News

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gmv INNOVATING SOLUTIONS

Strengthening the European Union Strategic Autonomy Through Defense Innovation Projects

INTERVIEW
Luis Astorga
Chairman of the NCI Agency Supervisory Board

FEINDEF
May 17–19
Madrid

GMV will be present at the International Defence and Security Exhibition (FEINDEF in Spanish), which will take place from May 17 to 19 at the IFEMA Convention Center in Madrid, Spain.

With institutional support from the Spanish Ministry of Defense, FEINDEF has become the most important event in Spain for those involved in the fields of defense and security, with 40,000 m^2 of exhibition space, more than 300 exhibitors from 35 countries, and 100 foreign delegations.

GMV will take part in this exhibition with a stand (D08) in pavilion 10, where it will be showcasing the solutions and systems it offers for security forces and law enforcement, crisis monitoring and management, defense and security, and information security.

In addition, as a member of the SATNUS consortium, representatives from GMV will be present at stand E12, also in pavilion 10, for the Future Combat Air System (FCAS) project.

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Letter from the president

The war in Ukraine has brutally and undeniably exposed the existence of security threats for Europe. As a result, many EU countries, including Spain, have significantly increased their defense budgets. They are now working to expand and improve their military capabilities, and this includes acquisition of new equipment and technologies. In addition, initiatives that were already in progress to improve defense coordination and collaboration among European countries have been accelerated, and increased attention is being paid to hybrid threats, such as propaganda, disinformation, and cyberwarfare.

GMV is actively involved in many of the projects focused on developing new defense capabilities in Europe. Some of the most relevant of these include the European Future Combat Air System (FCAS) and the Spainsat NG secure communications satellites. We are also contributing to improve interoperability between Spanish military systems and those of other allied nations or developing receivers for high-precision satellite navigation signals, along with solutions for detecting and locating the origins of signal jamming and spoofing attacks or designing cyberdefense systems. In all cases we are applying the skills and know-how acquired in GMV's multiple areas of activity while harnessing and evolving new technologies as they become available. Because in a global international scenario shaped by various major powers and a range of international organizations and confederations, the European countries need to act jointly in a committed, coordinated way. Technological innovation and development of our defense capabilities are essential to be able to protect the freedom and democratic rights we have grown used to enjoy in Europe.

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Strengthening Strategic Autonomy Through Defense Innovation Projects

When the global strategy for the European Union's foreign and security policy was approved in 2016, it represented a turning point for implementing the numerous defense initiatives being promoted in Europe, in terms of both developing the capabilities of the Member States and strengthening the industrial base for European defense. Those initiatives included approval of the European Defence Action Plan (EDAP) in 2016 (the European Defence Fund was part of this), and initiation of Permanent Structured Cooperation (PESCO) and the Coordinated Annual Review on Defence (CARD) in 2017.

In 2022, additional key advances were made along these lines, especially through the Strategic Compass, which provides policy guidance and specific objectives in view of evolution of the security environment, to be achieved during the 2022 2030 period. Publication of that document was followed by new initiatives launched by the European Commission (EC) in relation to the European defense industry, which included, most notably, those derived from the document known as the Defence Investment Gaps Analysis and Way Forward (DIGA). Those initiatives are focused on encouraging joint procurement and programming in the European Union (EU).

The common objective of all of these tools is cooperation among the Member States to advance Europe's technological and industrial independence, and in turn, the EU's strategic autonomy.

The importance of the European Defence Fund (EDF) is that for the first time, the European Union, through the European Commission, is making financing available to European industry for research and development activities focused on military capabilities.

The fund's purpose is to incentivize collaborative actions and cross-border cooperation among entities from throughout the European Union, in particular small and medium-sized enterprises (SMEs) and mid cap companies, with the aim of encouraging them to take better advantage of the potential for technological research, development, and innovation in industry, during all phases of the lifecycle for defense-related products and technologies.

The fund has a budget of approximately €8 billion for the years 2021-2027, with approximately one third of that amount dedicated to funding collaborative defense research, and the rest used to fund collaborative capability development projects.

