developed in PRS and resilient PNT and how to implement them in current and future programs for the procurement of weapons systems. These needs are reflected in a General Staff Requirements (REM) document, which allows the Spanish MoD to define a strategy for budget allocation and to create a program office for implementation. With the goal of supporting the REM, on October 3, 2023, the Spanish government's Council of Ministers approved a spending limit of €772.4 million until 2032 for the implementation of resilient PNT in the Spanish Armed Forces integrating Galileo's PRS service.

GMV activities in the fields of resilient PNT and PRS

Since its early dates, GMV has played a major role in satellite navigation, as a key player in the main European Union navigation programs and initiatives, and the company is currently a national leader in navigation solutions in the defense area. GMV started to work on PRS in 2013. After a first development aimed at acquiring PRS technological background, GMV has developed a first generation of commercial operational PRS receivers named PRESENCE2, and is currently working on the development of a new generation of more compact receivers in the framework of the GEODE project within the European EDIDP programme. GEODE is complemented currently by two Spanish projects through the DGAM for the development of various PRS-based solutions for the Armed Forces.

In carrying out this work, GMV has partners such as Cipherbit for the joint development of the PRS security module of the receivers and the secondary PRS channel, and Indra as the developer of Controlled Radiation Pattern Antennas (CRPAs) for reception of PRS signals.

PRS technology can be deployed in a wide range of solutions with different distributions in the PNT system of the receiver functions, not just self-contained receivers that integrate all the necessary functions. For Spain's CPA, GMV has developed a PRS support infrastructure that includes a "secondary channel," for managing PRS receivers through a national sovereign communications channel. Another solution developed by GMV is called "server-based PRS," and allows the satellite signal received at user terminals to be processed in PRS mode within centralized servers.

The technology developed by GMV, together with the Spanish industry players involved in PRS, allows us to use in-house technology, with maximum guarantees and minimum risks, to support the Ministry of Defense's programs for the implementation of resilient PNT by integrating Galileo PRS in the Spanish Armed Forces' current and future military navigation systems.

In addition to PRS receivers and solution architecture, GMV is participating in the development of the infrastructure for Galileo's ground segment in charge of service provision, the Galileo Security Monitoring Centre, or GSMC, and POCP, which is the interface with the authorities in charge of PRS operations in the EU Member States. GMV has also operationally deployed GNSS signal spectrum monitoring solutions, including the PRS band, to assess the GNSS service operational status. In this field, for several years GMV's Romanian subsidiary has also been participating in various studies and field tests in the Black Sea on the effects of jamming and spoofing on maritime navigation, from before the crisis caused by the war in Ukraine to the present day. As part of the RIPTIDE2 project with the European Space Agency (ESA), the Romanian subsidiary of GMV is currently studying possible resilient PNT solutions combining GNSS with multiple sensors.

Beyond this work on the deployment of the current Galileo system's PRS, GMV is working with the ESA, with the participation of diverse European GMV subsidiaries, on defining the user segment of future evolutions of Galileo as part of the Galileo Second Generation (G2G) program. GMV is the prime contractor of G2TURP, which is working on the development of the receiver prototype in the PRS evolution for G2G; G2TURN, the test receiver for non-PRS signals in G2G; and, lead from the GMV's Portuguese subsidiary as Prime contractor,G2RFCS, the Galileo signal simulator, which covers all Galileo services with open signals and PRS signals from the current generation and second generation of Galileo. As for using signals that offer an alternative to GNSS, GMV has also developed, in activities in Spain and in the United Kingdom, several concept studies and prototypes for the use for PNT of signals from communications satellites (in «signals of opportunity» or SoOP mode).

In the defense sector, since 2009 GMV has been developing several GNSS-based navigation systems and timing servers for the Armed Forces, combining data from multiple receivers and sensors, such as Galileo PRS and GPS PPS (P(Y)-code and now M-code), with a wide range of sensors. PRS capabilities have also been demonstrated on receivers supplied by GMV to the CPA and DGAM for various pilot projects. Our technology is alreadyincorporated into navigation systems deployed on air, land, and naval platforms.

A leading example of resilient navigation designed by GMV for the naval field is the SENDA system, designed for the new generation of Spanish frigates, F-110, which integrates both, Galileo PRS and GPS PPS technologies, with sliders and inertial sensors, plus an anti-jamming CPRA. GMV is working on adapting and expanding this technology to other Spanish Navy vessels.

In terms of ground operations, GMV's ISNAV navigation system hybridizes multi-constellation GNSS data with inertial data and odometers, and has also the capability to integrate a PRS receiver. ISNAV has been deployed on the 8x8 Dragón vehicle, the M-109 vehicle, and the Integrated Field Artillery System (SIAC). GMV is working on adapting and expanding this technology to other Spanish Army vehicles.

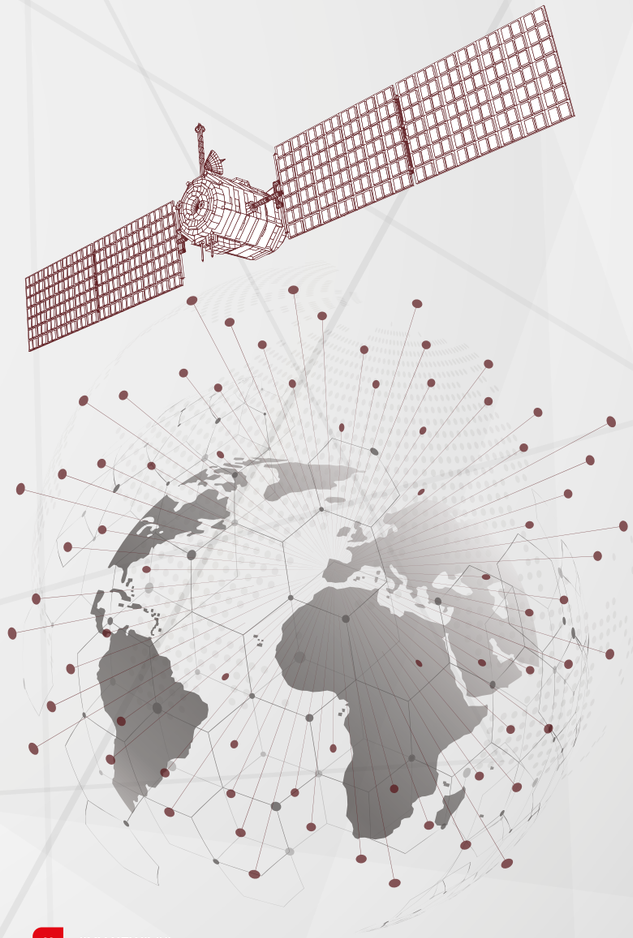
As for air operations, the RPAS ATLANTE's navigation system has been another leading solution, as it is nowadays the navigation system currently in development for the SIRTAP tactical UAS. In both cases, GNSS data are combined with inertial data, air data, and other sensors. And in the case of SIRTAP, an anti-jamming CRPA has been incorporated for the reception of the GNSS signals. In missile defense, GMV is participating in HYDEF, a European Union project of great strategic interest.

The integration of the processing of the PRS signal in navigation solutions developed by GMV and already deployed, or in others that are under development, is one of GMV's main proposals for facilitating the incorporation of the capabilities of this technology into the most relevant Spanish Armed Forces' platforms.

Spain has made a commitment to be a flagship country in the adoption of PRS solutions as a key component in the implementation of navigation and time synchronization systems under a state-of-the-art vision of the robust PNT concept.

GMV, and the Spanish industry as a whole, have the proprietary technology needed to provide the PRS solutions that will be demanded within the framework of the resilient PNT implementation program in the Spanish Armed Forces integrating Galileo PRS.

GMV is developing the PRS technology and its future evolutions with a European vision and we are in a position to export the solutions internationally.



Lieutenant Colonel
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Multi-Domain Systems Headquarters
Sub-Directorate General of Programs at the Spanish Directorate General of Weapons and Material (DGAM). Spanish Ministry of Defense

Lieutenant Colonel Ávila Alexandre joined the General Military Academy in 1989. Following several years at the Army's Academy of Engineers, in 1994 he was appointed lieutenant in the General Army Corps, in the Engineer Corps.

During his various posts, he has been assigned to different Spanish Army units, as well as the Directorate General of the Spanish Civil Guard, and is currently at the Directorate General of Weapons and Material, where he was the head of the Command, Control, and Communications Systems Modernization Program (MC3) and the head of the Military Emergencies Unit Communication and Information System (CIS UME) Program until 2021.

He is now in charge of the Galileo Public regulated Service (PRS) Resilient Positioning, Navigation and Timing Systems Program, at the Multi-Domain Systems Headquarters, and participates in several working groups at the European Commission, NATO, European Defence Agency, and the European Union Agency for the Space Programme.

He has completed the National Center for Defense Studies' course on High-Level Financial Resource Management, among other courses, and holds a master's degree in Defense Systems Acquisitions Management from the University of Zaragoza.

Could you tell us about the critical importance of having reliable positioning, navigation, and timing information in the military and in law enforcement agencies? How does this need apply to strategic services and infrastructure for society in general?
As we've been able to see in current armed conflicts, such as the war in Ukraine, military forces' heavy dependence on reliable positioning, navigation, and timing (what we call PNT) information is a critical vulnerability. If such information isn't available, this doesn't just restrict navigation capabilities; it also has the potential to affect other key capabilities, such as intelligence gathering, precise system synchronization, and distributed military communications networks or precision-guided weapons systems.

This criticality also applies to law enforcement agencies that need accurate PNT to use their surveillance systems for border control, fighting drug trafficking, and managing public safety incidents.

We can also see the importance of PNT systems for society in general. Today, we all use the navigators on our cell phones when we're driving or walking, and they've become an essential tool for getting around and avoiding traffic jams. Without this information, I think the impact of traffic jams would currently be much worse. That's why the transportation sector, covering sea, land, and air transportation, is one of the most highly dependent sectors when it comes to this kind of technology, and in the future, with the use of autonomous vehicles, it will become even more important.

In other critical sectors, a lack of reliable PNT information has a major impact on society. For example, cell phone stations use PNT information to route calls, and reliable timestamps are key to monitoring transactions and detecting fraud at ATMs and stock exchanges. Not to mention power grids that use ultra-precise timing to provide energy to areas with high electric demand at just the right time to avoid blackouts without causing dangerous power surges.

When it comes to the equipment and systems that guarantee the continuous availability of reliable positioning, navigation, and timing information, what kinds of threats do they have to be prepared to counter?
Assuming that the main source of PNT used is based on GNSS satellite navigation systems, such as GPS or Galileo, the main threats we're facing have to do with interference and spoofing.

Interference may be due to natural causes, such as weather phenomena, or the intentional emission of radio frequency signals similar to space signals coming from satellites, which is known as "jamming." In both cases, the impact is the same: the GNSS receiver is unable to extract GNSS signal information from the background noise.

If interference is extremely brief, the impact on navigation systems is low, since such systems tend to have backups. But for other applications that need precise timing, such as communications, arms systems, and banking transactions, it poses a major threat.

One example is in the war in Ukraine, where there is high-intensity GPS interference, and more recently in the area of Lebanon and Israel.

Meanwhile, "spoofing" refers to sending false signals with the intent of tricking a GNSS receiver into accepting them as genuine. From a technical point of view, the spoofing of GNSS receivers is trickier than jamming, and the consequences are much more serious, because the receiver uses the manipulated signals for PNT calculations. Neither the system nor the operator realize that the PNT data have been damaged. Spoofing can relocate the receiver, which isn't possible with jamming.

The effects of position spoofing are well known in the Automatic Identification System (AIS) for ships and have led to several accidents between vessels in the English Channel, one of the busiest shipping lanes in the world.

In addition to the threats already mentioned, there is another modality, known as "meaconing," which consists of intercepting GNSS signals and then rebroadcasting them at the same frequency but with higher power, leading to inaccurate PNT. If not detected, meaconing makes it possible to disrupt even encrypted GNSS systems.

Could you describe the concept of "resilient PNT" to withstand and recover from these threats?
Resilient PNT consists of equipping systems that provide PNT with a certain level of resilience, mainly against the aforementioned threats of jamming, spoofing, and meaconing, to ensure that they will be available or can be recovered in the event of a temporary degradation or denial of the GNSS signals.

To counter jamming, radio frequency signals must be protected using smart antennas that can detect intentional interference, cancel it out, and adapt to only pick up the correct signals. These antennas are known as Controlled

> Current armed conflicts, such as the war in Ukraine, demonstrate the importance of military forces having accurate and reliable positioning, navigation, and timing information

Reception Pattern Antennas, or CRPAs. Another protection strategy is to use multi-frequency GNSS, which forces jammers to use more complex and costly equipment.

For spoofing, we have to use authentication and encryption techniques to prevent access to, and manipulation of, the information used in PNT calculations.

As for meaconing, we have to use detection algorithms, also used to detect spoofing and jamming, which help tease out the false signals by calculating the angle and power of arrival, or by correlating this information with information from other PNT sources.

For our PNT to be resilient, we have to combine all these techniques and also have additional sources of PNT, such as inertial navigation systems.

Resilient PNT capabilities are critical for the continuity of ground, sea, and air military operations under limited or denied GNSS conditions.

What's the role of satellite navigation systems in solutions providing resilient PNT? What are the characteristics of the Galileo system's PRS service compared to other GNSS systems that make it a key component of resilient PNT solutions?

Satellite navigation systems are the systems most frequently used in obtaining PNT information, as they are highly precise and offer global coverage. But they are also the most vulnerable to threats such as spoofing and jamming. This is why resilient PNT solutions must be protected against such threats.

In Galileo, the PRS service, thanks to its modulation, multi-frequency, and signal encryption features, is more resilient than other GNSS services that don't have this added security and availability, such as the open services offered by Galileo, GPS in the United States, GLONASS in Russia, and BeiDou in China.

GPS also has an encrypted GNSS service, the Precise Positioning Service (PPS), which is currently evolving to the new service known as GPS M-Code. Although it's currently being used by the Spanish Armed Forces and NATO, it's under the control of the US Department of Defense, meaning that its availability is not guaranteed. That's why Galileo PRS, with European sovereignty, is a key component in resilient PNT solutions for the Spanish Armed Forces.

What other technologies may be needed in solutions providing resilient PNT?

Although Galileo PRS is encrypted, and therefore protected against spoofing, it has to be complemented with other technologies to guarantee the availability and reliability of PNT.

In terms of GNSS, together with Galileo PRS, the use of CPRAs and other GNSS systems such as GPS M-Code increases resilience against threats such as jamming and meaconing.

And in situations where GNSS is temporarily unavailable, other sources of PNT, such as inertial navigation systems, are needed in order to guarantee positioning and navigation.

For applications that require precise timestamps, if Galileo PRS is unavailable, high-precision local oscillators (rubidium, Passive Hydrogen Maser—PHM) can be used to cover the PRS signal receivers' time signal interruptions. Another option is to use "white rabbit" solutions on dedicated fiber optics, making it possible to distribute the time signal with precision in the nanosecond range.

What's the current status of PRS adoption in Europe and NATO? And what's the current consensus in terms of the doctrine and interoperability of resilient PNT solutions?

Several European countries, including Spain, have the capability to manufacture PRS receivers, thanks to the institutional R&D+i support of the respective defense ministries. So, we can say that we're prepared to use PRS.

There's currently no national or European doctrine on using PRS, and so it'll have to be developed. Since Galileo PRS has features for military use, I think it will be used much in the way NATO has come to use military GPS.

In this regard, there are several initiatives underway in Europe to promote PRS. One example is the Permanent Structured Cooperation's European Radionavigation Solution (EURAS) project, with the participation of Spain and several other European countries, which seeks to use Galileo PRS to promote the development of the EU's military PNT capabilities and future cooperation.

Another EU initiative that seeks to contribute to the interoperability of PRS is the Galileo for EU Defence (GEODE) project, co-funded by the European Defence Industrial Development Programme and the defense ministries of the participating countries (Spain, France, Germany, Italy, and Belgium), which seeks to develop and standardize PRS receivers for military use. In Spain, the business consortium made up of GMV, Indra, and TECNOBIT (now CIPHERBIT) is developing a naval PRS receiver with a PRS security module, and an electronic shaped-beam antenna to mitigate jamming.

In your opinion, where does Spanish industry stand compared to the rest of European industry in terms of its ability to meet the challenge of providing PRS and resilient PNT solutions with technological sovereignty and strategic autonomy?

Since 2015, the Spanish Ministry of Defense has supported Spain's development of PRS capabilities through several R&D+i pilot projects, culminating in the establishment of the Galileo PRS Resilient Positioning, Navigation, and Timing Systems Program.

Since there are currently no PRS-capable receivers on the market, in 2020 the Ministry of Defense authorized the development of Galileo PRS receiver capabilities with the goal of guaranteeing the continuity of the progress achieved to date by Spanish industry, thus achieving domestic capacity to design and manufacture GPS-compatible Galileo PRS receivers for military applications in the air, land, and naval domains, all in accordance with European Union standards.

The Program seeks to develop prototypes of domestically manufactured PRS receivers, making it possible to obtain resilient PNT services, with national remote management capability through the implementation of a secure communications channel connected to the Spanish Competent PRS Authority (ES-CPA) and the implementation of Galileo's High Accuracy Service (HAS), which provides decimeter accuracy.

Thanks to this institutional support, our industry is prepared to provide the national resilient PNT and PRS solutions our Armed Forces are calling for.

Satellite navigation systems are the systems most frequently used in obtaining PNT information, as they are highly precise and offer global coverage

PASSARO project's closing session

On September 27, at the INEGI headquarters in Tagus Park, Lisbon, GMV participated in PASSARO project's closing session.

GMV was a crucial member of the consortium developing the PASSARO project - caPAbilities for innovative Structural and functional teSting of AeROstructures. This project, which started in 2016, aims to develop multifunctional materials (integrating noise insulation and high energy impact resistance) for composite aerostructures, inspection, testing, and simulation for virtual certification, as well as robotic production technologies for the cockpit developed by Airbus DS in the Clean Sky Program.

The project also addresses the development of automation processes and functional tests for maintenance in an Industry 4.0 approach, as well as ergonomics concepts of 'Design Thinking,' promoting pilot comfort and improvements in Human-Machine Interaction.

The consortium comprises 11 partners, including companies and R&D entities, in close Iberian collaboration and with Airbus DS. PASSARO has been selected as a 'Core Partner' of the Clean Sky 2 Program, a Public-Private Partnership for the Aeronautics sector of the European Horizon 2020 Framework Program.

This project, recognized by the National Innovation Agency as one of the five European projects with national leadership and the greatest impact on Horizon 2020, has stimulated and leveraged national technological competencies, projecting them into the European Aeronautical industrial sector.

João Cintra, Section Head of Homeland Security and Defense at GMV in Portugal, presented the GMV augmented reality platform. This platform signifies efficiency in replacing manual cockpit testing with Microsoft Hololens technology, enabling complete dematerialization of the process, and resulting in an exponential increase in effectiveness and efficiency.

José Neves, President of AED Cluster Portugal and Homeland Security and Defense Director at GMV in Portugal, was also present at this closing session.

GMV evolves AUGUR, the GPS RAIM prediction tool

Since 2020, GMV has been providing a web service called AUGUR on behalf of EUROCONTROL. This service provides GPS RAIM predictions, a measure of the integrity and reliability of GPS signals, allowing airspace users to check RAIM availability during their pre-flight planning.

A number of additional services are provided with AUGUR:

- NOTAM (Notice to Air Missions): publication of proposed NOTAMs about predicted RAIM unavailability. These notices are delivered via the European AIS Database (EAD) to the corresponding NOTAM office (NOF) of the airports that have subscribed to the service.
- Application Programming Interface (API): tool to request related business data such as current GPS status, available locations, or predicted outages. This allows users to develop their own tools and integrate them with AUGUR.
- Helpdesk: centralized support system ready to assist users with technical issues, doubts, or service subscriptions.

From December 2023, GMV will lead the evolution of the AUGUR tool, which will be delivered as the AUGUR extended service. This evolution will improve the quality of the service, offer better graphical capabilities, and allow better integration with peripheral tools and services. The implementation of these features will bring benefits to the end user. Enhanced graphical capabilities are critical to facilitate simpler decision-making and better support of event investigation, reducing response time during operational tasks. By including additional data layers, the tool will act as a common source of information for GNSS monitoring.

The launch of the AUGUR extended service is planned for May 2025. GMV will continue to provide the basic AUGUR service (i.e. the current capabilities) while designing, developing and validating it.

Key Eurodrone systems pass preliminary design review

The review establishes the baseline for subsequent in-depth design and implementation

Recently, GMV successfully passed the Preliminary Design Review (PDR) for the Ground Flight Control Computer (GFCC) and Time Distribution Server (TDS) to be used for the Eurodrone, the future European medium-altitude long-endurance remotely piloted aircraft system being developed in a program led by Airbus Defence and Space.

In both PDRs, the high-level design of the two pieces of equipment was reviewed and approved, establishing the baseline for subsequent detailed design and implementation phases. This baseline includes the mechanical and electrical configuration of the two systems, as well as the definition of their high-level functional features and preliminary internal architecture, based mainly on COTS (commercial off-the-shelf) elements compliant with widely used standards in the defense industry.

The detailed design, implementation, and certification of the two systems will conclude in 2028, when serial production is expected to begin. Both development processes pose a significant challenge, but are also a great opportunity for GMV to cement itself as a leading supplier of critical systems for unmanned aerial systems.

First GNSS interference detection tests at the CIAR

On 19 September, GMV organized and successfully completed GNSS interference tests from a payload onboard a drone.

These tests, which took place at the Rozas Airborne Research Center (CIAR) in Lugo province, were carried out as part of the GMV-led project, under a contract awarded for €1.6 million, to help the Galician government's Galician Innovation Agency develop a cybersecurity system that will make it possible to detect radio frequency interference around the Center.

The purpose of this system is to protect the satellite-based communication and positioning systems used by unmanned aerial vehicles (UAVs), so that they can be operated continuously in the area near the Rozas airport with the level of security required.

The CIAR is the testing infrastructure created under the Civil UAVs Initiative led by Galicia's regional government, with the purpose of advancing UAV technologies for civilian use. The rapid increase seen in the use of unmanned aerial vehicles (UAVs) has been creating significant challenges in the field of security. Given this pressing issue, the Civil UAVs Initiative was developed as a way to address the new challenges arising in relation to use of unmanned vehicles in the private and public sectors, such as the management of health and social emergencies, sustainable management of forest and marine resources, fire prevention and extinction, biodiversity observation and monitoring, and developing new forms of mobility.

Global navigation satellite systems (GNSS) are an essential element for operating UAVs, because they allow these aircraft to precisely determine their exact location throughout their entire flight. Since these GNSS services have become widely available, UAVs can now make use of advanced features such as autonomous flight.

The new cybersecurity system, which will be developed by GMV and Galician company CENTUM Research & Technology, will protect the CIAR against intentional or unintentional jamming or spoofing of the GNSS signals used by UAVs.

These kinds of tests had never before been carried out at the CIAR and, due to their complexity, the organizers had to coordinate with ENAIRE to publish two NOTAMs (Notice to Airmen) warning airspace users about the interference and the drone operations.

Second round of flights in the European Commission's SONORA project

From 20 to 22 November, the second round of flight tests in the SONORA (Support to Standardisation Actions for EGNOS and Galileo in the U-Space) program was carried out. SONORA is a European Commission project developed by a consortium led by VVA Brussels and which includes GMV, CATEC, MCI, and RP Legal & Tax.

Funded by the European Commission, the main goal of SONORA is to develop the future of the U-Space industry and unmanned aerial systems. U-Space covers all the services and procedures being developed to allow for a high number of orderly, smooth, and secure unmanned aircraft operations.

The European Commission has established a regulatory framework that will enable automated management of drone traffic in a way that is integrated with manned aircraft. Spain's Ministry of Transportation, Mobility and the Urban Agenda has established a National Action Plan for the Deployment of U-Space (PANDU) to comply with these EU regulations.

The SONORA project seeks to transform the industry by incorporating European Global Navigation Satellite System (EGNSS) services into its rules and regulations while encouraging the implementation of GNSS-based solutions in the U-Space environment.

Two series of flight tests are planned as part of SONORA, one in an open environment and one in an urban environment. The first took place in November 2022 at the ATLAS center (Tactical Center of the Air Traffic Laboratory for Advanced Unmanned Systems) in Jaén. The goal was to collect and analyze GNSS data, gathered by various pieces of equipment and technologies, to support the development and verification of standards and assess several new EGNSS services, such as Galileo HAS (High Accuracy Service) y OS NMA (Open Service – Navigation Message Authentication), in an obstacle-free environment.

The second round of flight tests for drones in the SONORA project took place between 20 and 22 November in Benidorm (Alicante province, Spain). Over the course of three days, participants analyzed the results of a study that was similar to the first set of tests, but took place in an urban environment, which is more challenging in terms of navigation, and included the use of GNSS receivers hybridized with other technologies, such as inertial measurement unit (IMU) technology, used to measure the acceleration and angular velocity of an object, allowing for in-depth motion analysis.

The tests will also help evaluate the performance of various GNSS equipment and system technologies (for example, GPS, Galileo, EGNOS, EGNOS's future DFMC, RTK-PPP, etc.) and enhance our understanding of unmanned air system operations in urban environments, through the emulation of Specific Category operations at the SAIL III risk level. This level is an index used to assess security risks in drone operations.

Initial design of Galileo Second Generation´s ground control system successfully completed

GMV has reached a significant milestone by successfully executing the first major phase of the Galileo Second Generation (G2) Initial Operational Capability (IOV) Ground Control System (GCS) project. This crucial step corresponds to the completion of the Design Key Point (DKP) of the GCS 4.0, following two months of intensive collaboration among various teams operating under the guidance of the European Space Agency (ESA).

This milestone demanded a meticulous coordination, featuring multiple collocations, workshops, and design key meetings. The culmination of these activities materialized in a board meeting convened at the European Space Research and Technology Centre (ESTEC) on November 16th. During this session, GMV's proposed design for the initial deployment of the Galileo Second Generation project underwent scrutiny and subsequent validation.

The upcoming deployment activities are poised to play a pivotal role in substantiating the validation of the G2G satellites. These activities are indispensable for evaluating the integration of novel technologies introduced by the Galileo Second Generation project. Additionally, the deployment will enable comprehensive testing of the newly incorporated security modules, thereby contributing to the fortification of security measures and the overall management of the next generation of Galileo Satellites.

GMV's success in reaching this milestone underscores the company's commitment to advancing space technology and its adeptness in navigating the intricacies of complex projects. The collaboration with ESA and the validation of the proposed design mark a significant step forward in the development of the Galileo Second Generation Ground Control System.

As GMV continues to make strides in the G2 IOV GCS project, this accomplishment solidifies its role as a key contributor to the evolution of satellite navigation technology and the ongoing enhancement of the Galileo system.

EGNOS-NEXT is making steady progress

After two years of intense work, the preliminary study stage of EGNOS-NEXT, a project awarded to GMV by the European Space Agency (ESA), has recently been completed.

EGNOS-NEXT, the next generation of EGNOS (European Geostationary Navigation Overlay Service), is expected to expand the portfolio of its system services, as well as the list of supported user communities, especially in terms of improved integrity for non-aviation users. With this goal in mind,

EGNOS-NEXT is expected to provide four main services in addition to those already available: HAS/RAMOS, which will provide high-precision corrections and range-level integrity parameters; Timing Integrity Service, which will guarantee the integrity of time synchronization applications; ISM-G, which will generate Galileo integrity support messages; and EWS, which will transmit emergency warning messages.

Another EGNOS-NEXT feature that traditional SBAS systems don't have is the authentication of the information provided for new services. This makes it possible for users to be certain that the information they're receiving was actually generated by EGNOS-NEXT and that it hasn't been spoofed by a malicious attacker.

GMV's work on this project has included analysis, evaluation and definition of system performance goals, preliminary system design and development of the preliminary operational concept, definition of SBAS integrity and performance concepts for non-aviation users, and design of messages to convey the required information. Furthermore, in the framework of this project, GMV has developed a test bench of the representative system of the future operating system and has carried out an experimental campaign with it to analyze the expected performance through the use of real and simulated data.

GMV hosts SouthPAN's progress meeting

On 23 and 24 October, GMV hosted the SouthPAN program's quarterly progress meeting. At the event, attended in person by over 40 participants, representatives from Geoscience Australia, Toitū Te Whenua Land Information New Zealand, Mitre, Lockheed Martin Australia, Lockheed Martin Space, Zeta, Sequoia, and GMV analyzed the contractual and technical status of the program.

Following the program's progress meeting, the consortium led by Lockheed Martin Australia held several technical meetings addressing various aspects of the system, including functional security, cybersecurity, logistics, and algorithms, on 25 and 26 October.

SouthPAN, which started providing early Open Services on 26 September 2022, is a joint initiative of the Australian and New Zealand governments to provide positioning accuracy to as little as 10 centimetres in both countries.

GMV is responsible for developing two key subsystems for SouthPAN: the Corrections Processing Facility (CPF) and the Ground Control Centre (GCC). It will also be monitoring the system's performance in the region to ensure that it maintains performance standards, as well as providing support for the operation and maintenance of the system.

The first generation of Galileo is moving towards the final phase of deployment

GMV has reached a significant milestone in the Galileo Ground Segment (GCS) Activities by successfully qualifying version 3.1.1. This achievement marks a crucial step forward in the Galileo First Generation Program, particularly within the Galileo FOC2 phase.

This milestone is distinguished by the integration of features facilitating the staggered rollout of the GCS. This strategic move enables the phased implementation of the Galileo Ground Segment, aligning with the ambitious schedule of Galileo Launches slated for 2024 and 2025. The capability to concurrently deploy GCS with these launches is a testament to GMV's commitment to efficiency and adaptability in overseeing complex space programs.

Version 3.1.1 also incorporates the latest operational improvements requested by the Galileo Operator, further enhancing the overall capabilities of the Galileo system. These refinements affirm GMV's dedication to addressing the evolving needs and standards of the Galileo program, reinforcing the system's position at the forefront of satellite navigation technology.

Having successfully qualified the latest major version of the GCS for the Galileo FOC2 phase, GMV sets the stage for the final phases of deployment, anticipated to extend until the end of 2026. This achievement marks a substantial step forward in realizing the successful conclusion of the Galileo First Generation Program—a project of paramount importance in advancing European space capabilities.

GMV's expertise in aerospace technology and its adept handling of the intricate demands of the Galileo program have established the company as a key contributor to the success of the Galileo Ground Segment Activities. The achievement of this milestone not only showcases technical prowess but also reflects GMV's commitment to contributing to the ongoing advancement of Europe's space infrastructure.

GMV is present at NAVISP Industry Days 2023

GMV was once again present at the NAVISP Industry Days event that took place at the European Space Agency's Space Research and Technology Centre (ESA-ESTEC) in Noordwijk, the Netherlands, on 7 and 8 November.

The goal of this edition was to highlight the crucial role of positioning, navigation, and timing (PNT) in various sectors, offering insight and opportunities for innovation and collaboration. Themes covered included transportation and mobility, alternative PNT technologies, and current trends in this field.

The event provided information on opportunities, challenges, and the potential for transformative progress in several applications, and featured discussion panels and opening speeches with industry experts and opinion leaders who analyzed the current trends, challenges, and opportunities in the dynamic PNT landscape.

GMV, as a leading PNT solutions supplier and contributor to NAVISP's activities through several projects, such as magicBESAFE, SDXPAND, RIPTIDE, and HARMONY, participated in the round-table discussion on "The Opportunities of Alternative PNT."

GMV successfully completes RIGOUR project

■ On October 6, GMV completed the Final Review for the RIGOUR project, an ESA activity completed under Element 1 of the ESA's Navigation Innovation and Support Program (NAVISP).

The concept of integrity is an essential requirement for not only the aviation sector, but for other sectors and applications in the transport and maritime domains. Currently, SBAS (Satellite Based Augmentation System), GBAS (Ground Based Augmentation System) and RAIM (Receiver Autonomous Integrity Monitoring) provide the guarantee of accuracy and integrity for aircraft position estimation derived from GNSS. However, the two former systems require a lot of infrastructure, while the latter presents an inherent limitation on performance. RIGOUR is presented here as an alternative approach that can make use of a large amount of simulated non-reference receiver data that can monitor satellite health and characterise local environments effects i.e. multipath.

Among the conclusions reached highlights the fact that the aggregated user measurement algorithms have been effective in detecting satellite step anomalies of moderate to large amplitudes, showing further benefit with the usage of standalone rural data. The algorithms also show potential in improving the detectability of drift events.

In additon, the implemented adaptation of FDE algorithms for satellite integrity has also proven to perform well in terms of the absence of false alarms but is overshadowed by the UDRE broadcast – future decoupling is suggested for autonomous integrity streams.

The UDRE (User Differential Range Error) module, moreover, has successfully provided satellite overbounding information to compute users protection levels – including prompt protection from satellite simulated feared events. The enlargement of user distribution without dependency on stations for coverage can serve as proof of concept of UDRE module capabilities.

And lastly, the local integrity algorithm has shown improved integrity over urban users but is still insufficient to provide protection for high-magnitude local effects such as NLOS. New local level algorithms are suggested for future work.

The british space industry flexes its muscles at the UK Space Conference

From 21 to 23 November, Northern Ireland hosted the latest edition of the UK Space Conference, one of the United Kingdom's leading events in the space sector.

The biennial conference, each edition of which is held at a different location, brought together all the stakeholders in the sector (government, academia, clients, suppliers, researchers, etc.) for three days of sharing ideas, breakthroughs, technological developments, and news from the space community, as well as perspectives on how this knowledge can bring about social, political, and economic change.

The event reflected the milestones and developments in several areas of the space sector in the United Kingdom, where this industry is particularly active and enjoys considerable support from the government. It is highly involved in European Space Agency programs and domestic projects to develop space applications and technologies. In this regard, the conference was a resounding success, cementing its place as a key networking opportunity for clients, partners, and suppliers.

GMV, with a subsidiary in Oxfordshire, the United Kingdom, is committed to the development of the British space sector, and participated as an exhibitor, showcasing the products and services it currently offers in the space segment (guidance, navigation, and control systems), the ground segment (control centers for telecommunications satellites, data processing systems for Earth observation missions, and applications using space technology and data), and space robotics. GMV's stand attracted several prominent figures in this industry, such as MP Steve Baker, Minister of State for Northern Ireland; Annelies Look, Deputy CEO at the UK Space Agency; and British astronaut Tim Peake, among others.

This conference attests to the United Kingdom's commitment to the development of forward-looking space technologies. The country's goal is to achieve a 10% share of the global space market by 2030, amounting to 500 billion euros.

GMV, a pioneer in the agile transformation of the aerospace sector

■ Chris James, CEO of Scaled Agile, dropped by GMV headquarters in Tres Cantos, Madrid on 30 October as part of a tour of Europe.

Scaled Agile, Inc. is the leading international organization for promoting and providing agile frameworks at scale, such as Scaled Agile Framework (SAFe), to help businesses implement agile practices in their organizational processes and structures, enabling more efficient delivery of products and services.

GMV is currently applying SAFe in developing the ground control segment of the in-orbit validation system for the second generation of Galileo (G2G). GMV's adaptation of SAFe, with the support of Scaled Agile and with Estratecno as a partner, has used the official SAFe implementation roadmap to transform and evolve the old way of working into a more agile model for managing hundreds of requirements and validations.

The Scaled Agile CEO was accompanied by Britta Blank, EMEA Director Partner Development, and Michelle Lanzinger, SAFe Strategic Advisor. The GMV representatives present were Víctor Pozo, Director of GMV's Satellite Navigation Systems Ground Control Segment, and Diogo Ribeiro, in charge of GMV's Satellite Navigation Systems division. Estratecno was represented by Miguel Santiago, Managing Director, and Javier Morillom, SAFe Consultant.

During the visit, Scaled Agile commended GMV on its customization of the SAFe framework in this project and others, as well as the experience and best practices designed to adapt the hundreds of requirements and software features of large-scale, mission-critical solutions.

The topics discussed at the meeting included initiatives to boost the collaboration between Scaled Agile and GMV in adapting and expanding the framework to the aerospace sector. The meeting also covered initiatives related to cybersecurity and SecDevOps aspects from the beginning of the application development lifecycle, in line with the current importance of this field in everything having to do with operations security, regulatory compliance and protection against cyber espionage.

GMV welcomes the ICG

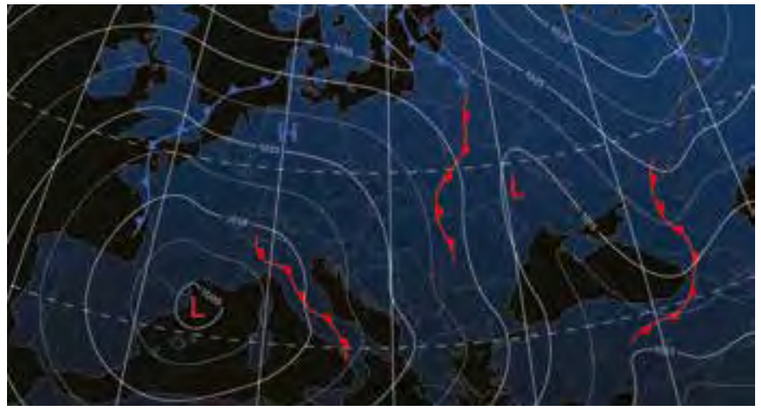
■ From October 15 to 20, Madrid hosted the 17th Meeting of the International Committee on Global Navigation Satellite Systems (ICG), organized by the European Union in collaboration with the Spanish Presidency of the EU. On Wednesday October 18, as part of this annual meeting, over 100 representatives from the countries associated with this United Nations committee had the opportunity to visit GMV's headquarters in Madrid.

This visit proved to be a unique opportunity to learn firsthand about GMV's track record and experience in the field of satellite navigation and space technology. Miguel Romay, GMV's General Manager of Satellite Navigation Systems, gave the attendees an overview introducing the company's history, growth, and expansion. He also presented GMV's navigation capabilities, products developed with inhouse technology and some of the most important projects GMV has taken part in, consolidating its position as a world-leading company.

In a second presentation, José Caro, GMV's Director of Satellite Navigation System Augmentation Systems and Services, addressed the challenges associated with Satellite-Based Augmentation Systems (SBAS) and mentioned the SouthPAN project, a joint initiative of the governments of Australia and New Zealand to offer satellite-based navigation and precise positioning services (SBAS and PPP) in both countries. GMV will be developing the system's processing and control centers, in addition to supervising and guaranteeing compliance with the performance of both services.

To conclude, Irma Rodríguez, GMV's Director of Satellite Navigation Systems Products and Services, presented ***GMV GSharp***, GMV's full and precise Global Navigation Satellite System (GNSS)-based positioning solution, which is currently being used in a variety of markets, such as autonomous driving, precision agriculture, and space missions.

GMV renews contract for evolutionary maintenance of Nowcasting SAF



GMV recently signed a contract with Spain's State Meteorology Agency (AEMET) to support the development, maintenance, and operation of EUMETSAT's Nowcasting SAF (NWC SAF).

The main goal of the SAFNWC project, led by the AEMET and being carried out in collaboration with other European meteorology services for EUMETSAT, is to provide domestic meteorology centers, scientific institutions, and the global meteorological community in general with operational, reliable, and robust services to support operational and research activities in the field of immediate and very short range prediction through a software application for the near real-time generation of meteorology products to support immediate forecasting, as well as support services for SAFNWC users to maximize the benefits and use of the software application and the products generated.

GMV, which has been supporting the AEMET in the SAFNWC project for over 20 years, was in charge of developing the infrastructure for the real-time processing of the images from different geostationary satellites (MSG, GOES, Himawari) and creating 16 different Level 2 support products for immediate prediction.

One of the main goals of this new phase of the project is the adaptation of NWCSAF to the new Meteostat Third Generation (MTG), whose first satellite was successfully launched on 13 December 2022, with the goal of fully exploiting the features of this new series of satellites, with significantly improved temporal, spatial, and spectral resolutions compared to the previous generation.

GMV was in charge of the installation and preparation of a NWCSAF processing chain in the AEMET's infrastructure, making the AEMET the first European meteorological institute to process MTG data and generate the products in real time since EUMETSAT began preoperational distribution of the new satellite's products in late October 2023.

Exploring the future of space innovation at Silicon Valley Space Week

GMV was present at Silicon Valley Space Week, which took place from 17 to 20 October in California, in the United States. This annual event focuses on innovation and brings together leaders and experts from the SatCom industry to discuss the latest trends, explore the future of space-based business solutions, and reflect on emerging hotspots and disruptive ideas.

This edition, in addition to including the 7th Satellite Innovation Conference, also featured the 3rd MilSat Symposium, which seeks to promote new communication channels between space defense and industry to facilitate contracting and secure improvements for defense technologies.

Space operations play a fundamental role in the interconnectivity of services, as well as an increasingly important role in the defense of space assets. The MilSat Symposium encourages discussion of these connections, whether newly formed or under development, while at the same time addressing the technological, logistical, and financial knowledge needed to build the next generation of space defense.

GMV took advantage of this event to highlight its catalog of solutions that support the operations of various types of missions, from smallsats to large satellite constellations.

The MTG geostationary meteorological satellite system achieves a new milestone

EUMETSAT confirms the successful completion of the preliminary acceptance review of the MOF (Mission Operation Facility) whose development has been led by GMV

On 15 November, EUMETSAT declared a successful preliminary acceptance review of the mission operations facility (MOF) for the Meteosat Third Generation (MTG) mission.

This is an important milestone as it means acceptance of the full functionality associated with the MOF, which will allow EUMETSAT to simultaneously monitor and control the two types of satellites, sounders and imagers.

MTG is the result of long-standing cooperation between ESA and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and is one of the most complex and groundbreaking geostationary meteorological satellites ever built. The complete constellation comprises six satellites: four imagers and two sounders (which will be the first to enter operational geostationary orbit).

EUMETSAT is already controlling MTG-I1, the first satellite of the complete MTG system, which will provide critical weather forecasting data for the next 20 years of the mission's operational life. The MTG-I1 satellite will be followed by an MTG-S in 2025 and the next MTG-I in 2026.

Under the MTG program, GMV has led the development of the mission operations facility, which comprises the main ground segment components for command and control of EUMETSAT's fleet of next-generation geostationary satellites: the mission control system (MSC), the mission planning system (MPS), and the flight dynamics system (FDS).

All these systems are supported by a set of operational tools for automation, operations preparation, configuration management, and system monitoring.

This new generation of meteorological satellites is designed to revolutionize weather forecasting by providing more accurate monitoring of the Earth's atmosphere, land and sea, and significantly improved imagery capabilities compared to Meteosat Second Generation (MSG).

Observations from the MTG satellites will drive the development of performance-enhancing products and services in a wide range of areas, including firefighting, air quality forecasting, air traffic control, search and rescue missions, disaster risk reduction, farming yields, marine and coastal management, and sustainable energy production.

SPACE

Deliberations on space sustainability at the Paris Peace Forum 2023

On 10 and 11 November, representatives from GMV attended the Paris Peace Forum 2023. Since 2018, this annual event has been highlighting projects and initiatives that are addressing global challenges in areas such as demographic crises, armed conflicts, climate change, digital ethics and security, and space sustainability, among others.

With the theme "Seeking common ground in a world of rivalry," the sixth edition of the Paris Peace Forum featured Miguel Ángel Molina, Deputy General Manager of Space Systems at GMV, who took part in a round-table discussion related to the Net Zero Space initiative, of which GMV is a signatory, titled "To gauge or not to gauge: what unified paradigm to assess sustainable use of outer space?" During the round-table discussions, which considered the recommendations of the initiative's working group on developing regulations to reduce the creation of space debris, Mr. Molina emphasized the hazards presented by the worsening situation caused by debris in orbit, along with the importance of creating better regulations on the subject.

The Paris Peace Forum 2023 was also an opportunity to celebrate the second anniversary of the Net Zero Space initiative, which GMV joined in 2022. This platform brings together top-level actors from throughout the value chain of any space mission, with the aim of confronting the pressing need for a consensus on how to tackle the growing problem of space pollution. It is also focused on finding urgent, concrete agreements and solutions as the year 2030 approaches.