Prior to launching of the EDF in 2021, the European Commission had implemented the Preparatory Action on Defence Research (PADR) in 2017, and the European Defence Industrial Development Programme (EDIDP) in 2019, with the aim of allowing Member States and their industrial bases to adapt to the requirements for participating in the EDF.

GMV'S POSITION AND PROJECTS IN PROGRESS

The European initiatives on the subject of defense in general, and the EDF in particular, have been designed to improve the competitiveness of the European defense industry, as a way of contributing to the EU's strategic autonomy. The goal is for the EU to provide co funding support for the defense industry's efforts to develop equipment and technologies.

In order to initiate those defense projects with European funding, rules for future projects were established in both the PADR and EDIDP, taking into account organizations from the areas of industry, business, academia, and research. From the very beginning, GMV was able to position itself as a participant in 3 of the PADR projects (2017-2019) and 11 of the 42 projects awarded under the EDIDP (2019-2020), as a continuation of its already extensive track record of international cooperation on defense-related projects.

In the context of the first call for proposals from the EDF 21 program, which led to the results published in July 2022, GMV was selected by the EC as a beneficiary company on 7 projects, with 2 of these specifically involving GMV's subsidiary in Portugal.

	PADR	EDIDP 2019-2020	EDF 2021
Information superiority		ESC2	
Cyber		PANDORA	ACTING
Sensors			
Space		GEODE INTEGRAL ODINsEYE SAURON	NAVGUARD
Digital transformation	EXCEED	AI4DEF	EDOCC
Protection & Mobility	GOSSRA		ACHILE
Ground combat		iMUGS FIRES eCOLORSS: led by GMV	
Naval combat	OCEAN2020		
Underwater warfare		SEANICE	
Air and Missile			EU HYDEF
Air combat			EICACS EPIIC

EDF 2021: PROJECTS IN PROGRESS

GMV was awarded a total of 11 projects through this program's two calls for proposals, making it the fifth-ranked company in Europe in terms of number of projects.

In both calls, GMV oriented its participation around some of its own strategic areas, focusing on development of capacities for artificial intelligence, command and control, navigation, space, and cyberdefense.

During the first quarter of this year, initial meetings were held for most of the projects in which GMV is now participating and that were awarded under the program's first call for proposals. They are the following:

ACHILE (Augmented capability for high end soldiers)

The aim of the ACHILE project is 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 make use of disruptive technologies to improve their capacities for survival, sustainability, mobility, lethality, and observation. This project is contributing to a PESCO initiative led by France and known as EU Collaborative Warfare Capabilities (ECoWAR), and its objective is to improve the interoperability for weapons platforms and systems for armed forces in the European Union.

The ACHILE project, also led by France, continues with further developments for the GOSSRA project (in which GMV is also a participant), where an open architecture was defined for the systems that soldiers will have to carry in the future. The objectives here are to standardize the equipment used by European combatants, as a way to improve interoperability between troops during joint operations among the Member States.

The launch meeting for this project was held on January 27th in a hybrid format, with participation by personnel from the European Commission and the participating companies from the various countries that are part of the consortium.

GMV is making a contribution to the most of the work packages defined, providing its experience in combatant system architecture, robotic interactions, navigation, and C4I equipment and software. GMV also has a leadership role in the work packages focused on communications equipment, and it will be contributing to design and improvement of the combatant system's navigation capabilities, integration of robotics, collaborative capacities for the battlefield management system (BMS), and multinational intelligence, surveillance, and reconnaissance (ISR) interoperability. GMV will also be helping to ensure alignment of the future combatant architecture with STANREC 4845, and assisting with updating of the GOSSRA architecture.

During the upcoming months, there are plans to organize workshops with all of the parties involved, and to initiate the activities focused on design of the architecture and the various subsystems.

Participating countries:

ACTING (Advanced European platform and network of Cybersecurity training and exercises centres)

The ACTING project will be developing a network of advanced, interconnected cyber ranges that will allow performance of cybernetics exercises for teaching and training purposes. This project will be contributing a new focus, to allow proactive training exercises to be carried out in a coordinated manner for cyberdefense operators in the European Union. Its objective is to incorporate sophisticated methods and techniques to simulate cyberattacks, analyze performance of the experts, and evaluate situational awareness for cybersecurity.