Increasing GMV's footprint on Space Surveillance and Tracking

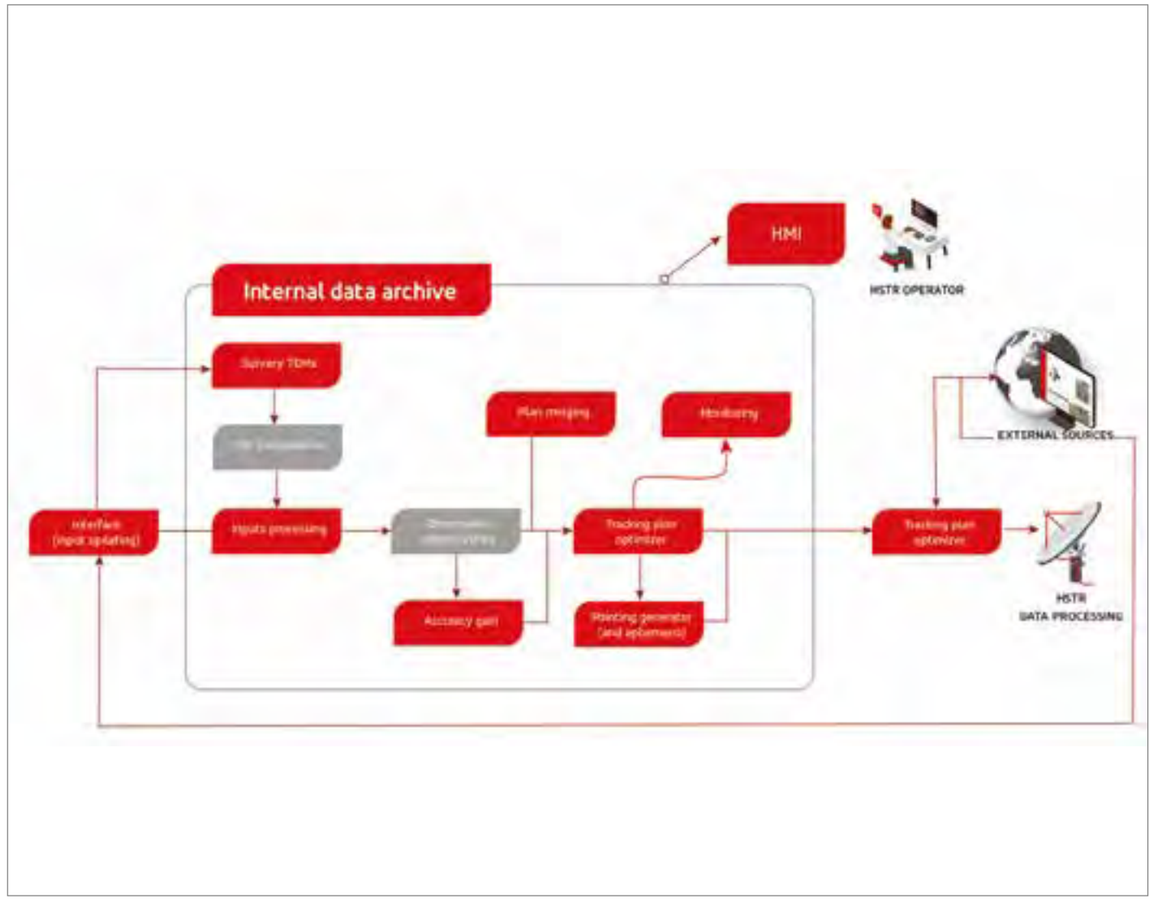
■ In the summer of 2022, GMV signed a contract with OHB DC for the delivery of our full suite of Space Surveillance and Tracking (SST) COTS Software solutions (***FocusSST***) to the military side of the German Space Situational Awareness Center (GSSAC), known as Weltraumlagezentrum.

FocusSST comprises an unparalleled set of tools providing capabilities for: SST sensor data simulation (***Ssdsim***), orbit propagation/determination and sensor calibration (***Sstod***), catalogue build-up and maintenance (***Catmai***), resident objects catalogue database (***Orca***), SST sensors scheduling and tasking (***Senplanner***), collision prediction and avoidance (***Closeap***), fragmentation detection and analysis (***Fragdet***), re-entry prediction and analysis (***Reenpred***), telescopes images processing (***Gendared***), maneuver planning and optimization (***Gemopt***), overflight prediction (Overflight), data visualization (***Visualfocus***).

Following an initial delivery after contract signature, GMV´s team of leading SST experts continued to upgrade these tools and make intermediate deliveries to our customer in an iterative development cycle. Key upgrades include the ability to detect maneuver trends (pattern of life), a new collision probability method (Foster), user authentication functionality (single-sign-on), new database table handling, elevation mask and zone grouping for overflight analysis, visibility of the re-entry and decay risk heat map, and some additional measurement formats (GESTRA, SATAM) and atmospheric models (GRAM, Harries-Priester, Jacchia-Roberts) for the orbit determination process.

The combined efforts of our incredible team led to a successful final delivery of ***FocusSST*** in late September. A possible further collaboration on the use of these tools is being sought.

Greek space debris tracking radar to rely on GMV technology



■ The European Space Agency (ESA) has awarded a contract for the design, manufacture, and deployment of the future Greek Space Debris Tracking Radar (HSTR) to a consortium led by the Spanish company TTI Norte and including GMV.

HSTR is a brand-new SST sensor that will be designed and built by Greece to enhance the existing network of European SST sensors. This sensor will add tracking capabilities for the LEO region, an already overpopulated region that will become increasingly congested with the growth of mega-constellations. With HSTR and the other European SST surveillance radars, Europe will be able to build its own SST catalogue for the LEO region, improving upon the accuracy of current catalogues.

As part of this endeavor, GMV has been entrusted to handle the external interfaces and to implement the planning and tasking (scheduling) component of this radar system. GMV will contribute to the system-level specification as well as to the specification, design, implementation, and validation of the external interfaces and scheduling subsystems. In this way, the company will strengthen its position in the area of sensor planning and tasking, which now includes a specific scheduler for tracking radars using state-of-the-art algorithms for the stare-and-chase concept and scheduling optimization.

The HSTR will be used to support SST operations such as orbit refinement, re-entry prediction, and collision avoidance, as well as other services currently provided by the EU SST partnership and for which GMV has extensive experience from several projects with EU national space agencies. This project represents a new opportunity to expand GMV's involvement in such endeavors.

GMV signs on to the “Zero Debris Charter” of the European Space Agency

After months of intense collaboration among more than 40 organizations, on November 6, the European Space Agency (ESA) released the Zero Debris Charter, which has been signed by actors in the space sector willing to commit to a more sustainable future in space.

At the 2022 Ministerial Conference, ESA member states encouraged the implementation of a Zero Debris approach for their missions and have since encouraged partners and other actors to take similar paths. In this regard, ESA has long been leading a profound internal transformation of its practices for mitigating and remediating space debris and intends to stimulate similar efforts in Europe and beyond. In 2023, the Agency announced the launch of the “Zero Debris Charter” initiative, which was completed in October of this year at ESTEC.

The Charter was drawn up by and for the global space community with the aim of shaping global consensus on space sustainability. It brings together a wide and varied range of space organizations to define ambitious and measurable goals to mitigate and remediate space debris by 2030.

GMV has set the global standard for studying, monitoring and preventing the proliferation of space debris. Operating in this field since the late 90s, GMV has been involved in numerous projects with the ESA, the European Union Agency for the Space Programme (EUSPA), the European Commission, multiple national space agencies in Europe, and several defense ministries and satellite operators worldwide.

GMV’s extensive activity in this area has led the company to align with the urgent and consensus-driven need to address the growing congestion in the space environment and to take urgent and concrete actions to mitigate it. In 2022, for example, GMV joined the “Zero Debris Charter” initiative promoted by the Paris Peace Forum. It did not hesitate to sign this ESA initiative as well, renewing its commitment to improving and promoting the use of its collision prevention systems and services and continuing to develop new solutions to ensure the safety and sustainability of space operations.

GMV presents its GNC and ADR projects at the Clean Space Industry Days

From 16 to 20 October, GMV attended the 2023 edition of the Clean Space Industry Days (CSID), which took place at the European Space Agency’s Space Research and Technology Centre (ESA-ESTEC) in Noordwijk, the Netherlands.

CSID is a five-day event focused on the design and development of sustainable space missions. Its core themes are eco-design for space, end-of-life management, and active debris removal and in-orbit servicing.

Fernando Gandía, GMV´s Space Systems EST Robotics and On-Board Autonomy (ROA) Division Head, was invited to be a panelist at the Standardized Removal Interface Workshop as part of the Design for Removal session. He was joined on the panel by Cristina Ortega from AVS, Christiane Bergemann from OHB SE, and Lorenzo Ferrario from D-Orbit.

GMV presented Capture Bay Design and End-to-End Verification of Design for Removal (CAT) - Phase 1. In this pioneering project, GMV, together with its partners AVS and Admatis, is working on the design, breadboarding, and verification of all the technologies required on the servicer (chaser) side to capture and deorbit the next generation of Copernicus satellites.

Design For Removal (D4R) technologies are already being installed on these satellites. One such technology, the Mechanical Interface for Capture and End-of-Life (MICE), has been developed by GMV and its partners and is currently being commercialized at the European level.

GMV also presented Guidance, Navigation and Control of In-Orbit Assembly of Large Antennas (IOANT), a project focused on GNC for the assembly and control of large antennas, performing hardware-in-the-loop tests to reach enabling technologies that can be applied to a wide range of servicing missions.

GMV defines late collision avoidance commanding through the Galileo system

GMV, as part of the consortium led by Astroscale UK, has been awarded with a new activity within the ESA’s CREAM (Collision Risk and Automated Mitigation) cornerstone, as an extension to the CREAM#2 activity, to advance in an alternative commanding path for late collision avoidance manoeuvres (CAM) making use of the Galileo Return Link Service.

The increasing space traffic congestion in low earth orbits has also increased the number of collision avoidance manoeuvres. They represent a very relevant cost in terms of operations effort and propellant, reducing the operational lifetime, and affecting the nominal mission of the satellite. As a result, satellite operators wait as long as possible to command the avoidance manoeuvre in order to reassess the risk and to avoid unnecessary ones. This commanding requires communication with the satellite, which is typically only available few times per day in LEO, when the satellite passes over the ground stations. This represents an important limitation for the satellite operator who has to wait until few hours before the collision and use the last passes available. The new developments proposed target to mitigate this limitation by providing alternative late commanding paths to trigger the manoeuvre much closer to the conjunction, allowing a net reduction on the number of collision manoeuvres required, and therefore, reducing the propellant consumption and increasing the operational lifetime of the satellites.

This is achieved by using of the Galileo Signal-in-Space (SiS) and its Return Link Service as an alternative continuous communication path to relay collision avoidance manoeuvre decisions to satellites mounting on-board Galileo compatible GNSS receivers. This solution presents a very innovative usage of Galileo (potentially in combination with SST services like the EU SST) that could be translated in the future into a unique collision avoidance service to be provided worldwide.

The German Space Agency trusts in GMV again

Since 2021, GMV is in charge of the maintenance and evolution of the operational mission and cataloguing system for the German Space Situational Awareness Center (GSSAC), located in Uedem, Germany.

GMV has recently been honored with an extension of that contract from the German Space Agency (DLR) for a duration of three years. GMV will continue updating the GSSAC Mission System (GMS) to answer the future needs of an advanced processing infrastructure in terms of performances and scalability, based on the experience and skills of GMV in this domain.

In the frame of this contract GMV will be responsible for the updates (in terms of robustness, redundancy, operability...) required to deliver the operational EU SST catalogue in the second half of 2024. It will then become the operational cataloguing system of the EU SST, being at the center of the services provided by the partnership. Apart from achieving that goal,GMV engineers´ team will continue developing other capacities in the space surveillance domain which will increase the performance and capabilities of the cataloguing system. GMV will work in this activity with a team of people working from Munich and Darmstadt in Germany and from Madrid in Spain.

In total, GMV leads EU SST contracts in five countries (Spain, France, Germany, Poland and Romania) and has additional contracts and capabilities in the field of the space surveillance in the UK, Portugal and USA. More than 100 GMV engineers work in SSA/SST activities in GMV, which makes us the biggest industrial team in this domain in Europe.

GMV delves into high-performance onboard processing for vision-based autonomous space navigation

On September 27, the final review meeting was held for the GMVision project (On-board image processing architecture and co-processor upgrade for vision-based navigation), a European Space Agency project, which aims to redesign, develop, and validate an engineering model (EM) of a high-performance on-board co-processing unit that redundantly processes images from two cameras for different autonomous vision-based navigation scenarios for aircraft and space exploration satellites.

The space aviation electronics system consists of two navigation cameras and a highly versatile redundant image processing co-processor (IPB) that could be used for rendezvous and search operations for satellites, as well as for descents and landings on asteroids, moons, and other small celestial bodies.

The solution resulting from this activity was developed in its entirety by GMV, from the concept to the software and then on to the development of the camera hardware and processing electronics. On the software side, the proposed solution is designed for complex vision-based algorithms, where core parts of the software solution are hardware accelerated to run in parallelizable solutions.

The system was tested following a complete validation chain that included proof-of-concept testing, a black room testbed, and system testing with real mock-ups.

GMV attends 41st ESA Antenna Workshop at ESTEC in the Netherlands

The ESA Antenna Workshop on Large Deployable Antennas was organized by ESA's Antenna and Sub-millimeter Waves Section and Structures Section and held at the European Space Research and Technology Centre (ESTEC) in Noordwijk, the Netherlands.

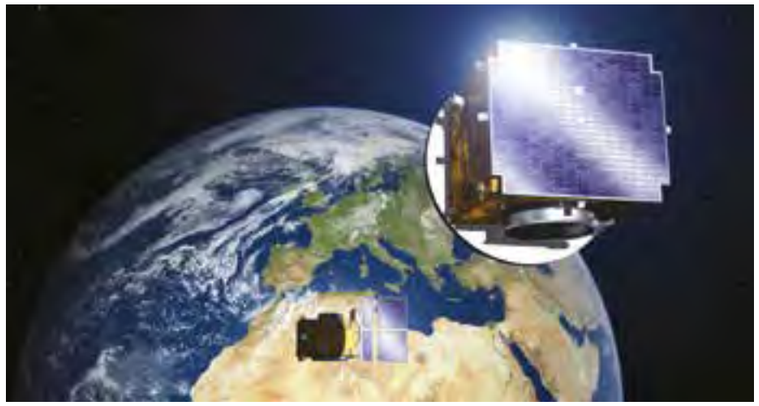
The workshop provided an update on the work of ESA's Large Antenna Working Group and the work plans that ESA has drawn up in collaboration with research institutes, industry leaders, and ESA Member States. It also highlighted the state of the art in innovative approaches to large antenna construction.

GMV presented Guidance, Navigation and Control of In-Orbit Assembly of Large Space Antennas (IOANT), a project led by two teams from GMV Portugal and Poland together with the National Technical University of Athens (NTUA) as part of the consortium. The aim of the project is to develop a system for the control and assembly of antennas (and other types of flexible structures) in orbit, focusing on a small number of critical guidance, navigation, and control (GNC) technologies. The goal is to raise the Technology Readiness Level (TRL) of these selected technologies to 4 by performing hardware-in-the-loop tests in a representative test facility.

The activity was presented during the In-Orbit Assembly and Formation Flying session and was very well received. It brought up several GNC topics that are not usually discussed at antenna conferences, sparking the curiosity of the attendees, who usually focus on telecommunications aspects.

Proba-3 enters its final testing pase

The environmental testing campaign was recently completed for the Proba 3 demonstration mission, with successful results. This testing took place in Ottobrunn, Germany, and it was able to confirm that the mission's various equipment elements can withstand the conditions generated during launching, as well as the thermal conditions that will exist once the satellites are in orbit. The campaign included a range of activation tests for the mission's various mechanisms, along with a full verification of the propulsion system.



Proba-3 is a technological demonstration mission of the European Space Agency (ESA), and its purpose is to provide a technological demonstration of high-precision formation flying by two platforms in space. With its launch planned for 2024, the mission consists of two satellites that will fly in formation, to observe a part of the sun that is normally hidden from view.

This is an especially ambitious mission for several reasons, including the high level of autonomy generated by the onboard algorithms, and because of the related operations and coordination needed for the two platforms, which will be travelling through space at a very close distance to each other.

The Proba-3 mission is being developed by an industry team led by Sener, with participation by more than 29 companies from 14 countries.

In the context of Proba-3, GMV is responsible for the formation flying subsystem (FFS), which is one of the mission's most important and complex onboard elements. The company's role includes design, development, and validation of the onboard software for that subsystem, in a simulation environment that represents the onboard computer and electrical interfaces. GMV is also responsible for providing the flight dynamics system for the ground infrastructure, which is responsible for monitoring, flight control, orbit determination, and prediction of events and maneuvers. For the FFS, GMV in Spain is collaborating with Sener, which is responsible for the control system and failure detection, isolation, and recovery (FDIR) system. GMV in Spain is also working with the Canadian company NGC, which is responsible for the attitude and orbit control system (AOCS), and with GMV in Poland, which is in charge of designing, implementing, and testing the onboard function that uses GPS measurements to calculate relative positioning of the satellites.

Proba-3 will demonstrate the viability of a critically important type of technology, which can be used, for example, to develop large telescopes with primary elements (lenses and detectors) that must be separated from each other, with their positions and relative distances established with high levels of precision and stability. The technological viability of this type of formation flying will eliminate the need to use heavy and bulky unfolding structures, thereby reducing the costs associated with entry into orbit and operation.

GMV participates in the latest edition of APSCC

GMV once again sponsored the Asia-Pacific Satellite Communications Council (APSCC) conference and exhibition, which in 2023 took place from 10 to 12 October in Kuala Lumpur, Malaysia.

The APSCC conference brings together professionals and leaders in the space industry, and is an excellent opportunity to identify new lines of business and share knowledge of an ever-growing market. The event attracts satellite operators, broadcasters, manufacturers, service providers, consultants, government officials, and end users to network with key players in the satellite and space-related industries.

Enrique Fraga, GMV's General Manager of EST Space Systems, participated in the session on "Ground Station as a Service (GSaaS): Evolving Business Model." GMV also had its own stand to showcase its products and services for the space sector.

HALO Space successfully completes second battery of test flights

HALO Space, the space tourism company with which GMV collaborates, recently carried out the second round of test flights for its space tourism trips in the dry lake of Cuddeback (California, USA), a habitual area for experimental flights.

This phase involves the execution of a series of flights, four in particular, as a proof of concept.

To carry out these test flights the prototypes of both the flight segment elements and those developed by GMV on the ground are already being used: a trajectory prediction algorithm based on a physical model of the atmosphere and its effects on a balloon (BFPS or Balloon Flight Path Simulator, developed by GMV in Spain), fed by a telemetry reception, processing and storage system (MCS or Mission Control System, developed by GMV in Romania).

GMV, as a top-level partner of HALO Space's industrial consortium, is currently in charge of the ground control centers incorporating the flight planning and ground monitoring systems of the onboard elements (capsule, balloon, parachute and parafoil) as well as navigation support for the pilot. GMV is also collaborating in the definition of flight profiles and operational aspects for future certification during the following phases of the project.

GMV participates in the Space & Defense Industry Seville Summit 2023

On 25 and 26 October, Seville hosted the fourth edition of the Space & Defense Industry Sevilla Summit. GMV participated alongside other companies in the space and defense industry, analyzing the new challenges in the fields of security, defense, and space, and highlighting the technological capacity and skills of a domestic and European business fabric capable of successfully tackling the challenges on the horizon.

GMV's Corporate Strategy Director, Jorge Potti, took part in the session on "Defense, industry and science: key factors for greater efficiency," where he analyzed the role of Spain's space industry, which accounts for 8% of Europe's industry. He also highlighted the robustness of the sector today, emphasizing its strategic nature and its impact on the economy. In his talk, he also highlighted how the development of space technology contributes to the sustainability of the planet. At the same time, he expressed the need to address the challenges arising from space debris and implement a global space traffic management system. He also cited the tremendous opportunities for both industry and GMV in European space programs such as Galileo and IRIS2 and the space exploration agreements between the various space agencies.

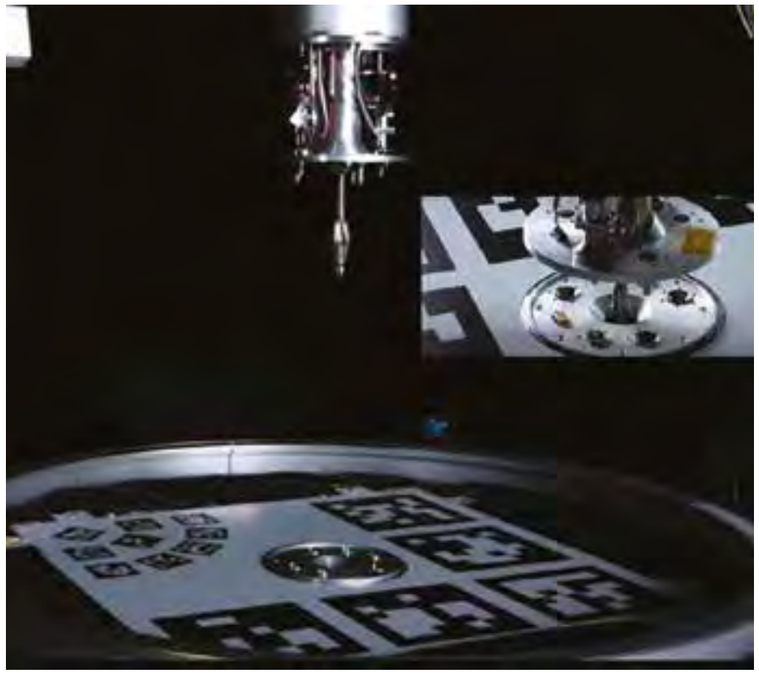
Finally, Potti stressed the importance of continuing to carry out large-scale projects to attract talent and promote STEM careers.

On Wednesday, November 23, GMV's CEO, Jesús Serrano, opened the session on "Space and defense: an efficient and essential duo." In his remarks, Serrano stressed the importance of satellites and space infrastructure in the current and future context as essential assets both for our society and our security forces and law enforcement agencies. He also pointed out how these space activities bring with them new threats, which also need to be addressed using cutting-edge systems.

Serrano highlighted the need for government investment in the space sector and stressed how important it is for Spain to play a major role at the international level and for investments to be in line with its relative weight in terms of GDP. He also emphasized that the Spanish space sector has the technology, talent, and competitiveness necessary to address the challenges raised by government institutions.

The UK Government will fund the development of a virtual reality-based simulator led by GMV

GMV was selected by the UK Space Agency as one of the leading companies in the development of space technology. Through the Enabling Technologies Programme (ETP), the UK Space Agency will provide GMV with £250,000 (€277,776) for the development of the "REALM: Virtual Reality Aided Spacecraft Refuelling for IOSM Verification & Validation" project.



The project, underway since October and lasting until February 2025, aims to build a distributed simulation environment equipped with Digital Twins and Virtual Reality components to validate and verify operations for in-orbit refueling. GMV is collaborating on this development with other companies such as Thales Alenia Space, Satellite Applications Catapult, and Pitch.

The Enabling Technologies Programme (ETP), launched by the UK Government to accelerate the development of the space sector, has earmarked £4 million to companies and universities conducting cutting-edge programs in space technology. Of the program's total funding, £3.2 million has been allocated to the UK Space Agency and an additional £800,000 to the Science and Technology Facilities Council (STFC), part of the UK Research and Innovation office (UKRI). The goal is to provide funds to industry and academia to develop technological projects that explore mechanisms for the efficient use of space, as well as projects focused on weather prediction or the removal of space debris.