The project is giving support to a PESCO initiative being led by Portugal, for developing an EU Cyber Academia and Cyberdefence Innovation Hub (EU CAIH).

The ACTING project, which held an initial meeting in December, will be led by the Bulgarian Defence Institute (BDI), with participation by GMV's subsidiary in Portugal as part of a collaboration among 28 European companies and entities.

GMV's team is involved in demonstrating a network of advanced, interconnected experimentation ranges, supported by a development language for next-generation scenarios.

Participating countries:

EDOCC (European Defence Operational Collaborative Cloud)

The objective of the EDOCC project is to create a virtual platform that can enhance interoperability, efficiency, and resilience for military operations on the battlefield. The project's participants will study, design, and perform conceptual validation for that virtual platform, and they will develop a first version of the catalog of services, while also identifying the appropriate standards and technologies that will ensure high levels of performance and interoperability.

The EDOCC project was initiated on January 31st, with a meeting that took place in Germany. The team from GMV will be contributing an assessment of the interoperability needs within the federated environment, and it will be identifying the applicable standards. It will also be implementing artificial intelligence (AI) algorithms and advanced analytics for C4ISR systems.

As part of the associated work package, GMV's team will be studying trends in application of AI in all activity areas of the multi-domain operational cloud (MDOC), at various levels: strategic, operational, and tactical, with the aim of improving the decision-making capabilities of the human operators. The team will also be studying advanced analytical and visualization techniques for data, in order to meet the substantial requirements related to data volume and speed, data ingestion, and data federation. This technology will facilitate real-time decision-making across an extensive territory and in various environments (air, maritime, land, and cyberspace). At the end of the project, all of these developments will be subject to testing, where GMV will demonstrate its solutions by implementing a coalition shared data (CSD) system that incorporates the new AI and database analytics services.

The EDOCC project is supporting developments from the PESCO project led by France known as EU Collaborative Warfare Capabilities (ECoWAR).

Participating countries:

EICACS (European Initiative for Collaborative Air Combat Standardization)

Along with organizations from 11 countries, GMV is a member of the international consortium developing the European EICACS defense project, which held its initial meeting in February at Dassault Aviation's facilities in Saint-Cloud, near Paris.

Within the area of collaborative air combat, the EICACS project is focused on ensuring interoperability for future European combat systems, including both manned and unmanned aircraft, as well as sensors and actuators and updating of the current systems and platforms.

The objectives of the EICACS project are focused on two main areas: on one hand, promotion and development of design rules and proposed interoperability standards, and on the other hand, analysis of issues that could arise from the use of artificial intelligence techniques for aspects such as aircraft navigation, security, and applicable development methodologies, among others. Like the other projects described above, this project supports developments for EU Collaborative Warfare Capabilities (ECoWAR) as part of a Permanent Structured Cooperation (PESCO) initiative led by France.

GMV is participating in this project by managing the tasks for defining the requirements associated with standardizing development processes and methods, validation, operational assessment, and certification of critical and non-critical components, based on artificial intelligence. It is also collaborating on technical activities that will lead to standardization of collaborative service contracts for systems integrated into other systems, standardized operational interfaces for the sensors service, and standardized processes for software development, methods and means of integration, and mission system software.

Participating countries:

EPIIC (Enhanced Pilot Interfaces & Interactions for fighter)

The EPIIC project, led by France and with participation by GMV's subsidiary in Portugal, held its first meeting in January in Paris.

This project's objective is to take on the enormous technological challenges presented by future air combat and collaborative combat, by identifying, evaluating, and developing highly innovative and disruptive technologies to be integrated into the fighter aircraft of the future. These developments will be supporting the PESCO project known as Air Power.

The aim of the EPIIC project is to take on the enormous challenges of future air combat and collaborative combat, by identifying and assessing highly innovative technologies and disruptive modalities, for integration into the cockpits of future fighter aircraft. This project will benefit from participation by more than 30 organizations, and it is focused on sixth-generation fighter aircraft, i.e., the Future Combat Air System Next-Generation Fighter (FCAS NGF) and Tempest. The results of this project will combine unique knowledge and capabilities to develop best-in-class cockpit avionics, by taking advantage of leading-edge technologies such as artificial intelligence, human-machine teaming, and new means of interaction.