This funding from the UK Space Agency will enable GMV to invest in the development of critical technologies in guidance, navigation, and orbital robotics control. It is also a clear indication of the company's commitment to building the UK's infrastructure to achieve the ambitious goal of capturing 30% of the global IOSM market by 2030.

GMV attends Space Tech Expo Europe

From 14 to 16 November, GMV participated in Space Tech Expo Europe, a major event for the space industry in Europe where key players come together to discuss topics such as space exploration, sustainability, New Space, cybersecurity, the general state of the industry, connectivity, and 5G capabilities for the satellite industry, among others.

Space Tech Expo Europe is among the top showcases for leading companies in the space industry to display their latest developments. GMV had its own stand at the event, held in Bremen, Germany, and was represented by several members of the company. GMV presented some of its latest developments in the ground and space segments, including the company's guidance, navigation, and control products for both satellites and launchers. Space Tech Expo Europe has become one of Europe's leading space technology events and a key forum for space industry stakeholders to share their expertise.

GMV, at the cutting edge of in-orbit services

The consortium in charge of the European Robotic Orbital Support Services (EROSS) mission is working to develop the first in-orbit service platform, an unprecedented milestone in the exploration and maintenance of satellites in space. Coordinated by Thales Alenia Space France, with GMV as lead partner, this consortium has become a pioneer in space innovation, pooling knowledge and developing technology to carry out this exciting mission.

On 25 and 26 September, in front of the iconic Berlaymont building, the headquarters of the European Commission, the EROSS consortium gathered to present and share the latest developments regarding the in-orbit service platform. Over the course of these two days, there were discussions and presentations on the progress made, the milestones achieved, and the challenges that still remain in the development and construction of this platform.

A month later, on 25 and 26 October, Thales Alenia Space France (TASF) and GMV met again, this time at GMV's central headquarters, with the goal of addressing the platform's vision system and guidance, navigation, and control system. The main goal of these developments was to train EROSS IOD to access its client satellites safely and efficiently.

These meetings highlight the importance of strategic collaboration and co-engineering in the space field. They also reflect the pressing need to pool efforts and knowledge to make progress in space technology and exploration, paving the way for a new paradigm in the industry.

GMV at ASTRA 2023

GMV attended the Advanced Space Technologies in Robotics and Automation (ASTRA) symposium held by the Automation and Robotics (A&R) section of the European Space Agency (ESA) every two years.

ASTRA offers a platform for agencies, industry, and European academics in the field of space robotics to meet and interact, showcasing the full range of research and development activities in this field. ASTRA will focus on providing an overview of the technologies/missions that are available or being developed in ESA Member States or as part of international partnerships, but it strongly encourages other international contributions whenever possible.

Given its experience in the field of space robotics, GMV had a major presence, presenting nearly a dozen technical articles highlighting its leadership in European Space Agency projects such as Robust and Semi-Autonomous Platform for Increased Distances (RAPID), In-Orbit Assembly of Large Space Antennas (IOANT); Sample Transfer Arm (MSR), Moon Rover System, and Sample Fetch Rover (SFR), as well as European Commissions projects within the framework the development of the operating system for space robot control (ESROCOS project) and autonomy or artificial intelligence systems (ERGO project).

On 20 October, GMV participated in the In-Orbit Servicing and Construction Workshop, which sought to draft a technical document that will become the roadmap for developing the ESA's cross-cutting technological initiative on in-orbit maintenance and construction.

New round of Sample Fetch Rover field tests completed successfully

These tests have made it possible to thoroughly test the autonomous navigation system and crucially combine it with the robotic arm

In mid-October, engineers from the European Space Agency (ESA) and Airbus teamed up in Stevenage, the United Kingdom, to carry out a new round of field tests for the SFR (Sample Fetch Rover) robotic surface vehicle.

The SFR rover, now nicknamed Codi, was originally developed as a testing platform for the Mars Sample Return (MSR) mission to recover samples extracted by the Mars2020 mission on the Martian surface, collecting them and storing them in a Martian sample canister. Although the SFR component of the MSR mission was removed from the mission architecture, maintaining, testing, and developing innovative and precise navigation and collection capabilities for a rover that can function without human intervention are essential for possible interplanetary and lunar exploration in the future, which is why the ESA decided to continue with this Airbus-led project, in which GMV is participating.

These tests were conducted over the course of two weeks and introduced a novel feature: a robotic arm integrated into the rover for the first time that autonomously took on the challenge of collecting the thin 15 cm long sample tubes left on the ground, simulating the collection of samples on the surface of Mars.

GMV is in charge of the design and development of the project's VBDS (Vision Based Detection System). One of the most critical sub-systems in the rover, VBDS is essential for finding the sample tubes. It integrates artificial intelligence and image processing techniques that allow it to accurately detect and estimate the position of the tubes on the surface of Mars and then capture them with the robotic arm. To do so, VBDS processes images provided by the rover's stereo navigation camera and the monocular camera mounted on its robotic arm.

During the testing, the rover was able to autonomously move approximately 300 meters and get around various obstacles before parking near a sample tube. One parked, the stereo navigation camera at the top of the mast detected the tube with samples and estimated its position in relation to the rover. The robotic arm then began a complex choreography to take new images of the sample tube at close range, estimate its position more precisely, capture it, and store it.

These successful tests made it possible to explore the autonomous navigation system in depth and, crucially, to combine it with the robotic arm and carry out the first complete process of pinpointing, identification, and collection of sample containers, all without human interaction.

Now that the tests are complete, the industrial team is analyzing the data and has started to implement the updates needed for the next round of testing, which will take place in mid-2024.

GMV at the X Portuguese Conference on Cartography and Geodesy

The X National Conference on Cartography and Geodesy has proven to be one of the largest events in Portugal in the field of geospatial information, featuring the most important companies and professionals in the sector. The Conference took place on November 2nd and 3rd at the Polytechnic Institute of Guarda, and the theme of this edition was "Geospatial Information for Sustainable Development Goals."

Geospatial information, nowadays primarily obtained through Remote Sensing (RS) and Global Navigation Satellite System (GNSS) techniques, plays a crucial role in mapping the Earth in nearly real-time. It enables the acquisition of data concerning the environmental condition and socio-economic aspects, serving as an essential element in addressing societal challenges.

Teresa Ferreira, Director of GMV's Satellite Navigation Systems in Portugal, was a panelist on "The Space Sector and Geospatial Information" talk, along with representatives from the Portuguese Space Agency, EMA-Espaço, CEIIA, and DEIMOS.

This was an excellent opportunity to exchange information between the scientific, industrial and policy community on topics related to geospatial information contributing to national development in the field.

The value of EO satellite data in tackling global threats

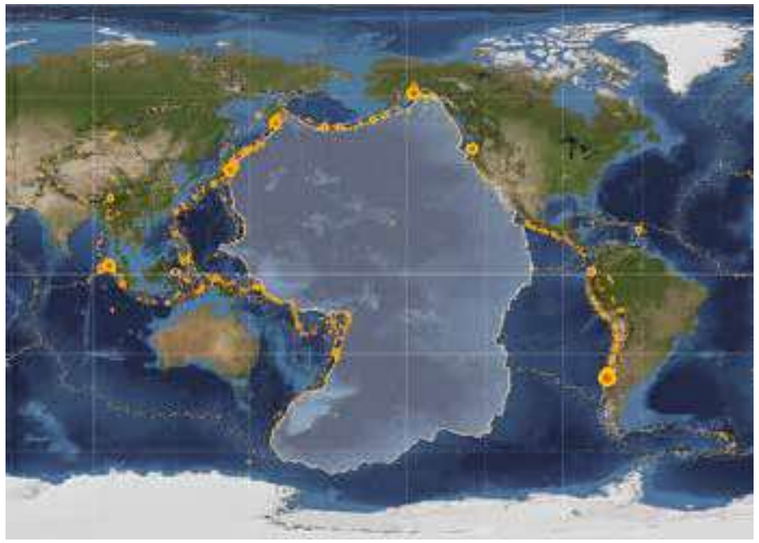
The European Space Agency's (ESA) EO4MULTIHA (High-Impact Multi-Hazards Science) initiative, a two-year project taking place as part of the ESA EC Earth System Science Initiative, held its kick-off meeting (KOM) on 13 September.

The data provided by Earth observation satellites provide key information that help us grasp our planet's complexities and monitor the environmental problems and threats it faces. This global vision allows the scientific community to detect signs of change, identify significant trends, and fine-tune models to predict the future. The ability to address and tackle these threats is key to predicting future changes, supporting the development of effective policies, enabling communities to build a more sustainable and resilient future, and managing the associated consequences.

In this context, EO4MULTIHA seeks to explore the full potential of Earth observation satellite data in order to better describe and understand the factors and complex underlying processes that lead to several high-impact multi-hazards, such as droughts, floods, and landslides. The project will focus on concatenations of events, particularly cascading and compound events, and on improving our ability to assess vulnerability, risks, and the potential impacts of these threats.

EO4MULTIHA will be carried out by a consortium led by GMV and made up of major European universities, agencies, and research centers such as Eurac Research (Eurac), CMCC (Euro-Mediterranean Center on Climate Change Foundation), UT-ITC (University of Twente's Faculty of Geo-Information Science and Earth Observation), UCL (University College London), and VU (Vrije Universiteit Amsterdam).

In addition to leading the consortium, GMV will be in charge of providing the project's modeling teams with satellite data.



GMV leads EO4HEALTH resilience project consortium

This project, that is part of the ESA Future EO Resilience activities, will develop predictive innovative tools for pandemic preparedness and risk mitigation based on Earth Observation

GMV, Plymouth Marine Laboratory, Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise, GMATICS, Brockmann Consult, and a significant number of eminent scientists are developing EO4HEALTH, a project that will further develop the analytics and data sources used by decision-makers to extract actionable information for designing strategic plans in the field of public health.

This project is part of a cluster of ESA Future EO Resilience activities aimed at developing cutting-edge services for pandemic preparedness and risk mitigation, including innovative predictive tools based on Earth observation (EO).

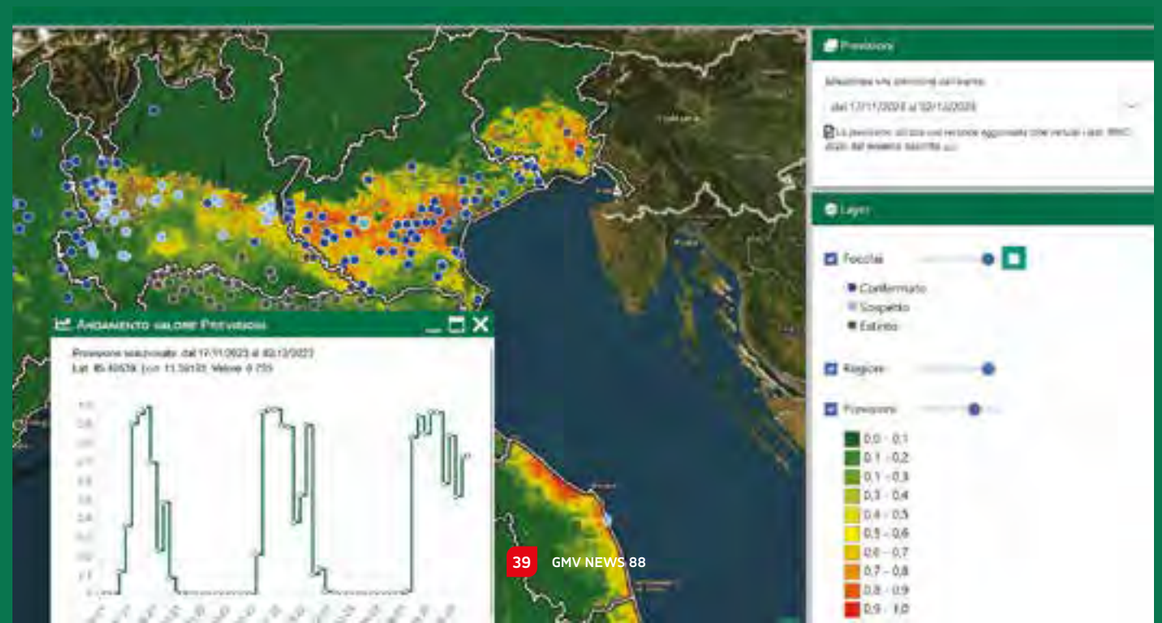
By shifting efforts from science to engineering, EO4HEALTH aims to assess the suitability of EO imagery in the context of public health decision-making, scenario assessment, and impact/risk assessment, with a clear focus on prototyping and developing pre-operational analytic pipelines.

This objective will be realized through the establishment of a Resilience & Earth Observation Virtual Observatory involving key stakeholders, public authorities, and private actors in three areas of interest: ecosystems, cities, and health. This Virtual Observatory will act as a one-stop-shop for all project-related activities. It will not only collect relevant EO and health-related data (e.g. epidemiological data) for use by health experts, but will also enable two use cases and the integration of additional processing capabilities for the study of patterns associated with emerging diseases.

The use cases now being implemented are based on the extensive knowledge gained from previous ESA-funded activities. These have focused on the ability of EO data and artificial intelligence (AI) methods to automatically identify patterns that can accurately predict the spatial-temporal re-emergence and spread of two types of disease: West Nile disease and cholera.

All this technical and scientific work is being done in close collaboration with relevant health stakeholders, such as the Food and Agriculture Organization of the United Nations (FAO), the European Centre for Disease Prevention and Control (ECDC), and the World Organisation for Animal Health (WOAH), who are helping to tailor the project development to their actual operational needs.

As prime contractor, the GMV Portugal team is not only involved in all project-related matters but is also leading the integration of advanced data analytics to support health-related developments.



Latest developments in Earth observation

On 22 and 24 November, GMV participated in the EC-ESA Joint Earth System Science Initiative 2023, organized by the European Space Agency (ESA) and the European Commission's Directorate-General for Research and Innovation (DG RTD) at ESA-ESRIN, in Italy. The event focused on the latest developments in Earth observation, as well as the latest results, initiatives, and projects funded by the European Space Agency and the EC as a foundation for creating networks and an interdisciplinary science.

Carlos Doménech, head of GMV's EST Space Systems Climate Resilience section, and Èlia Cantoni, project manager in the same section, presented a poster on the ESA's EO4Multihazards project at the session on "Earth Observation for Multi-Hazards and Compound Events," as part of the "Climate adaptation – Extremes, multi-hazards and compound events" theme of the workshop. The EO4Multihazards project seeks to investigate the capabilities of Earth observation in order to explore and comprehend the processes that trigger high-impact compound cascading multi-hazards.

The poster was presented in the form of a lightning talk in the session devoted to defining priorities for a better comprehension and evaluation of extremes and multi-hazards. Carlos Doménech wrapped up the presentations and discussion that took place during the closing session of the workshop, devoted to the topic of disasters.

GMV awarded PLESS DEMO, the Plastic-Less Society demonstration project

■ The Plastic-Less Society demonstration project, scheduled to start in early 2024, aims to use the lessons learned from the eponymous feasibility study to create an online platform for marine pollution detection and monitoring.

Together with MARETEC (IST Research Centre for Marine, Environment and Technology), GMV will further develop the Earth observation-based marine pollution detection algorithm, which leverages both satellite data and oceanographic models. This will provide a clear picture of how litter moves across the sea surface and which areas are more prone to pollution, resulting in value-added products for project users.

The marine pollution detection algorithm delivers different types of services, which can include single or continuous monitoring of user-defined areas. In addition, by integrating pollution detection with ocean circulation models, the model provides insight into where pollution is heading or where it may have been originated.

For this project, GMV aims to further develop its marine pollution tool by leveraging an in-house developed super-resolution model. This model will be implemented to enhance the spatial resolution of Sentinel-2 images used for marine pollution detection. The aim is to optimize results.

All the technical developments will be implemented by the Portuguese team on GMV's Geobrowser, a web-based platform that will allow non-expert users to access the capabilities of marine pollution detection and monitoring in a fully autonomous way (including service request and output provision).

For the development of PLESS DEMO, GMV and MARETEC will work with relevant stakeholders, including port authorities, local governments, and fishery agencies, benefiting from the engagement established during the feasibility study and looking to gather additional requirements that can help to tailor the services to real operational needs.

GMV features prominently at the 2nd Space Congress

■ On 9 and 10 November, the Palacio Fibes in Seville hosted the 2nd Space Congress, organized by the Spanish Association of Defense, Security, Aeronautics, and Space Technology Companies (TEDAE) in collaboration with the Spanish Space Agency.

Amparo Valcarce, Spanish Secretary of State for Defense, opened the conference, while Teresa Riesgo, Secretary General of Innovation for Spain's Ministry of Science and Innovation, and Ricardo Martí Fluxá, President of TEDAE, led the closing event. The two days of the conference saw various talks and round-table discussions with renowned participants, addressing topics such as sustainability and Earth observation; the immediate future through navigation, launchers, science, and exploration; space connectivity and security; the conclusions of Space Week, and the Spanish Space Agency.

On the first day of the 2023 Space Congress, GMV's General Manager of Satellite Navigation Systems, Miguel Romay, participated in the round-table discussion on "The Immediate Future: Navigation, Launchers, Science, and Exploration." Romay shared his thoughts on what the near future holds in terms of satellite navigation systems, highlighting the progress made in the services offered by European global navigation satellite system Galileo. He also discussed the new Low Earth Orbit (LEO) satellite constellations and users' growing demand for greater accuracy, integrity, and resistance, and highlighted the importance of expanding Satellite-Based Augmentation Systems (SBAS) worldwide.

Meanwhile, Jorge Potti, Corporate Strategy Director at GMV and Vice-President of Space at TEDAE, participated in the "Spanish Space Agency" round-table discussion, moderated by the president of the agency itself, Miguel Belló, and featuring leading representatives from the Latin American and Caribbean Space Agency (ALCE), Argentina's National Space Activities Commission (CONAE), Spanish public engineering company INECO, and the Spanish National Research Council (CSIC).

HYDEF is underway

The program seeks to research and define the concept of a European hypersonic interceptor

On 31 October, the Spanish missile consortium SMS, of which GMV is a member, formally signed on to the development program for the European hypersonic interceptor HYDEF.

Specifically, the director of OCCAR-EA, together with the HYDEF consortium—made up of 14 industrial partners from seven countries (Belgium, Czech Republic, Germany, Spain, Norway, Poland, and Sweden) and represented by SMS (associated on behalf of the OCCAR countries participating in HYDEF, such as Belgium, Germany, Norway, Poland, and Spain)— signed the Grant Agreement (GA) on behalf of the European Commission and the HYDEF Linked Procurement Contract (LPC).

The program has a total budget of €110 million, of which €100 million is co-financed by the European Union's European Defence Fund (EDF). The aim of the program is to research and define the concept of a European hypersonic interceptor capable of neutralizing new emerging threats and those likely to arise in the coming decades, and incorporating new technologies (e.g. innovation in propulsion, aerodynamics, guidance systems, sensors, and actuators) to achieve maximum maneuverability and performance.

Within the program, GMV is responsible for Boost and Mid-Course (BMC) navigation, which includes the GNSS solution hardware and software It is also leading the pre-launch BMC guidance and the simulation environment for system performance evaluation. GMV is also playing a key role in defining the concept of operations (CONOPS) for space situational awareness and early warning as part of the overall assessment of the guidance, navigation, and control performance of the future European air defense system against hypersonic threats.

HYDEF is aligned with the EDF 2021 project (EU HYDEF), for which OCCAR-EA was appointed as grant authority. The signing of the Grant Agreement marks an important step in strengthening the cooperation between OCCAR-EA and the European Commission in the management of the European Defence Fund.

The project kick-off meeting was held in Madrid on 29 November and included a working group with various end users to gather operational requirements.

BACSI, cutting-edge technology for aerospace support

In October, GMV attend Connected, Sustainable, and Intelligent Air Base (BASCI), a series of projects run by Spain's Air and Space Force (EAE). The meeting took place from 18 to 20 October at the Albacete Air Base with the theme of "New Technologies for Aerospace Support."

The BACSI project covers a series of sub-projects that are exploring new technologies in a collaborative environment involving SMEs, research centers, and universities. These are then activated and tested in operational environments by the EAE. The goal of BACSI is to make progress in the transformation of the Air and Space Force, taking advantage of the technological evolution linked to Industry 4.0, artificial intelligence, and other developments linked to what's known as the Fourth Industrial Revolution.

GMV, event sponsor, was present at BACSI with a stand showcasing some of its solutions in the field of aeronautics and robotics. The company exhibited two of its rovers, LAMARR and ROBIN, and showed how they could be used at current and future air bases for operations such as the autonomous movement of airplanes within the base, transportation, surveillance, and logistics tasks, among others. Jose Luis Delgado, head of GMV's Defense and Security SCIS section, participated in the networking space, sharing GMV's vision and experience in the command and control of autonomous ground systems and how the use of artificial intelligence can provide a tactical advantage.

GMV's SAPIIEM systems will successfully participate in the CIAV FMN AV&V exercises

From 23 October to 10 November, GMV participated in the CIAV AV&V exercise for certification of ***SAPIIEM*** capability in FMN Spiral 4 (SP4) within the Joint Intelligence, Surveillance, and Reconnaissance (JISR) functional area, which took place at the Spanish Joint Cyberspace Command's (MCCE) FMN CFBLNet Pink laboratory.

Federated Mission Networking (FMN) is a NATO initiative to establish the requirements that make it possible to federate different functional services as a coalition in an interoperable way. As such, at FMN, with its different working groups, participants establish the operational, technical, and verification requirements that make it possible to ensure the interoperability of systems for coalition missions. AV&V exercises are one of the authorized events for verifying these requirements and suggesting, based on the results, the acceptance of the system in the FMN baseline of the corresponding spiral.

The CIAV AV&V exercise is multinational and includes both activities associated with domestic-level coordination and coordination activities with other multinational agencies. Spain, Canada, the United States, the NCI Agency (NATO), Finland, and Sweden all participated in the exercises.

GMV's goal in participating, sponsored by the MCCE, was to validate the ***SAPIIEM*** systems (focusing on ***CSD Sierra***) against the capabilities required for the JISR Information Exchange functional area of FMN Spiral 4 (SP4), the one currently being validated, in order to become an FMN affiliate for this capability.

For the exercise, GMV's SAPIIEM systems were deployed, with CSD-SIERRA as the main exposed focus, using the ***SAPIIEM*** tools (***SIERRA Tools***, ATENEA, SEISMO) in a topology with five other nodes under the responsibility of their respective countries. All the tests were completed successfully during the exercises, both those led by Spain and those in which Spain is a partner, in this case of NATO and the US.

The goal behind having the ***SAPIIEM*** systems participate in this exercise was successfully achieved, and their inclusion as part of the FMN SP4 baseline is expected to be completed shortly.

ACHILE soldier system modernization project now underway

As part of the Safran-led consortium, GMV took part in the ACHILE kick-off meeting on 6 and 7 September.

ACHILE (Augmentd Capability for HIgh end soLdiErs) was one of the projects selected under the first call for proposals of the European Defence Fund (EDF) program, which aims to strengthen the competitiveness of the EU defense industry and thus contribute to its strategic autonomy.

The ACHILE project aims to develop innovative solutions for the next generation of combatants, to demonstrate the benefits of the open architecture known as GOSSRA (Generic Open Soldier System Reference Architecture), and to harness disruptive technologies to improve soldiers' survivability, sustainability, mobility, lethality, and surveillance capabilities. The project will work holistically along four lines to achieve these goals: core soldier capabilities, augmented capabilities, core capabilities for interoperability with equipment, and augmented capabilities for interoperability with other systems or platforms.

GMV is contributing to most of the defined work packages, lending its expertise in combatant system architecture, robotic interactions, navigation, and command and control software. It is also leading the tasks focused on C4I equipment and will contribute to the design and improvement of the combatant system's navigation capabilities, robotic integration, collaborative capabilities for the battlefield management system (BMS), and multinational intelligence, surveillance, and reconnaissance (ISR) interoperability. GMV will also help to align the future soldier architecture with STANREC 4845 and to upgrade the GOSSRA architecture.

In addition to ACHILE, in the first call of the EDF 21 program, which led to the results published in July 2022, GMV was selected as a beneficiary company by the European Commission on seven projects, with two of these specifically involving its subsidiary in Portugal.

GMV attends the Army-Enterprise and Research Forum

From 4 to 5 October, the Infantry Academy of Toledo hosted the sixth edition of the Army-Enterprise and Research Forum (F2E+I), organized by the Army Museum Foundation and, in this edition, sponsored by GMV. José Luis Delgado also participated in the round-table discussion on artificial intelligence, automation, and robotics, in which he shared GMV's vision and experience in the command and control of autonomous ground systems and how the use of artificial intelligence can provide a tactical advantage, greater autonomy and an improved decision-making process.

The C2 iMUGS Field Operation exercise has been successfully completed

■ In October, GMV took part in the C2 iMUGS Field Operation demonstration for the Spanish Army's logistics support command (MALE), as part of the preparation phase for the Canary Islands Command's units involved in the European Union's MILEX 23 exercise.

The demonstration took place in Spain at the military training grounds in Albacete. The purpose of this exercise was to showcase the technological capabilities that Spain has developed in the context of European and Spanish initiatives, in a training environment. It also demonstrated the potential for creating a national system that integrates multiple unmanned platforms into a single command and control (C2) system, thereby reducing the need to have separate command personnel for each platform.

The demonstration took place as part of the opportunity that MALE offered to companies in association with the MILEX 2023 exercise, and its main focus was the C2 system that GMV has developed during the Integrated Modular Unmanned Ground System (iMUGS) project. This is an R&D program based on permanent structured cooperation (PESCO), co funded by the European Union, which has the primary objective of increasing the EU's defense capabilities and strategic autonomy. The iMUGS consortium is led by the Estonian company Milrem Robotics, with participation by 7 countries (France, Estonia, Finland, Spain, Germany, Latvia, and Belgium) and 13 companies.

During the exercise, the C2 system that GMV has developed for unmanned vehicles during the iMUGS project was used with the following platforms: ALANO (Sener/Einsa), THeMIS EVO-1 (with the OTEOS camera from Escribano) and three Tizona VTOL drones in swarming mode (from Swarming TS)

GMV has been responsible for coordinating the command and control and C4ISR interoperability subproject, where it has developed a C2ISR system to manage UxVs. That system is capable of planning and executing joint operations between manned and unmanned systems. It also allows control of the payloads installed on the platform, along with use and distribution of data from the UGV's data sensors, as a way to ensure interoperability and standardization of interfaces with C2 systems, C4I databases, and existing ISR networks.

Twentieth Conference on Defense and Security Technologies

GMV sponsored the twentieth Conference on Defense and Security Technologies, held on 7 and 8 November at the Higher Council of Scientific Research (CSIC) in Madrid, Spain.

The Defense and Security Technologies Circle Foundation hosts this meeting to learn about core technologies, reflect on their impact in different areas, and discuss measures to ensure that Spain's security forces and law enforcement are equipped with equipment and systems that incorporate the most advanced technologies and have trained personnel to operate them, as well as an industry capable of designing and producing them.

Manuel Pérez Cortés, GMV's General Manager of Defense and Security, was the technical coordinator of the session on artificial intelligence as a disruptive element on the battlefield. David Montero, GMV's Manager of Aeronautics and Onboard Defense Systems, participated in the same session as a speaker.

GMV contributes to promoting peace and safeguarding the EU's security

■ GMV's European Union Command and Control Information System (EUCCIS) took part in the MILEX 23 exercise with the aim of enhancing the European Union's (EU) military preparedness to respond to external conflicts and crises.

This year's exercise involved strategic, operational, and tactical levels and included the participation of 19 EU member states, along with various headquarters, locations, and operational units.

MILEX 23 consisted of two interconnected phases. The first phase, which began on September 18 and ran until October 6, tested the military planning process at the strategic and operational levels. The second phase, conducted from October 16 to October 22, saw a force of 31 units and 2,800 personnel deployed in a simulated operational theater in the province of Cadiz to execute the operational plan developed in the planning phase.

During the first phase, a collaborative planning exercise for an amphibious landing was conducted to restore security to a country destabilized by a terrorist organization. To facilitate this collaborative planning, the EUCCIS command and control system installed on the LHD Juan Carlos I ship was connected via satellite to the center in Brussels overseeing the operation.

In the exercise's second phase, the EUCCIS system supported the exchange of various types of tactical elements between the ship (Force Headquarters, FHQ) and the Brussels center (Operation Headquarters, OHQ), whose location was represented on a Common Operational Picture (COP) map. Collaborative efforts were also made to generate and send mission-related documents between both nodes.

The motivation for conducting exercises like this underscores the importance placed on Europe's ability to promote peace and safeguard security within and beyond its borders with the appropriate level of ambition. In line with this objective, GMV also participated in the CWIX 2023 exercise held in June and conducted a demonstration of the system's capabilities to end-users (MPCC) in May.

GMV increases the capabilities of the BICES Network

■ GMV has consolidated its relationship with NATO, winning new contracts worth approximately a million euros with the BICES Group Executive (BGX) to provide IT security services and support until the end of 2024.

Battlefield Information Collection and Exploitation Systems (BICES) makes it possible to share and exchange intelligence-related information among all the NATO member countries, partner countries, and the organization. BICES capabilities are intended for national, NATO, or coalition use, both in times or peace and times of crisis or conflict, supporting decision makers, deployed force commanders, and tactical users.

The BICES Executive Group (BGX) works as a facilitating agency, maintaining the central network and the provision of community-wide capabilities and services operated at the national/organizational level.

The services awarded to GMV focus on modernizing and consolidating the capability of the Network Operations Center (NOC) to support the use of BICES at the strategic, operative, and tactical levels by providing total visibility on BICES infrastructure and all its components, compartments, and equipment in the BGX NOC area, which in turn will be combined with the Security Operations Center (SOC) to create the future BICES Network Operations and Security Center (BNOSC).

This achievement is a step further in the company's international consolidation in the defense and security field, strengthening its leadership in the provision of a wide range of services that are vitally important for both European defense agencies and NATO.

Demonstrating the applications of artificial intelligence for the defense sector

In late 2021, GMV signed a contract with the European Commission to demonstrate the benefits of the use of artificial intelligence (AI) in the defense sector (AI4DEF).

Within the framework of this contract, involving a consortium of 20 companies, GMV is leading a work package that consists of the adaptation of AI standards to the military field, as well as the application of ethical and legal aspects of using it in the defense domain.

GMV also leads one of the use cases that consists of improving each phase of the Task, Collect, Process, Exploit, Disseminate (TCPED) intelligence cycle through the use of AI techniques, resulting in faster, more reliable, and more appropriate situational awareness and decision making.

In September, a first demonstration of the initial developments of the AI4DEF project took place in Copenhagen. It

was attended by representatives of several defense ministries, as well as the consortium members. At the demonstration, GMV gave a general presentation on the use case it's leading and an online demonstration of the artillery impact-detection capability on the ground.

For the next demonstration, which will take place in April 2024, the plan is to show how the characterization of the impacts detected can be used to estimate the trajectory of the shot and how the shooter's position can be inferred from the confluence of these trajectories.

GMV's experience in the field of Joint Intelligence, Surveillance and Reconnaissance (JISR) intelligence tools allows it to take on new capabilities. In the case of the AI4DEF project, it offers proof of concept for the integration of artificial intelligence modules in the already existing JISR tools (CSD, Sierra Tools).

GMV attends international SEGUREX 2023

From 10 to 12 October, GMV showcased its expertise in the defense, security, and space industries at this event in Lisbon, Portugal, highlighting the development of command, control, and intelligence solutions that address the new challenges and opportunities posed by satellite navigation in the context of increasingly connected and intelligent mobility.

At its booth, GMV presented some of its most relevant solutions, such as ASGARD, a maritime GNSS receiver based on the European satellite navigation system Galileo that uses the authentication service, and SAFETERM, a system that leverages state-of-the-art artificial intelligence technologies to enhance the safety of remotely piloted aircraft systems (RPAS) in emergencies, ensuring safer flight termination. There was also a focus on cybersecurity and civil-military cooperation in space, as well as defense and security-sensitive sectors.

On the last day of SEGUREX, Teresa Ferreira, Director of GMV's Satellite Navigation Systems in Portugal, participated in the session "Companies that Found Portugal as a Business Opportunity".

Teresa highlighted the effective potential of GMV's technological solutions in space, defense and security, intelligent transportation systems, and cybersecurity. Citing GMV's globally integrated work dynamic, she stressed the importance of investing in talent and praised the team's high level of competence.

SEGUREX is increasingly seen as a technological event focused on the trends of its different market segments. Its dynamic growth with the constant emergence of new companies, the range of solutions presented, and the remarkable technological and innovative character of the equipment are of strategic importance for SEGUREX. This year's event brought together around 100 companies, institutions, and official bodies and around 10,000 professionals in a wide range of activities that included conferences, workshops, demonstrations, and business meetings.

GMV delivers intelligence sharing capability to Swiss Armed Forces

Under a contract with Systematic GmbH, GMV is providing the Coalition Shared Database (CSD) capability required by the Swiss Armed Forces as part of its intelligence system upgrade (Project AFIS) to share intelligence products with other NATO countries.

The solution is based on GMV's ***CSD Sierra*** product, which implements the STANAG 4559 AEDP-17 interoperability standard (IPL: Intelligence Products Library). Thanks to this solution, the Swiss Armed Forces are able to catalog and archive their intelligence products and exchange them with other countries via the NATO coalition and allied countries. To this end, GMV is also providing a module to ensure the dissemination of information between security domains (X-Domain) by integrating ***CSD Sierra*** with Koch IT's Unidirectional Data Gateway (UDG).

As part of this project, in addition to supplying the ***CSD Sierra*** system itself, GMV is offering technical consultancy, both for the design of the architectural solution and for the system's security accreditation, as well as during deployment and the various phases of test validation (in factory, integration, and system acceptance). In August, the system successfully passed the system acceptance tests (SAT) ahead of the final SAT (including X-Domain capability) scheduled for February 2024.

The project is part of GMV's Joint Intelligence Surveillance and Reconnaissance (JISR) initiative, which the company has been working on for more than a decade. The JISR initiative synchronizes and integrates the planning and operation of all information collection capabilities with those of exploitation and processing, and the dissemination of the resulting information to the right recipient, at the right time and in the right format.

GMV develops training needs analysis for European Defence Agency communication and information systems

GMV is developing European Defence Agency communication and information systems for training needs analysis. This project, led by the GMV Portugal team in collaboration with Vedette, started at the beginning of 2023 and will be completed by the end of May 2024, when a stakeholder presentation will be held to showcase the new training needs analysis (TNA).

In the future, the security environment will be more dynamic, faster-paced and less predictable. This has led NATO to focus its capability development efforts on collective defense. Communication and information systems (CIS) are critical to effective command and control (C2) and information sharing among decision-makers. At the strategic level, CIS structures support these decision-makers in managing the structures that make up the integrated crisis management communication and information system (ICMCIS) of individual nations, the EU, and NATO.

Since 2014, new training lines have gradually been introduced in a European action plan that integrates academia at its core and industry in its full practicability.

TNA is a crucial step in the development of capabilities in the area of communication and information systems, as it identifies the shortfalls in EU CSDP CIS training and their operational impact on EU-led missions and operations, and proposes appropriate corrective measures. The Cyber Defence TNA was instrumental in developing the feasibility study for the Cyber Defence Education, Training and Exercises (ETE) Platform at the European Security & Defence College (ESDC).

Properly addressing the training dimension of the EU CIS for CSDP will significantly facilitate the achievement of the three strategic CIS objectives: CIS support for C2 at the strategic/operational level; CIS support for military planning and conduct capability (MPCC); and CIS interoperability with EU Member States and partners.

EU CIS training skills and specialized training pathways are essential to ensure a sufficient supply of skilled CIS personnel capable of supporting a modernized digital battlespace.

GMV's experience in communication and information systems for command and control enables a profound perception of the needs in terms of training and possible gaps existing today.

3rd ASPROMEC Conference on Machining

On Thursday, 23 November 2023, the 3rd Conference on Machining took place in Madrid. The event was organized by ASPROMEC, the Association of Professionals for the Competitiveness of Machining, which was founded in 2010 with the goal of improving the competitiveness of the local industrial machining sector and facilitating cooperation among machining companies.

The conference's schedule revolved around three major themes: aeronautics (Trends in Aeronautics); defense (How to become a leader in complex defense systems); and digital transformation (Are you in time for the future? When your colleague is ChatGPT).

GMV had a significant presence in the second section, with the participation of Manuel Pérez Cortés, GMV's Defense and Security General Manager, at the discussion on "Defense: a market niche with great opportunities," where he highlighted GMV's leadership and key role in the defense and security sector through the development of innovative solutions.

GMV will participate in the refurbishment of the Spanish Army's 155/52 SIAC and M109A5 howitzers

In November, the Economic Affairs Headquarters of the Spanish Army's Logistics Support Command awarded Santa Bárbara a contract for the maintenance of the SIAC and V07 model 155/52 howitzers and a limited number of M109A5s for area of operations, both currently in service in the field and coast artillery units, respectively.

This project is part of a framework contract in which the Spanish Army will invest more than €36 million to update all its howitzer systems and the associated elements.

As part of this maintenance contract, Santa Bárbara Sistemas has awarded GMV a contract to supply 75 navigation systems (***ISNAV***), interconnection equipment with ***TALOS*** (SBT), and portable ***TALOS*** equipment to enable the mobility of the gun captains.

The ***ISNAV*** system is GMV's an advanced navigation and time reference solution for ground systems. ***ISNAV*** provides data on position, velocity, attitude, and time in a variety of formats to offer an integrated navigation and synchronization solution.

SBT is a piece of equipment designed by GMV that allows for remote control of all the howitzer's elements, enabling the mobility of the operators and maintaining 100% operability.

TALOS capabilities include fire support and maneuver planning with decision support tools for choosing the line of action, conducting the maneuver with integrated fire support, friendly force tracking (FFT) and monitoring maneuver tactics, obtaining targets, fire management, and fire execution and observation, up to arms-system level in the case of mortar and field artillery fire.

Opinion

A successful approach to DORA compliance

The implications and challenges of DORA will play a major transformative role

On 17 January 2023, the new Digital Operational Resilience Act (DORA) came into effect. This European Union (EU) regulation seeks to improve the security and resilience of financial institutions and their ICT service providers against digital disruptions and threats. It will apply to all financial institutions operating in the EU, including banks, investment companies, trading platforms, central counterparties, and other financial market infrastructure, and will be mandatory starting on 17 January 2025.

The implications and challenges of DORA will play a major transformative role for GMV in terms of the architecture of financial institutions' processes and systems. Here are some of the main aspects:

- **Integration of ICT risk at the highest level of management**, establishing a model for calculating such risk in the event of any changes in the organization's ICT processes, systems, and providers.
- **Comprehensive reformulation of continuity strategies**:
  - **Specific response capabilities and processes** based on the type of incident.
  - **Model for calculating** the direct and indirect costs of the incident.
  - **Activity log** for before, during, and after the incident.
  - **New strategies for segmentation and immediate disconnection** of networks and assets.
  - **Structured and auditable plan** for testing the entire system, supported by a continuous improvement plan.
- **Expanded inventory of critical services** and assets, mapping support from systems and external suppliers and identifying sources of risk.
- **Strong commitment to training and awareness-raising** in relation to resilience and cybersecurity.
- **New relationship model with essential ICT suppliers**. Organizations will be required to design and deploy exit and redundancy strategies for suppliers that support essential functions.
- **Structured, uniform models for operations management**. Shared models will be established for incident classification, logging, impact calculation, and notification, with the obligation to report such events to the competent authority and inform other organizations in the sector.
- **Focus on crisis communication and management**, establishing specific positions and roles for this purpose and strengthening automation mechanisms, including notifications to the institution's own customers.

GMV believes that three key levers will be essential. The first consists of adopting a comprehensive framework of processes covering ICT operations and security in a natural way, while allowing for the adoption of global GRC (governance, risk, and compliance) solutions for risk monitoring at the same time. The second seeks to focus on data through the creation of a resilient data lake that will make it possible to integrate information sources and apply artificial intelligence in decision-making. Last but not least is the promotion of hyper-automation in all activities and systems linked to the activation of response and recovery plans.

Ángel García-Madrid
Head of Resilience Services Business Continuity of GMV´s Secure e-Solutions sector

GMV and Mediaset, cybersecurity in good company

Last October in Madrid, SIC magazine held a new edition of SECURMÁTICA, the Spanish Global Conference on Cybersecurity, Information Security, and Privacy. This year's theme was "In good company."

GMV and Mediaset España gave a talk on "Quality cybersecurity for 30 years in good company." Ramón Ortiz, head of security at Mediaset, and Óscar Riaño, head of CERT at GMV, shared how to take on complex aspects of cybersecurity, together with a guarantee provider, in the specific environment of a leader in entertainment production and broadcasting such as Mediaset España.

Since Telecinco started broadcasting in 1990, Mediaset España has undergone a major transformation. Ramón Ortiz and Óscar Riaño went over the main cybersecurity risks of the current content production and broadcasting environment, as well as the measures this process should implement to avoid impacts from cyberattacks, such as possible broadcast interruptions, signal interference, and the current problems linked to fraud in paid online content platforms.

Ramón Ortiz presented different examples of cyberattacks that may take place in this environment and how cybersecurity has become a key part of the company's strategy, detailing the initiatives that have been carried out over these years and how GMV has been an essential trusted supplier in these projects.

Óscar Riaño, meanwhile, presented the most innovative aspects of the service provided by the specialized GMV-CERT unit in relation to monitoring the cybersecurity of the company's assets, as well as the response to detected cybersecurity incidents.

Cybersecurity in the supply chain, a main focus of the 45th CEL Conference

Last October in Madrid, the Spanish Logistics Center (CEL) held the 45th CEL Conference, a leading event in which experts and professionals from the logistics sector share opinions and expertise on the current and future challenges companies are facing in this area and how cybersecurity is emerging as a key element in the management, protection, and operational continuity of an increasingly digitalized and interconnected sector. The event allowed GMV to position itself as a crucial player by impressing upon participants the importance of cybersecurity in the supply chain.

Javier Hidalgo, Solutions Architect and Cybersecurity Expert at GMV, stressed a core principle: never pay for a cyberattack. This approach is essential in a world in which cyber threats are constantly evolving and pose a clear risk to companies' operational continuity. Cybersecurity should not be seen as an additional expense but as an essential investment to protect our assets, our integrity, and the trust of our customers and partners.

In his presentation, Hidalgo also emphasized that cybersecurity is more than a simple protection measure; it's a strategic component that can make the difference in an organization's competitiveness and resilience. GMV shares this assessment, and strongly believes that adopting a proactive stance towards cybersecurity is key to mitigating risks and ensuring a secure and reliable supply chain environment.

Collaboration agreement between GMV and GlobalSuite Solutions

GMV and GlobalSuite Solutions, an experienced provider of governance, risk management, and compliance (GRC) solutions, have announced a new partnership. By incorporating GlobalSuite® into its work methodology, GMV's consulting department will benefit from significant process automation, more consistent and efficient management, and a centralized information repository that will provide quick access to key data.

In addition, real-time monitoring will provide on-the-spot visibility of the status of operations, enabling fast and accurate responses. The tool increases operational efficiency by freeing up resources spent on manual tasks, optimizes productivity, improves profitability, and provides greater security through built-in controls that ensure the integrity and confidentiality of information.

The synergies created by this partnership will enable more organizations to benefit from GlobalSuite Solutions' wide range of user-friendly solutions, which can be implemented to improve business continuity standards, assess regulatory compliance in the organization, and generate reliable and up-to-date reports for data-driven decision making.

"This strategic partnership will not only open the door to unprecedented expansion in various sectors of the Spanish market, but will also raise the quality standards for governance, risk management, and compliance in these sectors," says Antonio Quevedo, CEO of GlobalSuite Solutions. "This confidence comes from our ability, in partnership with GMV, to provide our customers with tools that not only strengthen their business continuity and optimize regulatory compliance, but also provide accurate and

secure reporting, which is essential for making sound strategic decisions."

"The addition of GlobalSuite Solutions to our partner portfolio strengthens our risk management services, allowing us to offer more customization options, increase our efficiency, and deliver more value to our customers," says Nathalie Dahan, Partner Strategy Manager of GMV´s Secure e-Solutions sector.

The importance of cybersecurity in business environments

In October, GMV participated in the seventeenth edition of ENISE, the International Meeting on Information Security, held by the National Institute of Cybersecurity (INCIBE) in the city of León.

This year, the event celebrated INCIBE's 017 service, "Your Cybersecurity Helping Hand," which allows it to connect directly with general public and private businesses to answer their questions and help solve their problems in the field of cybersecurity.

The conference is a unique opportunity to highlight the critical importance of cybersecurity in the current business world, and offers a forum to listen to the opinion of experts in the cybersecurity sector and interact with industry professionals from Spain and abroad.

GMV had a stand in the exhibition area and participated in various expert panel discussions. Nathalie Dahan, who works on Business Development and Partner Strategy for GMV's Secure e-Solutions, participated in the round-table discussion on the "Internationalization of SMEs in the Cybersecurity Sector," and Mariano J. Benito, Privacy and Cybersecurity Ambassador in the same department, gave a workshop on "Cloud Security: Adapting to NIS2 in the Cloud with Cloud Control Matrix."

12th edition of the Study on the State of the Art of Cloud Security

On 16 November, the 25th edition of the International Information Security Workshop, organized by ISMS Forum, took place with the theme "Building Effective Cybersecurity Privacy Governance: The Path to Resilience."

At the event, which took place in Madrid, leading cybersecurity experts met to highlight the main issues that senior management should be considering in relation to cybersecurity and privacy governance in organizations.

Mariano J. Benito, Privacy and Cybersecurity Ambassador for GMV's Secure e-Solutions sector and Coordinator of Technical Operations Committee at the Cloud Security Alliance's Spanish division, together with Alberto Bernaldez, Head of Security & IT Governance in Europe for Liberty Mutual Insurance, and Cándido Arregui, Information Security Officer at Spain's airport management company AENA, gave a presentation on the results of the XII Estudio del Estado del Arte de Seguridad en la Nube (12th Study on the State of the Art of Cloud Security).

This edition of the study, which has been carried out yearly since 2012, detected how organizations have incorporated cloud services at the core of their operations, both for email services and for office automation and file storage. In particular, there has been a notable increase in the use of cloud-based security services, which in turn, as Benito explained, has led to an increase in the security expectations and demands of cloud users, proportionate to the criticality of these services.

The conclusions of the study also describe organizations' growing aversion to users implementing cloud-connected applications or using cloud services in the company environment without the knowledge or permission of the IT department ("shadow IT"), and commend organizations' executives for their increased awareness of the role of security in the adoption of cloud services.

GMV participates in the Autonomous University of Madrid's "Today's visitor is..." program

On 30 October, GMV participated in one of the events for the "Today's visitor is..." series on innovation at the Autonomous University of Madrid (UAM), and challenged the UAM's researchers to come up with possible answers to a yet unsolved mathematical problem.

During his presentation, Juan Jesús León Cobos, Manager of Products and New Developments of GMV´s Secure e-Solutions sector, explored the complexity of the problem from both a scientific and business perspective, highlighting the real-world practical applications that would be possible if it was solved. In this regard, he emphasized GMV's budgetary commitment to innovation, as well as its openness to collaboration and the search for solutions together with the academic community.

The event was made possible thanks to the initiative led by the UAM's Vice-Rector's Office for Collaboration, Innovation, and Culture, whose main goal is to create an environment that fosters communication between academia and the productive sector. This collaboration seeks to identify the main areas of interest in research, encourage constructive discussions and conversations with university research groups, and come up with viable ideas for solutions to the challenges posed.

Innovation in cybersecurity and cryptography, topics addressed by GMV at the STIC CCN-CERT Conference

"Sharing to win" was the central theme of the 17th STIC CCN, a major cybersecurity event in Spain that this year focused on two core values of cybersecurity: collaboration and cooperation.

The event, which was held from 28 to 30 November, also featured speeches by the Minister of Defense, Margarita Robles; the Secretary of State and Director of Spain's National Intelligence Center (CNI) and National Cryptology Center (CCN), Esperanza Casteleiro; and the Secretary of State for Digitalization and Artificial Intelligence, Carme Artigas.

As usual, GMV was there to share its projects and knowledge in the field of cybersecurity, where it has been a pioneer, "working on these issues since 1994, when the field was in its infancy," as GMV's Secure e-Solutions General Manager, Luis Fernando Álvarez-Gascón, noted in the panel discussion on cybersecurity entrepreneurship and innovation. Over these years, the company "has led the way with visionaries and leaders who have created a school of thought, and today, GMV is working on projects with quantum technology applied to cybersecurity, as a multinational company", he added.

In fact, the application of quantum and post-quantum technology to improve cybersecurity was the main topic of the presentation given by Enrique Crespo, Head of SKMF Cybersecurity for Galileo in GMV's Secure e-Solutions sector, who presented several specific use cases such as CUCO, a pioneering GMV-led quantum computing initiative at both a national and company level and Caramuel, the first geostationary quantum key distribution mission, in which GMV is playing a key role.

ATMIA Latin America summit

In November, GMV participated in ATMIA Latin America 2023, a summit that took place in Mexico City and brought together a large number of representatives of the region's ATM industry. At the event, GMV was able to meet with clients and suppliers and share its solutions and services for the sector that can help them take on present and future challenges.

Together with Cyttek, an approved partner for GMV's market-leading ***Checker ATM Security solution***, the company had the opportunity to present its extensive knowledge of cyber threats and cyber protection for ATMs.

Transforming cybersecurity thanks to AI-assisted pentesting

The “it-sa Expo and Congress,” an event devoted to IT security, took place in Nuremberg from 22 to 24 October. GMV sponsored the event and gave a talk on “Pentesting: Using AI and ChatGPT to Compromise Computer Networks,” in which it highlighted its pioneering role in harnessing the power of artificial intelligence to strengthen cybersecurity.

GMV’s innovative approach to penetration testing (“pentesting”) shed light on how artificial intelligence (AI) can be used to make cybersecurity more efficient and effective in the fight against ever-changing cyber threats.

GMV unveiled its innovative techniques and showed how AI can be used to make cybersecurity more efficient and effective in the fight against cyber threats. AI is able to quickly analyze complex network structures and generate informed reports. Incorporating generative AI into the process adds human comprehension and contextual awareness, which allows pentesters to better simulate real-world attacks. It also frees up valuable time and resources, thus allowing cybersecurity professionals to focus on developing proactive strategies to protect networks against known and emerging threats.

GMV’s pioneering work in AI-assisted pentesting is the start of a new era in the constant fight against cyber enemies. As the industry evolves, GMV’s dedication to innovation is cementing its place as a leader in the cybersecurity sector.

GMV CERT is a runner-up at the 2023 IngenierosVA awards

On 26 October 2023, at the auditorium of the Miguel Delibes Cultural Center in Valladolid, the Professional Association of Technical Industrial Engineers of Valladolid (IngenierosVA) held the sixth edition of the Industry Awards, which recognize innovation and excellence in companies that are part of this industry. GMV was shortlisted for the Industry category thanks to the excellence and innovation of its Computer Emergency Response Team (CERT).

Since it was established in 2008, GMV’s CERT has been an example of business success as a result of its evolution and growth over these years providing its services to guarantee the cybersecurity of public and private organizations. Based at the Boecillo Technology Park in Valladolid, GMV’s CERT has been expanding to new locations such as Madrid, Barcelona, and Bogota, and has Spanish and international clients from all different sectors.

GMV’s CERT seeks to provide a 24/7 360º managed information security service that makes it possible to take on the major challenges in cyber risk management, with a commitment to innovation and differentiation to be more competitive at home and abroad. The center has earned the most demanding certifications, as a member of the Forum of Incident Response and Security Teams (FIRST), the leading international organization in this field, as well as a Gold member of the recently created National Network of SOCs (RNS), an instrument created by Spain’s National Cryptology Center (CNN) to coordinate collaboration and information sharing among cybersecurity operations centers in the Spanish public sector.

2nd HTO Conference: cybersecurity in ubiquitous healthcare and collaborative research

What are the benefits to patients of the new healthcare model resulting from the integration of digital technology? What are the risks and how can we manage them? Digitalization is becoming a reality in healthcare, and as a leader in the development of digital systems and products, GMV is involved in this process to improve human health. The 2nd HealthTech Observer (HTO) Conference, organized by GMV in collaboration with the National Association of Health Informers (ANIS), focused on challenges such as cybersecurity, data governance, and connectivity between information systems of health centers and hospitals, using a liquid healthcare model.

The event was attended by leading experts such as Miguel Ángel Benito, Information Security Coordinator at the Balearic Islands Health Service; Luis Pérez Pau, European Chief Information Officer at FutuRS, a company in the Ribera Salud Group; Óscar Riaño, Head of GMV’s CERT; Francesc García Cuyás, Director of Digital Strategy and Data at Sant Joan de Déu Hospital in Barcelona; Inmaculada Pérez, Director of Digital Health at GMV’s Secure e-Solutions; and Alberto Estirado, Director of Information Systems and Digital Transformation at HM Hospitals.

GMV presented two proposals to address the challenges of digitalization: the liquid CERT model, described as a digital incident response center capable of monitoring the entire flow of health information and helping to restore service quickly, and federated research networks based on artificial intelligence (AI).

The new model of patient care based on e-health collects and analyzes vast amounts of health data to facilitate personalized medical treatment, driving the shift towards what is known as personalized precision medicine. For this to work, the cybersecurity of the systems involved must be ensured and people’s health data must be protected to safeguard their privacy. This is crucial because, according to Óscar Riaño, Head of GMV’s CERT, “digital availability in healthcare is proportional to people’s quality of life.”

Accessibility and quality of care can be guaranteed by the “liquid CERT” incident response center proposed by GMV, which monitors the entire flow of health data and responds to any incident in order to restore service as quickly as possible. Similarly, the use of big data in healthcare is possible with tools such as GMV’s ***U-Tile***. This development, which uses privacy-enhancing technology, breaks down the barrier that proprietary companies can pose to research by training algorithms in their facilities without having to take their data off-site. Robust governance is ensured, thus preventing loss of privacy and lack of trust among patients.

The conference concluded that digitalization can improve the quality of services by reducing medical mistakes, streamlining administrative processes, and optimizing resource management. To optimize outcomes, this process must be backed by strong cybersecurity measures and effective data governance, ensuring connectivity between systems and taking an ethical and responsible approach to the challenges associated with the use of advanced technologies such as AI and big data analytics.

Diagnosing Alzheimer's disease based on spontaneous speech is now a reality thanks to AI

■ Research on diagnosing Alzheimer's disease, carried out as part of TARTAGLIA, a GMV-led project to support research with federated networks and AI in healthcare systems, concludes that speech analysis could be a less invasive and more economical tool for detecting the onset of the disease, opening up more screening options. This would allow for early monitoring of cognitive impairment and identification of those most at risk.

Currently, lumbar punctures are the only way to gain information on possible decompensations or abnormalities in the process of certain proteins involved in the cell cycle that have been detected as the origin of the disease. This intervention to obtain cerebrospinal fluid is not without its risks, such as a possible infection or hemorrhage. If the disease is more advanced, when one of the proteins (beta amyloid) forms plaques in the brain, an MRI is needed, and this imaging test can cost anywhere from €200 to €500.

That's why the TARTAGLIA project, with the goal of finding non-invasive and more affordable ways to detect the onset of the disease and broaden screening possibilities, carried out joint work involving Dr. Sergi Valero's research team at the Ace Alzheimer Center Barcelona, alongside specialists from acceXible and tech teams responsible for the federated network created as part of GMV's project. The study analyzed 88 sound factors from the speech of patients diagnosed with mild cognitive impairment, applying artificial intelligence strategies to assess these psychoacoustic factors without taking into account lexicon or syntax.

The findings from this research on predictive models for early detection pave the way for creating less invasive diagnostic tools, enhancing the ability to detect Alzheimer's in its early stages or even before symptoms of the disease become apparent. The added value of this study is its potential replicability at other centers worldwide, enabling them to delve deeper into understanding the connection between specific speech factors and the presence of the beta-amyloid protein. As Dr. Valero explains, "These results pave the way for enhancing diagnostic tools with non-invasive tests, enabling the creation of a cost-effective and non-invasive physiopathological profile for individuals with dementia. This could facilitate the monitoring of cognitive decline and the identification of at-risk individuals."

Funded by the European Union
NextGenerationEU
Plan de Recuperación, Transformación y Resiliencia

Opinion

A rainbow in the fog of Alzheimer's disease: digital technologies

When it comes to health, statistics such as those provided by the Spanish Neurology Society—there are 800,000 people with Alzheimer's in Spain and every year some 40,000 new cases are diagnosed—and the Alzheimer's Disease International (ADI) federation—by 2050 over 131.5 million people will be living with this disease—seem to cast a shadow on the well-being achieved by the advanced societies of the 21st century. The significant progress in pharmacological and health research made over the course of centuries hasn't yet been able to clear the fog that clouds the memory of Alzheimer's patients.

Major efforts are being made to diagnose the early stages of the disease with the goal of slowing its progression, focusing on a drug that can stop it. And digital technologies are emerging like a rainbow on a stormy day, since tools such as big data and artificial intelligence allow us to extract information from massive volumes of data on patients with this disease in a way that would be impossible without this technology. Being able to research a larger sample means that clinical trials can offer previously unknown results.

The use of these technologies requires contributing a vast amount of data, which comes up against significant legal obstacles, as patient health information is particularly sensitive and is protected by laws such as Spain's Law on the Protection of Personal Data and Guarantee of Digital Rights (LOPDGDD) and the European Union's General Data Protection Regulation (GDPR). That's why the launch of consortium research projects, such as TARTAGLIA,* whose overarching goal is to further the use of artificial intelligence in health research by creating the first federated network of health data in Spain, brings hope for overcoming these barriers.

NON-PHARMACOLOGICAL APPROACH

Meanwhile, as the rainbow fades and gives way to sunny days and we wait for the fog clouding the memory of our loved ones to clear, hoping that research will find the cure, it can be hard to provide good company during this process. Coming to terms with the diagnosis and the new reality is challenging, both for the patient and for their family members. Accepting the gradual "loss" of the loved one who was and embracing and supporting the person they are becoming seems to be the best way to navigate what is new and unchartered territory for most people.

There are several guides and documents with recommendations on how to "accompany" an Alzheimer's patient in their decline, from manuals to help maintain cognitive functions not yet affected by the disease, with memory training programs to improve several neurocognitive areas, to cognitively stimulating leisure activities such as playing a musical instrument, making arts and crafts, reading, writing, or doing puzzles. All these exercises help keep the healthy neurons in good shape.

It's understandable that family members struggle with their loved ones not recognizing them or remembering recent events, but perhaps the healthiest thing for everyone is to accept the new situation and help the patient cope with it as best as possible, accompanying them in their losses and helping them engage in activities to preserve their cognitive reserve. At the same time, since they need their caregivers and family members to offer them stability and joy, all the people around them should work on constructive acceptance.

Thanks to digital technology, projects such as TARTAGLIA and many others like it in the field of genetics and biomarkers, the application of potential therapies, and the emergence of digital technologies, offer a rainbow in the fog of Alzheimer's disease.

Maole Cerezo
Adviser for Marketing and Digital Health Outreach of GMV's Secure e-Solutions sector

** TARTAGLIA is part of the Digital Spain 2025 Agenda and National Artificial Intelligence Strategy's Artificial Intelligence R&D Missions program, and is funded by the European Union through the Next Generation EU funds. One of its five research projects focuses on the early detection of Alzheimer's using digital technologies.*

Digital technologies and information: the 18th Conference of the National Association of Health Informers

Digital technologies have brought about a radical transformation in how media content is produced, distributed, and consumed. Digital tools such as Perpexitly, Bigvu, Scrip AI, Simplified, and Youcut, as well as new audiovisual forms of journalism made possible through new digital formats such as podcasts, short clips, and video news, are now commonplace for journalists and storytellers, just as the professionals of the past used pica typographic units. Artificial intelligence (AI) algorithms help the media personalize the user experience by recommending certain content based on the reader's preferences and habits. They also use AI to generate automated news reports. And journalists use online tools for research and verification with the goal of fighting disinformation and fake news.

While the media and journalists have embraced digital transformation and the changes that come with it, as the Minister of Health, José Miñones, remarked at the opening of the 18th Conference of the National Association of Health Informers, the media still has an essential role to play in promoting good health and preventing diseases.

GMV, as a leading digital health technology company, participated in the talks and workshops at the conference, which took place in Mallorca at the end of October. The company also unveiled a challenge for the next edition: the creation of a news sharing workshop bringing together digital and traditional tools to tell the news stories about the emergence of artificial intelligence and address the role of data in 21st-century journalism. Big data and AI offer conclusions and evidence of great interest for investigative and verification journalism.

ALISSE is presented at the ESA's Industry Working Days

GMV participated in the conference program for the special edition of the Industry Working Days event organized by the European Space Agency's (ESA) General Support Technology Programme (GSTP), which took place in Poland in September to celebrate 30 years of innovation and innovative technology.

Carlos Illana, Head of Product Development of GMV´s Secure e-Solutions sector, and David Miraut, Technical Lead for Medical Imaging Computing for GMV's Secure e-Solutions, presented the results of the "Autonomous uLtrasound Improvement SyStEM" (Alisse) project, carried out with the participation of the Emergency Radiology Section of the Radiology Service at the Hospital La Paz, space medicine specialists from the ESA, and researchers from the Complutense University of Madrid's Nuclear Physics group. The goal of this innovative project was to develop an artificial intelligence system offering diagnostic imaging for astronauts, as well as for people in other places that are far from hospitals or imaging centers.

Opinion

How does the exposome affect people's health?

The concept of the exposome, a term coined in 2005, refers to all non-genetic external and internal factors, and their corresponding biological responses, that affect our health and well-being over the course of our lives. The external exposome consists of exogenous factors that can influence our health, such as air pollution, noise, radiation, the presence or absence of green spaces, income levels, and the neighborhood in which we live. Meanwhile, the internal exposome refers to all the biochemical markers that allow us to measure the effects of the exposure.

To measure the exposures that impact our health, that is, to understand the exposomes of individuals and groups of people, we propose a strategic technological approach: design secure federated networks connecting massive data spaces, making it possible to train more precise and specific mathematical models in a secured and shared way across the network's members.

This process will lead to artificial intelligence algorithms that take into account patients' socio-demographic context, giving us highly valuable tools in chronic disease prevention. By both taking a population analysis approach and including these data in the different precision medicine programs, prevention will be enhanced, potentially improving people's quality of life and optimizing healthcare resources.

Although science shows that the exposome is largely responsible for the current prevalence of chronic diseases, this does not detract from the importance of the genome; rather, it is the combination of the two factors that gives us the full picture of disease causation.

CHRONICITY AND EXPOSOME

Chronic diseases affect 54.3% of the Spanish population over the age of 15 and account for 90% of deaths. Extrapolating this percentage to the healthcare resources needed to assist these patients, it will be necessary to invest €28 billion over the next few years to address the challenge of the sustainability of the healthcare system, as the CH2025 platform suggests in its report on chronic disease in Spain.

The increase of chronic conditions in our country can largely be explained by its aging population. Spain is the fifth country in the European Union in terms of average age, and by 2030, more than 30% of its population will be over the age of 65. Diabetes, cardiac disease, kidney failure, and mental health problems are the most prevalent complex chronic diseases.

However, given that not all chronic disease suffers belong to the "silver" generation, it should be noted that environment and lifestyle play a key role in our health. We'd all like to be fit as a fiddle, but many of the factors that influence our health are out of our control. Climate, access to healthy food and medicine, and air quality are just some of the external exposome factors that play a key role.

Miguel Ferreiro
Bioinformatics specialist and health analyst of GMV's Secure e-Solutions sector

GMV will supply the new central ITS management system to the regional government of Castilla y León

The system will integrate all public transportation information and manage the services that must be generated based on this information for the administration, operators, and citizens

The Castilla y León Regional Government has contracted GMV to supply and implement an ITS central management system that will integrate all public transportation information for the upcoming launch of the concessions that will be part of the New Concessional Regular Public Road Passenger Transport Map of Castilla y León. It will also manage all services that must be generated based on this information for the administration, operators, and citizens, with the aim of improving the technological systems associated with regional public transportation.

The central management system, funded by the Recovery, Transformation, and Resilience Plan, Is part of the plan defined by the regional government to achieve the goals established in the Transport Reorganization Plan.

The basic version of the system must be operational before the new concessions begin their operation. Consequently, the implementation, with a duration of 22 months for supply and two years of warranty, will be structured in several phases, ensuring that the first phase is executed in time for the start of operation of the new concessions.

The project, representing the highest level in the ITS architecture defined by the regional government, includes the supply of a central system capable of integrating data from multiple operators. It consists of a back-end with functional services and a front-end for user management. The control center includes electronic fare collection CAD features, traveler information, and integration with the local CAD systems of other operators that make up level 3 of the regional government's ITS architecture.

GMV expands TMB's user information and surveillance system

After the contract in November 2021 for onboard user information and video surveillance systems for a fleet of 1170 vehicles, Transports Municipal de Barcelona (TMB) once again trusted GMV to deliver again at the end of 2022 and again, in October 2023, has chosen the company to expand the supply, representing a total investment of around 12 million euros.

The system, consisting of the onboard architecture that serves the set of systems through a versatile CPU, manages user information and the video surveillance system. Firstly, user information is provided through 29" and 21" panoramic screens that display information about the next stop, connections with other lines, recommendation messages, and the progress thermometer on the line with the next three stops. Soon, the screens will also show the transfer time in interchange areas, transportation incidents (in more of a visual thermometer view), the time remaining to the next three stops, and finally, points of interest near stops, such as shops, cinemas, theaters, hotels, and more. This onboard information is complemented by sound information for visually impaired people, activated by an ONCE device.

As for the video surveillance system, it includes interior cameras, exterior cameras, and cameras to record license plates and monitor bus lanes. Functionally, the system records all images from the cameras, and in the medium term, the cameras will enable intelligent video analysis for passenger counting, searches for lost objects, alerts for fallen passengers, and the construction of origin/destination matrices.

This recent contract reinforces the excellent results of the initial project, further strengthening GMV's position as a leading provider in ITS for TMB as one of the world's leading transportation operators.

GMV presents its latest products at APTA 2023

GMV took part as an exhibitor in this year's APTA TRANSform & EXPO, held from 8-11 October in the Orange County Convention Center in Orlando, Florida.

The EXPO, held every three years at the same time as the Annual Meeting of the American Public Transportation Association (APTA), is a prime showcase for public-transportation technology, products and services.

GMV presented its latest cutting-edge technologies developed to help public-transport operators keep to schedules, increase ridership and achieve other operational goals, as well as providing visibility in bus operations.

Among other developments, GMV introduced the high-performance on-board computer, ***GMV Hub***, capable of executing multiple onboard operations simultaneously on a single device. Another highlight was the EcoDriving solution, designed for real-time monitoring of driving quality. At APTA, GMV also showcased ITS Suite, its Fleet Management solution, which can be integrated into systems operating on local IT infrastructures or in the cloud. The software-as-a-service solution, Sync, geared towards managing small and medium-sized transportation fleets, was also featured.

Currently, over three hundred public transportation operators and managers in 35 countries rely on GMV's intelligent transportation systems. GMV's ticketing and control systems handle approximately four million contactless card transactions worldwide each day.

GMV will supply the Castilla-La Mancha regional government with the new digital interurban public transportation platform

This project, based on ***ITS Suite***, helps GMV to position itself as the leading technological provider for the region's public transportation

The Castilla-La Mancha regional government (JCLM) has contracted GMV for the digitization project of the interurban public transportation service in the Community, consisting of the implementation, launch, operation, and maintenance of a digital platform to improve the quality of current transportation services in the region.

The project, funded by the Recovery, Transformation, and Resilience Plan, has a 24-month execution period and must integrate information from the local CADs of concessionaire operators, as well as manage a fleet estimated at least 1,000 vehicles.

In this context, the project aims to:

- Have standardized and centralized information about all the services offered throughout the region.
- Provide real-time information to service users, reducing their waiting times at stops.
- Facilitate the purchasing process of public transportation services through advance sales and seat reservations.
- Encourage the use of contactless payment methods.
- Have more detailed and real-time control of ticketing to better manage operator compensation.
- Streamline the functions and tasks of the Directorate General of Transportation and Mobility of the JCLM.
- Facilitate the planning, design, and operation of transportation services through immediate diagnostics.

The new regional CAD will be supplied with information from the operators' CADs, which in turn comes from their onboard equipment, resulting in a meeting point for integrated mobility and reliable real-time information. This new regional CAD will enable the interoperability of possible different local CAD solutions that make up the interurban transportation network of Castilla-La Mancha. Specifically, the digital platform will mainly consist of these information systems: Global CAD management platform and user information system through a web portal and/or mobile application.

CAF Awards GMV the Contract to Supply the ITS on the New Trams in Alcalá De Guadaira

CAF (*Construcciones y Auxiliar de Ferrocarriles*) has awarded GMV the contract to supply the Intelligent Transport Systems (ITS) for the new trams operating in the Sevillian city of Alcalá de Guadaira, continuing the collaboration between both companies for various URBOS III tram projects that CAF is implementing in Spain.

The new agreement includes the supply of onboard equipment for six urban trains. The ITS elements that GMV will be supplying are the passenger information system, public address and intercom system, and CCTV video-surveillance system. along with the Ethernet communication networks being installed on those trains.

The passenger information system will be shown on LED panels, both front and side, connected to the system controller, and on 21.5" LCD panels located throughout the train. The onboard control equipment will generate both service information to be displayed and scheduled advertising content, thereby improving the visual experience for passengers during the journey.

The public address system features an intercommunication system with twelve IP intercoms per train, located near the doors, allowing quick passenger assistance in any emergency situation.

Finally, the video surveillance or CCTV system integrates an NVR digital recorder along with various types of IP cameras (interior, forward-facing, etc.). This system is complemented by a cabin monitor for the driver, which allows real-time viewing of any camera to monitor any event on board. All these systems will be integrated with the train monitoring and control system to receive the necessary control information and report their statuses and alarms.

As part of this supply contract, the applications corresponding to the control center will also be provided, which enables the management of both content for the Passenger Information System and images from the CCTV system of each train, among other features.

Rail technology and innovation at Rail Live 2023

From 29 November to 1 December, IFEMA hosted Rail Live 2023. GMV participated in this rail industry event, which is organized to showcase the latest in rail technologies and projects.

This year's motto was "Technology, Innovation & Strategy for the Entire Rail Supply Chain," and the key themes were sustainability, rail market liberalization, industry digitalization, and the drive towards a zero-carbon future.

The event featured over 300 speakers and more than 250 exhibitors from network and infrastructure operators from around the world, private sponsors, and industry associations, attracting upwards of 7,000 visitors. Technical visits to advanced rail technology sites were also organized for participants.

As a leading company in the design, development, and deployment of intelligent transportation systems for the rail sector, GMV did not miss this event and had a stand to showcase the latest updates to its ticketing system, as well as the new features developed for its ***SAE-R®*** product, a suite of applications that is already a leader in the field of AVLS systems (Automatic Vehicle Location System) for rail operations.

Opinion

AI and Public Transportation: Creating Inclusive and Sustainable Cities

Sustainable Development Goal 11, one of the 17 SDGs established by the United Nations, seeks to "make cities and human settlements inclusive, safe, resilient, and sustainable." This goal recognizes the vital role that cities play as engines of social and economic progress, as well as the challenges posed by urban growth, pollution, poverty, inequality, and climate change.

One crucial aspect of achieving sustainable cities is public transportation. It can contribute to improving mobility, accessibility, road safety, emissions reduction, and social inclusion for people living in urban areas.

The use of innovative technologies is revolutionizing public transportation and, consequently, urban mobility as a whole. Transportation management systems can be used to monitor and control services, improving operational efficiency. Additionally, real-time information systems provide passengers with information on schedules, delays, and traffic conditions, allowing them to plan their journeys effectively.

Electronic payment systems, such as smart cards and mobile applications, simplify the payment process and expedite passenger boarding. Surveillance cameras enhance security on vehicles and stations, creating a safer environment for users.

Furthermore, technologies like Wi-Fi, information screens, and mobile applications enhance the passenger experience, making the journey more comfortable and enjoyable.

Moreover, the advent of artificial intelligence in all technological domains represents a great opportunity for public transportation and urban mobility management in general. Efficient optimization of routes and schedules through AI algorithms reduces waiting times and improves on-time performance, creating a smoother experience for citizens. AI also enables precise predictions about travel patterns, facilitating more informed and sustainable urban planning to reduce congestion, decrease greenhouse gas emissions, and improve air quality in cities.

However, the use of AI also poses ethical, legal, and social challenges that must be addressed. One of them is cybersecurity regarding the protection of computer systems against malicious or accidental attacks that could compromise their operation or integrity. Cybersecurity is crucial to ensuring that AI applications do not jeopardize the safety or privacy of individuals.

Antonio Hernández
Business Development Manager for Transport & Mobility of GMV´s Secure e-Solutions sector

GMV, an expert in public transportation systems, AI technologies, and cybersecurity, is committed to the SDGs and will continue to invest in technological development as a key driving force for their achievement.

GMV will implement *SAE-R*® in the Warsaw Commuter Railway

The Warsaw Commuter Railway (Warszawska Kolej Dojazdowa, WKD) is a company with a history dating back to the early 20th century. The line was launched on 11 December 1927 as the first standard-gauge electric railway, built from scratch in the reborn Poland under the name of Electric Commuter Railways (Elektryczne Koleje Dojazdowe, EKD). In 1951, the EKD lines were taken over by the District Directorate of State Railways in Warsaw and renamed to the Warsaw Commuter Railway. Between 2000 and 2008, the company operated as the Polish State Railways Warsaw Commuter Railway (PKP Warszawska Kolej Dojazdowa).

Currently, the WKD is a company managing a separate urban railway system that is part of the Warsaw Public Transport (Warszawski Transport Publiczny) network. The WKD runs around 100 passenger connections daily and carries almost 4 million passengers per year on the route section Warszawa Śródmieście WKD – Podkowa Leśna – Grodzisk Mazowiecki (line 47) with a branch line Podkowa Leśna – Milanówek (line 48).

The company has been investing in modern rolling stock and infrastructure for many years, increasing the quality of the services it provides. As part of the ongoing project for extending the second track of the entire length of the WKD line and building new platforms equipped with dynamic passenger information panels, a decision has been made to replace the dynamic passenger information central management system with a new one. The contractors of the task chose to entrust this part of the awarded contract to GMV, who, under the concluded agreement, will implement the internationally recognized ***SAE-R***® system of its own design.

The ***SAE-R***® system will be integrated with geolocators installed in the WKD vehicles, which will send real-time data to the ***SAE-R***® system, where the data will be processed, and the system will calculate the ETA of each train for each of the 28 stations. The system will enable the management of the WKD passenger information and will feed data into almost 140 panels installed on platforms. In addition, thanks to the ***SAE-R***®, the WKD employees will gain access to new functional modules presenting the positions of trains in real time on a basemap and in a synoptic view.

The Warsaw Commuter Railway will be the second – besides the Warsaw Trams (Tramwaje Warszawskie) – user of the GMV's ***SAE-R***® software that is part of the Warsaw Public Transport network, which carries a total of almost 900 million passengers per year (buses, trams, subway, and commuter rail).

GMV presents its technological solutions for ITS at ExpoBus 2023

From 16 to 18 November, GMV participated in the latest edition of ExpoBus Iberia, the Road Passenger Transportation Trade Fair, which took place in Pontevedra (Spain).

The event, attended by over 2,000 visitors from 15 countries, presented the latest developments and innovations for the road passenger transportation sector. ExpoBus offered a wide range of activities covering all kinds of transportation: urban, long-distance, and occasional services.

At its exhibitor stand, GMV showcased its latest ITS technological solutions, such as the all-in-one ***DTD200*** console (which manages sales and fare validation, an operation support system, onboard information via screens and a public address system, video surveillance, and efficient driving), the ***TV100*** external validation system, and EP200 onboard equipment (managing the operation support system, onboard information via screens and a public address system, video surveillance, and efficient driving). Those attending the fair were also able to learn about technology that complements standard systems, such as the service planning solution, passenger information in outdoor locations, sales and reloading machines, and more.

In addition to the exhibition area, the fair also featured interesting talks such as "The situation of the industry and its companies in Spain," "The long-distance bus industry: legislative changes and debt solutions," and "Long-distance bus drivers."

GMV's presence at this trade fair highlights its leadership in the field of technological solutions for Intelligent Transportation Systems (ITS).

New positioning solution for autonomous driving based on GMV technology

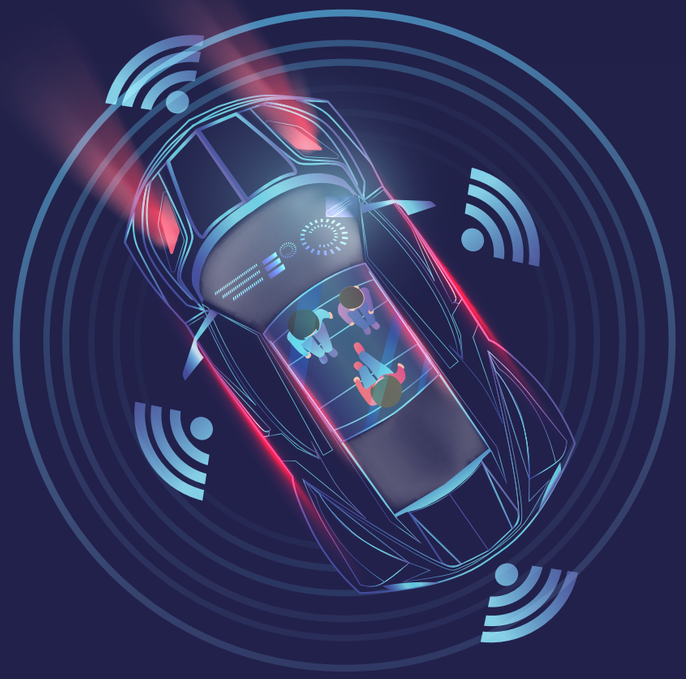
u-blox Introduces u-safe following its agreement with GMV to provide secure and reliable positioning solutions

u-blox, a global provider of leading positioning and wireless communication technologies and services, has unveiled u-safe, a comprehensive secure positioning solution for vehicles that is designed to accelerate the adoption of autonomous driving. u-safe intelligently leverages components proven in car navigation systems to offer Tier-1 suppliers and automotive manufacturers an advanced positioning solution for autonomous driving systems and Advanced Driver Assistance Systems (ADAS), boasting a significant track record of reliability and safety worldwide. Typical use cases include level 3 and higher ADAS applications, meeting functional safety and integrity requirements. Furthermore, level 2+ ADAS applications can also benefit from this solution to ensure that systems are future-ready and poised for a transition to higher levels of automation.

u-safe provides ASIL-B GNSS positioning to secure and highly sophisticated automotive systems and incorporates u-blox's A-9 ninth-generation technology platform (chipset and ASIL-B module), along with PointSafe, which utilizes GMV's secure positioning embedded software and correction service.

The introduction of u-blox's u-safe solution comes after the recently announced agreement with GMV, a leader in navigation and solutions for autonomous and connected vehicles. u-blox and GMV have joined forces as pioneers in functional safety, aiming to provide market-proven components with the same goal: bringing end-to-end secure positioning solutions to the automotive sector for consumer applications. Years of research and development have culminated in a mature solution for autonomous driving.

While GMV's high-precision and integrity solution is currently marketed in various sectors (precision agriculture, robotics, space missions, etc.), one of the most relevant is the automotive sector, meeting the demanding performance requirements for automated driving applications. In this regard, the collaboration's objective is to provide a complete, integrated, and ready-to-use solution, further solidifying GMV's position in the field of Advanced Driver Assistance Systems (ADAS) by combining GMV's expertise in high-precision and secure positioning with u-blox, a leader in positioning hardware.



The CDTI visits GMV to review progress on the R3CAV project

■ R3CAV (Robust, Reliable and Resilient Connected and Automated Vehicle for people transport) is a project subsidized by CDTI, funded by the European Union-NextGenerationEU, and supported by the Ministry of Science and Innovation. The project's consortium of companies, led by the Renault GROUP, is made up of Alsa, GMV, Indra, Masermic, MásMóvil, and SIGMA.

The project's primary objective is to research and develop new connected technologies, as well as to design and develop a new adaptive architecture of the future connected autonomous vehicle, capable of operating at different levels of autonomy, starting with advanced predictive driving assistance systems and extending up to being completely autonomous without a driver.

On the morning of November 14, a meeting was held at Renault's offices to review 2022 and the progress achieved in 2023 in the R3CAV project. Following the meeting, CDTI (Center for Industrial Technological Development) visited GMV's facilities at the Boecillo Technological Park in Valladolid, meeting the staff and learning about the materials used in the project.

During the visit, a live demonstration was conducted of GMV's intelligent speed control module based on C-V2X (Vehicle-to-Everything) communications and C-ITS (Cooperative Intelligent Transport Systems) services, which GMV implements using a Road Side Unit (RSU), two OnBoard Units (OBUs), two traffic lights, and their respective controllers. Two additional demonstrations were then performed, highlighting the anomaly detection system powered by artificial intelligence (AI) and the secure communication protocols. The visit concluded with a dynamic vehicle demonstration employing GMV's equipment for precise positioning based on GNSS.

All demonstrations showcased the successful performance and progress of GMV's activities in the R3CAV project.

Funded by the European Union - NextGenerationEU
Subsidized by the CDTI
This project has been supported by the Ministry of Science and Innovation

Barriers connected through V2I, moving towards smart mobility together with Road Steel (Gonvarri)

■ In recent years, substantial efforts have been undertaken to achieve maximum vehicle autonomy. A crucial aspect of this is vehicles' immediate awareness of its surroundings, which is heavily reliant on receiving information from other vehicles (via V2V communications) and intelligent road infrastructures (via V2I communications).

It is now common to hear about communication between vehicles and road infrastructures such as traffic signals or traffic lights. Going a step further, communication is also being established with road containment systems (metal barriers, impact attenuators, etc.) and removable barriers present in the infrastructure.

To that end, Road Steel (Gonvarri Industries) is developing a new generation of barriers that includes a control unit with various sensors to monitor the barriers. This control unit will be connected to RSUs (Road Side Units), and through the use case developed by GMV on both the RSU and OBU sides, utilizing the management and configuration tool for these devices (the C-ITS Hub), these barriers will be able to send information to vehicles traveling on the road. In this use case, GMV has integrated available information for the service using IEEE 802.11p and 3GPP (C-V2X)/PC5 technology, as well as applicable standards for the operational demonstration of the system.

The implementation and rollout of these communications aim to expand the information available to vehicles, thereby increasing their level of caution or anticipation of certain risk situations. On one hand, road users can receive alerts from barriers that have detected potential accidents that may be obstructing the road. On the other hand, concerning opening barriers, users can be notified if the existing barriers on the road are open, as well as changes to the road (e.g., new lanes being opened or closed or new lanes being opened for driving).

This represents another step toward the concept of connected roads, leveraging V2X connectivity wherein GMV is collaborating with Gonvarri, by contributing its technology to make progress towards safer mobility.

ELIV, the leading event for the automotive industry

This October, GMV participated in the International VDI Congress "ELIV," the world's leading conference on automotive electronics, software, and applications, which took place in Bonn, Germany. The Congress has been on the cutting edge of vehicle electronics since the 1980s, making it a key event for spearheading emerging trends in the automotive sector. As the industry becomes increasingly complex, ELIV continues to attract domestic and international participants from the fields of electricity, electronics, and software.

GMV attended the event, in which Carlos Busnadiego, the company's Head of Automotive Products & Processes, led the interactive panel on "How Safe and Precise GNSS can be relevant for Autonomous Vehicles," explaining the advantages of GNSS-based positioning technology for autonomous driving in terms of high precision and safety. The product developed by GMV, the first generation of which is already being used in BMW vehicles, meets the highest quality and performance standards and is a necessary complement to current vehicle sensors if these vehicles are to achieve the highest levels of autonomy.

In addition to the panel, GMV was once again present at ELIV with an exhibition space where members of the company were able to have conversations with visitors at the fair regarding autonomous driving and other topics in automotive business, such as services for connected vehicles.

GMV is transforming electrical substation inspections through autonomous robotics

GMV is working on the ASUMO project, a cross-cutting initiative led by Redeia companies that is driving digitalization and remote management of electrical substations

GMV has developed an innovative autonomous robotics solution for inspecting electrical substation assets, as part of its participation in the Advanced Substation Monitoring (ASUMO) project. The project is an innovative initiative led by Elewit and Red Eléctrica (Redeia companies), and seeks to optimize remote management of electrical substations through the use of artificial intelligence (AI), the internet of things (IoT), and data analytics, among other technologies.

ASUMO will modernize inspections of electrical substations through cutting-edge technology for real-time monitoring, early failure detection, and informed decision-making to guarantee operational efficiency and the security of the electricity grid. The integration of AI, IoT, and data analytics in this project represents major progress in the automation and optimization of key processes.

GMV, renowned for its experience in control systems and advanced robotics, has played a key role in the project, developing an autonomous robotics solution for remote management of critical asset inspections at electrical substations. This technology is based on the integration of ***uPathWay***, a GMV solution that combines precise location accuracy through Global Navigation Satellite System (GNSS) and the efficiency of dynamic routing, with an ANYbotics quadruped robot designed specifically for inspection tasks. This innovative approach makes it possible to optimize inspection processes and increase sampling frequency, thus reducing time between inspections and improving substation management efficiency.

Autonomous robotics plays a crucial role in improving the efficiency and reliability of the electricity grid by allowing for more frequent inspections and early detection of possible issues with critical assets. This translates into greater grid availability and performance, as well as reduced operational risks.

GMV worked with Elewit and Red Eléctrica on the implementation of this advanced robotics solution, which speaks to the three organizations' shared commitment to making progress in operational efficiency and sustainability in the energy sector.

"The efficiency of our solution, which is constantly running on tasks that may be repetitive, minimizes risks for workers and ensures accurate and consistent performance," says Ángel C. Lázaro, Head of Industry Robotics and Automation area of GMV's Secure e-Solutions sector. "Its ability to reach places that are inaccessible or remote for humans and collect data in real time allows for predictive and corrective maintenance, optimizing resource use and extending the useful life of these facilities."

GMV and ANYbotics team up to transform industrial inspections through autonomous robotics

GMV and ANYbotics, a leading developer of autonomous inspection robots for industrial applications, have joined forces to drive innovation and enhance efficiency in automated industrial inspections. This strategic collaboration aims to completely transform how companies manage their inspection operations, promising improved effectiveness and optimized resource utilization in industrial environments.

Autonomous robotics has become a cornerstone solution in the industry for conducting routine and complex inspections with greater efficiency. The alliance between industry leaders GMV and ANYbotics marks a significant stride towards the widespread adoption of robotic technology. By integrating GMV's ***uPathWay*** solution with ANYbotics' purpose-built quadruped robots for inspections, it becomes possible to deploy outdoor navigation systems and optimize fleets in real time.

ANYbotics is a pioneer in creating versatile autonomous robots capable of navigating complex industrial environments and conducting precise inspections. The robustness and adaptability of their ANYmal quadruped robots, coupled with their ability to operate in challenging conditions, make them ideal partners for industrial applications.

Meanwhile, GMV brings extensive expertise in control and automation systems, along with proficiency in integrating advanced technologies like artificial intelligence and cybersecurity. The ***uPathWay*** solution integrated into quadruped robots merges precise location accuracy through the Global Navigation Satellite System (GNSS) with dynamic routing efficiency.

The deployment of inspection robots in industrial settings brings several benefits, including process and resource optimization. Real-time data collection and advanced analysis of these data enable informed decision-making and facilitate predictive maintenance scheduling, reducing costs and prolonging asset service life. These inspection robots can also autonomously navigate remote or hazardous areas, eliminating the need for human presence and substantially reducing the carbon footprint.

GMV presents its self-driving solution for outdoor robotics

The ROSCon 2023 event took place in late September at King Juan Carlos University (URJC), attracting many robotics experts and enthusiasts, who came together to explore the latest developments related to Robot Operating Systems (ROS). At the event, Ángel C. Lázaro, Head of Robotics and Automation of GMV's Secure e-Solutions Industry Sector, presented the ***uPathWay*** solution.

uPathWay represents major progress in the areas of automation and efficient management of autonomous industrial robots designed for work in outdoor settings. Based on cutting-edge technology, this solution is transforming the way in which these industrial vehicles operate automatically and safely in outdoor settings such as manufacturing sites and agricultural areas.

GMV's talk at the event showed in detail how ***uPathWay*** can be integrated with other technologies, such as artificial intelligence and the latest communication systems. Strategic integrations of this type are improving decision-making and allowing for accurate and effective route optimization, with no need to modify an outdoor site's existing facilities or add any new ones.

uPathWay is also a versatile solution, with cross-cutting applications in a wide range of industries, from logistics to agriculture. Using it leads to a significant increase in operational optimization, along with a notable degree of risk reduction in a variety of industrial and commercial settings, such as those involving inspection tasks and transportation of materials.

Sacyr and GMV sign agreement to automate the placement of traffic cones

Sacyr has signed an agreement with GMV to prototype an autonomous system for placing and collecting traffic cones.

The project, called Automatic Cone Machine Safe Signalling System (ACM3s), is being developed by Sacyr Conservación and consists of designing an autonomous cone handling system for lane-closure operations. The two-year agreement is funded by the Center for Technological Development and Innovation (CDTI).

The aim of the project is to ensure correct signaling for work on the roadway, positioning and forward movement during operation, as well as the placement and removal of these objects in complete safety. This autonomous machine, which eliminates the need for human workers to be on the roadway or exposed to physical risks, uses GMV's ***uPathWay*** solution, which allows mobile robots to circulate autonomously.

This innovative road safety system represents a technical evolution in road marking trailers, allowing a maintenance vehicle to automatically hitch and unhitch a trailer when initiating a lane cut. Equipped with autonomous navigation and leader follower technology, the trailer follows the lead vehicle, placing cones according to safety protocols, detecting obstacles, and maintaining the required signaling. At the end of the operation, the trailer automatically re-hitches itself to the lead vehicle.

For accurate cone placement and pick-up, the trailer has a built-in robotic arm that uses artificial intelligence-based algorithms that factor in the relative position of each cone in an open environment. This solution improves road safety and simplifies the work of personnel, eliminating the need for human intervention in certain processes.

This project is part of Sacyr's commitment to the health and safety of its professionals. The company uses innovation and new technologies to improve infrastructure preservation and maintenance and to guarantee the safety of its teams and road users. ACM3 will increase road safety and help to detect the presence of vulnerable road users.

AlimTech, technological solutions for the agri-food sector

AlimTech, a project led by digital transformation company TSK, aims to research, develop, and implement cross-cutting technology solutions to ensure traceability, safety, quality, and sustainability in the agri-food industry. In fact, it emerged from the industry's need to adapt to the current global situation from a scientific and technological perspective.

To this end, AlimTech plans to invest €17 million between now and June 2025 as part of the Strategic Project for Recovery and Economic Transformation (PERTE) for the agri-food industry, led by the Spanish Ministry of Industry, Trade, and Tourism. The project is supported by the technology consulting company Doit Development and involves 15 innovative companies in the food industry, including SMEs, start-ups, and large companies from various autonomous regions of Spain, as well as 12 technology centers and universities.

The project also includes 22 collaborative sub-projects in the areas of sustainability, digitalization, and traceability and food safety, which will contribute to improving the competitiveness and productivity of the agri-food industry of the future. These projects focus on the processes that are present in all agri-food businesses, such as the reception of raw materials, preparation of ingredients, production, general facilities and energy generation, quality control and food safety, and the storage of finished products.

Each of them will apply one or more technologies (artificial intelligence, internet of things, robotics, blockchain, etc.) in these stages of the chain, with the aim of increasing productivity, enhancing production quality, reducing energy and raw material consumption, improving the treatment of by-products, and ensuring traceability and food safety.

Promoting alternative energies through technology, a key part of the energy transition

In November, EnerTIC organized a breakfast symposium on "Innovation and digitalization in the field of alternative energies to meet the new energy challenge." Representatives from several industry sectors and technology companies, including GMV, were present.

One of the Spanish energy sector's main challenges is that of taking an industry that has traditionally been quite conservative, stable, and lacking in digitalization, and turning it into an innovative ecosystem committed to decarbonization and the use of alternative energies.

Recent years have seen major technological developments in the energy industry, such as the implementation of big data, cloud computing, 5G technology, and mobility management. However, those who attended the event see generative artificial intelligence as the disruptive element that will truly mark a turning point in the industry. Using high-quality data, this technology will improve the efficiency and speed of processes and will help facilitate the industry's transformation. And if we add in quantum computing, this tool may be even more useful for the industry in coming years.

Sensors, the internet of things, digital twins that can be used to create simulations, and information analysis are also going to be key assets in helping the industry make the leap to the massive implementation of alternative energies. In this context, access to high-quality data is especially important for perfect monitoring of these data and decision making.

Opinion

Technology for ESG risk management in the financial sector

Financial institutions have started to incorporate climate risks into their business strategies and governance frameworks, as well as to assess their exposure to emission-intensive companies. They're doing so in part because the European Union's Pillar 3 requirement on disclosing climate and environmental risks requires them to.

However, the challenges banks are facing are wide-ranging. First, to measure their exposure to climate risks, they need highly detailed aggregated data on their clients, data banks don't usually handle. Second, they need to develop new methodologies to incorporate ESG (Environmental, Social and Governance) KPIs into their processes, and there is currently no regulatory framework guiding them on how to do so. Banks will need to have reliable monitoring instruments to assess the sustainability of initiatives to be funded, subsidiaries, and the companies in their value chain. Technologies such as blockchain will be key to verifying that green funds and bonds are actually being used to fund sustainable initiatives. Meanwhile, new ESG KPIs may be decisive in scoring processes for a mortgage operation, just as income levels are now. After all, what bank would grant a mortgage on a property knowing that it will be flooded due to rising sea levels? In this context, KPIs resulting from the processing of high-resolution satellite imagery will be used as another input in credit scoring. But is the tech sector ready to address the new needs that banks are already starting to demand? There's now a new generation of data providers, such as the European Space Agency, which are providing the community with data that may be relevant for banks.

Earth observation programs offer large amounts of data that, processed appropriately through artificial intelligence and advanced analytics techniques, will make it possible for the financial sector to have a new generation of metrics and information complementing the information already available and that will be objective, coherent, consistent, periodic, and comparable with each other (in space and time) anywhere on the planet.

We see sustainability as the greatest challenge facing humanity and the greatest business opportunity for all sectors. Here, the banking industry plays a key role insofar as it has the ability to channel funds towards green projects. Investments in sustainable initiatives, the traceability of these investments through the monitoring of new KPIs, ESG risk management, and new governance models also open up new business opportunities for consulting, certification, and technology companies.

Gema Pérez Diéz
Business Development for the Financial Services Industry (FSI) of GMV Secure e-Solutions

GMV supports the digital transformation in the agricultural sector using artificial intelligence

GMV was an active participant in the round-table discussion organized by AMETIC on the subject of "Artificial intelligence at the service of a sustainable agri-food sector," held as part of the Fruit Attraction event held in early October in Madrid. The trade fair was a key milestone in the exploration of how technological innovation, especially artificial intelligence (AI), can bring about major change across the value chain of the agri-food sector, making it more sustainable and efficient.

Almudena Nieto de Castro, in charge of business development for GMV's Secure e-Solutions Industry Sector, highlighted the crucial importance of funding and grants in accelerating the digitalization of this strategic sector for Spain. One notable example of this synergy is the AgrarIA project, led by GMV and funded through the R&D Missions in Artificial Intelligence Program of the State Secretariat for Digitalization and Artificial Intelligence (SEDIA) of the Ministry of Economic Affairs and Digital Transformation, corresponding to funds from the Recovery, Resilience and Transformation Plan. This project reflects GMV's vision of using AI as a driving force to improve productivity, sustainability, and competitiveness in agriculture and the food sector.

Through AgrarIA, GMV is working to develop cutting-edge solutions that will enable more efficient management of agricultural resources and more informed decision-making. The funding provided through SEDIA offers key support for the ability of all the partners involved in the project to innovate and carry out pioneering research in this field. These use cases include satellite image management to calculate crop capacities, the application of quantum computing to satellite image management to predict crop performance through machine learning, autonomous robotics to optimize agricultural production, the development of biopesticides and the distribution thereof through drones and precise positioning, as well as the use of artificial vision in product recognition and sorting in supermarkets, among other applications.

GMV and Exolum, recognized at the "Comunicaciones Hoy" awards

At the fifteenth edition of the Comunicaciones Hoy (Communications Today) awards, GMV and Exolum were recognized in the Digital Transformation Project category for their exceptional collaboration implementing a groundbreaking project for digitalizing aircraft loading processes.

The initiative, led by Exolum with GMV collaborating in a pivotal role as a technology partner, won the award for its cutting-edge approach to digitally transforming the aircraft fueling system. The project is based on using Cloud Native architecture, mobile apps, and real-time API services, thereby enabling the whole process to be efficiently and securely optimized.

GMV has developed a comprehensive digital product to integrate the onboarding services in real time, together with the product's technical and functional operation support services. The resulting platform was designed with agile methodologies, incorporating user experience (UX) dynamics to significantly improve the user experience when interacting with the equipment.

This project is not only a significant technological milestone but also allows Exolum to proactively further the digitalization of its operations. The strategic approach seeks to enhance efficiency by using various methodologies and leveraging synergies between business areas and advanced technologies.

AMETIC, 50 years of driving the digital transformation in Spain

GMV again attended the Meeting on the Digital Economy and Telecommunications, which took place at Menéndez Pelayo International University in Santander in early September. The company was one of the leading participants at the event, organized by AMETIC with the theme "50 years of driving transformation in Spain." In addition to sharing expertise at the panel discussions on cybersecurity, talent, and satellite applications, Luis Fernando Álvarez-Gascón, General Manager of GMV's Secure e-Solutions and Vice-President of AMETIC, moderated several round-table discussions.

Javier Zubieta, Manager of Marketing and Communication for GMV's Secure e-Solutions and Chair of AMETIC's Cybersecurity Commission, participated in the round-table discussion on the keys to cybersecurity in the supply chain. As Álvarez-Gascón said in his opening remarks to the panel, the impact of cybersecurity on the economy and the development of society is undeniable. The growth of the digital economy brings with it increased risks associated with digital assets, and the estimated impact of security incidents shouldn't be discussed only in terms of the economic impact, but also in relation to individual freedoms, threats to our privacy and, of course, threats to national security. Given this situation, as Álvarez-Gascón noted, European institutions have adopted various measures, with Spain standing out as a leader in digital regulations, cybersecurity, and privacy protection.

GMV also took was present at the panel on "CEOS: Talent, Strategic Investment," represented by Luis Fernando Álvarez-Gascón, who also spoke as the vice president of AMETIC. Meanwhile, Miguel Ángel Molina, GMV's Space Systems EST Deputy General Manager, took part in the panel on satellite applications, where he highlighted the company's growth in the space industry and some of its major achievements, such as the Galileo management contract and the development of the SouthPAN system's processing and control centers. Molina stressed the versatility of space applications and their ability to positively impact a wide range of sectors.

During the event, AMETIC presented GMV with the 2023 Business Excellence in Quantum Technologies Award for the CUCO project, led by GMV, and the Caramuel project, led by Hispasat and also involving GMV.

Discovering the potential of artificial intelligence in the insurance industry

On 14 November, the insurance industry gathered in Madrid for the Insurance Revolution conference to learn about the latest technological innovations in this field, with a special focus on artificial intelligence (AI).

With the theme "Discovering the potential of AI in the insurance industry," the tenth edition of the conference saw a record number of participants. Over 400 visitors were able to learn about the new opportunities that generative AI and applications such as ChatGPT open up for their businesses, how AI can improve customer relationships, and how to improve efficiency through increasingly intelligent automation processes.

GMV, as the event sponsor, showed participants both its AI solutions focused on improving customer experience satisfaction and those that are helping fight fraud at major insurance companies. GMV also provided information on the consulting services it offers companies to help them adapt to the Digital Operational Resilience Act (DORA), a European Union regulation for ICT risk management that will become mandatory in 2025.

GMV presents *uPathWay* at the leading event for the manufacturing industry

In mid-November, the Advanced Manufacturing Madrid event took place with the goal of exploring the latest trends and innovations in advanced manufacturing. Ángel C. Lázaro, Robotics and Automation Director for GMV's Secure e-Solutions Industry Sector, participated in a round-table discussion organized by HispaRob, a Spanish robotics technology platform, in which participants presented automation projects and technologies that can be used in this industry.

Lázaro highlighted the advantages of ***uPathWay***, GMV's comprehensive solution that's changing the automation of work vehicle fleets by allowing them to operate autonomously outdoors. This solution addresses one of the fundamental challenges in industrial management: the optimization of logistics and operational processes. The ability to automate fleets significantly improves supply-chain efficiency and the execution of critical tasks. This translates into not only a reduction of operational costs, but also a significant increase in productivity, allowing companies to reach performance levels that previously might have seemed impossible.

At the heart of ***uPathWay*** is GMV's vision of a future in which technology doesn't just improve how we work but transforms it as well. Autonomous automation in outdoor settings guarantees non-stop, 24/7 operations. This not only optimizes production, but also has a positive impact on resource management and long-term strategic planning.

GMV presents the *uTile* success story at the 1st Andalusian Artificial Intelligence Congress, organized by the government of Andalusia

Collecting and sharing the data needed to train models that can offer valuable information through artificial intelligence (AI) and machine learning poses significant challenges. Data owners—government organizations, private companies, and research institutions—must ensure data privacy, security, and sovereignty, recognizing that sharing certain kinds of information can pose significant risks and that, in most cases, there are legal or political restrictions that limit data sharing.

As Pablo González, an artificial intelligence specialist for GMV's Secure e Solutions, explained at his TED talk in Granada on 22 November at the 1st Andalusian Artificial Intelligence Congress, organized by the government of Andalusia, "***uTile*** is a tool based on Privacy-Enhancing Technologies (PET) that uses a federated learning approach applicable to any activity sector to solve the issue of how to work with large amounts of data while guaranteeing the privacy and governance of these data." Within this framework, the process of training the model is shared by model developers and data owners. Each party trains a portion of the model in their local environment, without needing to share the raw data directly. The parties then work together to pool their contributions and build a complete and accurate artificial intelligence model.

González shared the Earth observation success story of ***uTile***, developed in response to a European Space Agency challenge. As he explained, federated learning provides an effective solution

in terms of preserving the privacy and security of data while they are being used to train advanced models. In this case, GMV's tool makes it possible to analyze how harvests are progressing, the risk of fire or floods, or the state of roads, by making it possible for software developers and owners of satellite photos to work together without having to share their data.

AgrarIA, an example of technological innovation in agriculture presented at Atlas Collaborate Málaga

GMV participated in Atlas Collaborate Málaga, an event organized by Atlas Tecnológico in collaboration with Málaga TechPark and the Ricardo Valle Institute of Innovation (Innova IRV) Foundation, which took place from 20 to 21 September with the theme of "Collaborate: Reset The Economy."

One of the most notable moments of the event was the presentation by Miguel Hormigo, Manager of GMV's Secure e-Solutions Industry Sector, who shared his experience and expertise on "Technological Innovation in the Agri-Food Sector," focusing on the AgrarIA project. This project, funded through the R&D Missions in Artificial Intelligence Program of the State Secretariat for Digitalization and Artificial Intelligence (SEDIA) of the Ministry of Economic Affairs and Digital Transformation, is part of the Recovery, Resilience, and Transformation Plan funds.

AgrarIA is an initiative spearheaded by GMV that seeks to bring about sweeping change in Spain's agricultural production system through the implementation of artificial intelligence (AI). The strategic use of AI is aimed at optimizing and modernizing agricultural production, providing farmers with the tools needed to improve the efficiency, sustainability, and profitability of their operations.

The AgrarIA project seeks to apply green AI algorithms that reduce these operations' carbon footprint to analyze and process large amounts of data from various sources, such as sensors, drones, and monitoring systems. These data are crucial for making informed and accurate crop management decisions, making it possible to optimize resources and anticipate possible challenges. Currently, 77 end-user SMEs directly related to the project are involved.

Hormigo also shared AgrarIA use cases that demonstrate its innovative scope, including satellite image management to calculate crop capacities, the application of quantum computing to satellite image management to predict crop performance through machine learning, autonomous robotics to optimize agricultural production, the development of biopesticides and the distribution thereof through drones and precise positioning, as well as the use of artificial vision in product recognition and sorting in supermarkets, among other applications.

The Madrid Food Bank acknowledges GMV's contribution to those most in need

On October 26, the Food Bank Foundation of Madrid (*Fundación Banco de Alimentos de Madrid*: FBAM) recognized GMV's work for its important collaboration and support for the organization in 2022. The prize to GMV is part of FBAM's traditional annual awards to companies and educational centers. Through these collaborations the organization reached over 160,000 people in 2022.

GMV's contribution to the Food Bank was recognized during a meeting where Francisco García, president of the Foundation, presented Ignacio Ramos Gorostiola, GMV's Corporate Director of People and Infrastructure Strategy, with the award, as a show of the Foundation's satisfaction with the help given over the past year by the company and all the people who are part of it.

GMV is continuing with the commitment it made in 2020 to the Food Bank and in 2022, thanks to the generosity of its professionals and the company, it contributed by raising funds to distribute 12,585 kilograms of food, and this work has not let up in 2023.

The collaboration between GMV and the Food Bank began in 2020 as a result of the need for the company and its professionals to show their support in the wake of the socioeconomic consequences brought about by the COVID-19 pandemic. After this first collaboration, GMV did not hesitate to continue supporting the Food Bank and, as a result of this collaboration, in the last three years the company has raised a total of 114,000 euros thanks to its professionals' solidarity.

According to Food Bank data published in its activities report, the Foundation helped a total of 160,000 people in 2022 through 568 charities. The annual average number of people who received a daily meal was 171,961.

GMV in World Space Week 2023

In October, several company professionals participated in different educational activities aimed at students

On the occasion of World Space Week, developed under the theme "Space and Entrepreneurship", GMV and its professionals have carried out various space promotion and dissemination activities, contributing to the aim of this annual initiative.

Several of our GMV colleagues took part in the organization and were present as speakers at the "2nd Children's Space Congress", organized on 4 October by the Madrid local group of the association WIA-E (Women in Aerospace Europe). The event took place at the Adolfo Suárez cultural center in Tres Cantos and was attended by around 800 6th grade students from different schools in the municipality, who were able to learn from our colleagues about different space-related topics such as technological developments to combat space debris, or how the Copernicus Earth observation satellites contribute to the sustainability of the planet.

Other members of GMV also took part in various space-related forums and meetings. GMV was represented in the First Meeting with Speakers of Tres Cantos organized by the science outreach association "Ciencia con Tres enCantos", as well as "SPACECON 23", the University Space Congress organized by the Cosmos Aerospace Association, highlighting the work of mission analysis in the context of space missions in which GMV participates, especially in the area of earth observation.

GMV also supported and collaborated in the Madrid edition of NASA's International Space Apps 2023 challenge, the biggest STEM hackathon in the world, whose theme revolved around the slogan "Explore Open Science Together". This initiative is promoted by NASA and supported by 9 space agencies around the world, including ESA.

Recognition of GMV's leadership

GMV won the second edition of the Intereconomía Radio Awards during the gala ceremony held on October 19 in the Real Academia de Bellas Artes de San Fernando in Madrid, Spain. GMV's director of corporate development, marketing and communication, Pedro Schoch, accepted the prize awarded by this year's jury, presented by the CEO of Radio Intereconomía, Daniel Martín Escanciano.

This edition of the Intereconomía Radio Awards received more than 200 nominations, from which the jury selected five finalists in each category. Of these 30 finalists, including individuals, companies, and organizations, GMV was awarded in the Leadership category in recognition of its record of steady growth and its position as a point of reference in many of the areas the organization works in.

GMV's story is one of success thanks to its commitment to innovation and the quality of its services, the excellence of its professionals supported by many projects, and the trust of its large worldwide client portfolio. Its strategy of diversification and internationalization, ability to adapt to market changes, and flexibility in response to client demand place GMV at the cutting edge of its business sectors.

Good team habits

More and more colleagues from GMV are taking part in the Corporate Run that takes place each year in multiple locations. In 2023, our colleagues from Germany kicked off the Corporate Run in Munich during the summer. Then our Spanish counterparts took the reins, organizing races in Seville and Valladolid in November and in Madrid last Sunday.

A total of 266 GMV professionals participated in these runs throughout 2023, wearing the corporate colors and embodying our culture and values beyond the confines of the workplace. Beyond the realm of sports, these gatherings embody camaraderie and a positive atmosphere. Alongside fellow runners from other companies, GMV participants have exemplified the essence of a great team.

These runs are part of our corporate Wellbeing program, which is designed to foster a positive work environment through a focus on health and safety.


Madrid run


Sevilla run


Valladolid run


Múnich run

The Race of the companies: Physical well-being, team spirit, and fun

The Wellbeing Program is a corporate wellness plan through which GMV runs a series of activities and initiatives to provide its professionals with information, tools, and strategies to help them achieve a healthier lifestyle based on four fundamental pillars: physical, emotional, social and financial wellbeing.

As part of the program, GMV has participated for several years in the Companies Race, an annual competition held in various cities around the world. In 2023, it took part through its Madrid, Seville, Valladolid, and Munich offices.

In addition to promoting physical activity, the event helps GMV professionals share experiences outside the workplace and improve their personal relationships. We know that when we participate in sports, our bodies produce hormones like dopamine, serotonin, and endorphins, which increase our feeling of well-being.

Whether you've already taken part in one of the races or haven't had the chance yet, we look forward to seeing you at the next one. More and more professionals are taking up the challenge, proudly donning the company colors and demonstrating that team spirit is one of its core values.

Óscar Casado
Division Head
(Valladolid, Spain)

Ever since I discovered running back in 2007, I haven't looked back. Running has become a very important part of my life, so much so that even when I see other runners while I'm driving, I feel the call of the road.

On November 19, there were 18 colleagues from the Intelligent Transportation Systems sector at GMV taking to the streets of Valladolid, closed specifically for the event, creating a unique experience. The race, which focuses on teamwork—with times counted only when the last member crosses the finish line—drives homes the feeling of being on a team. For some, it is the athletic highlight of the year, while for others, it meant participating for the first time in a race like this.

Personally, I feel these races are a source of continuous improvement and satisfaction. Collectively, they have served to forge stronger bonds among us at GMV. After the race, our team breakfast becomes a moment to share endorphins and stories.

I encourage everyone at GMV to come and experience this feeling. Join us next year and be part of something greater than just a race: a commitment to well-being, teamwork, and personal growth.

Francisco Javier Hernández
Technical Leader
(Seville, Spain)

I started running in the Race of the Companies in 2018, a year after joining GMV. First, I took part in Madrid, and now I run it in Seville. My colleagues at work encouraged me to do it, and I took it on as a personal challenge, as I had never been much of a runner.

The best thing about the race, in my opinion, is being able to share the experience with your co-workers: talking about how we are training in the weeks leading up to it, setting a small challenge as a group, and, of course, having breakfast or a snack together after the race to recover some energy.

Without question, I encourage other GMV colleagues to sign up. Don't worry about the distance or however long you take to get to the finish. In the end, it's about having a good time together outside the office.

Heike Schuda
Subsystems Engineer
(Germany)

I started working at GMV in September 2022 as a video subsystems engineer for the Columbus Ground System at GMV's subsidiary in Germany. I had been at GMV for just under a year when I heard about the Companies Race. My colleague Ilinca, also from GMV, encouraged me to sign up. I must admit that it was quite a challenge for me.

So, on 12 July, with the thermostat showing more than 30 degrees, GMV colleagues in Germany gathered at the Olympic Park in Munich to cross the finish line together, located in the Olympic Stadium. You could feel the team spirit in the air, and that excitement helped push me to do my best.

Seeing myself at the start with so many people was something special, but what left the biggest impression on me was the run-in into the stadium. An event like this undoubtedly gives your self-confidence a boost and promotes team spirit.

Zsófia Bodó
Systems Engineer
(Germany)

Although I had heard about the race, I had never participated in it. When I read that GMV was taking part, I couldn't contain my excitement to run and didn't hesitate to sign up.

Race day was definitely one of the hottest of the summer, so I think everyone was very grateful that the start time was delayed to avoid the heat. Just getting to the start line was a challenge in the heat, as the Olympia Park was packed with runners that day.

There were lots of people running, walking, and jogging at their own pace. So it was a pleasant surprise to cross paths frequently with other GMV colleagues on course. Although we didn't know each other before since we didn't work together, saying hi and encouraging each other turned out to be a pleasant experience. I will definitely run again in the next race.

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