At a time when Portugal is assessing the need to replace its F 16 fighter jets, the team from GMV will be participating in assessing the essential technological blocks for future "eyes-out" visualization systems for combat aircraft, since this equipment has become a central element of the cockpit. GMV will also be providing technological components to support the new crew monitoring sensors.

Participating countries:

NAVGUARD (Advanced Galileo PRS resilience for EU Defence)

NAVGUARD is a project focused on developing European NAVWAR capabilities, by monitoring the global navigation satellite system (GNSS) spectrum. It will increase the resilience of the Galileo public regulated service (PRS) by supplementing the activities of the GEODE project.

This project is providing support for the PESCO project known as European Radio Navigation Solution (EURAS), based on an analysis of the state of the art in current technologies. The project will then begin its implementation, which will cover everything from defining the user requirements through to development and testing.

This system will be based on various subsystems used to generate and make use of information related to GNSS signal jamming:

- Ground systems for monitoring the GNSS spectrum, to detect illegitimate activities (jamming and spoofing), including geographic detection of malicious sources.
- Miniaturized PRS receivers with extended anti-jamming and anti-spoofing capabilities, which will also allow inclusion of information about the spectrum's situation.
- An information management system (IMS) that compiles all of the information coming from the various field elements, and which provides an image of the spectrum's situation. It also includes control centers to give the Member States the ability to obtain information from the system and interact with it.

The initial meeting for this project took place at the end of February, with participation by the 26 companies included in the consortium. GMV's participation has been focused on leading the work packages for defining the interfaces, making the system compatible with the G2G (Galileo Second Generation) signals, and designing, developing, and validating the viewing systems for the Member States.

Participating countries:

EU HYDEF (European Hypersonic Defence Interceptor)

Along with the projects described above, it is worth mentioning another project selected as part of the first EDF call for proposals: the Spanish EU HYDEF project, which will be developing a European interceptor to protect against potential ballistic threats, planned for completion by 2035. This project's results will include concept development, risk mitigation, and demonstration of a cost-effective endo-atmospheric interceptor capable of operating at various levels.

EU HYDEF will be supporting developments from the TWISTER (Timely Warning and Interception with Space-Based Theater Surveillance) project, as part of a Permanent Structured Cooperation (PESCO) project led by France.

GMV is leading the work packages that will be designing the interceptor's navigation and GNSS system. Initiation of this project remains pending, because its management by the Organisation for Joint Armament Co-operation(OCCAR) is still in progress.

Participating countries:

GMV CONSOLIDATES ITS POSITION IN EUROPE

GMV's successful results achieved in previous European Defence Industrial Development Programme (EDIDP) projects were essential for allowing the company to be awarded a very significant role in the projects selected by the European Defense Fund (EDF). This is now allowing further consolidation of the track record that the company established in 2019 and 2020 with the Preparatory Action on Defence Research (PADR) and European Defence Industrial Development Programme (EDIDP) calls for proposals, where GMV also had excellent results.

GMV has now been awarded participation in total of 21 projects, making it one of the top European companies in terms of number of projects, and a leader in the category of mid cap companies. Currently, GMV has submitted 8 bids under the EDF 22 call for proposals, with those results expected to be published in mid 2023.

Participation in European PESCO and EDIDP/EDF projects represents one of GMV's strategic lines of operation in the area of Security and Defense, as a way to support its international expansion and strengthen its ability to provide value in its strategic areas, which has proven to be an essential aspect for allowing its proposals to be selected. In this way, GMV is consolidating its position as a key international participant for collaboration on defense-related projects. It has also succeeded in improving its international position in relation to some of its key technologies. The awarded projects will focus on developing missile defense system capabilities, and systems for supporting infantry, avionics, command and control, navigation, space observation, and cyberdefense.

All images used in this interview are courtesy of the NCI Agency Creative Media Center

Luis Astorga

Chairman of the NCI Agency Supervisory Board

Dr. Astorga has served as a naval officer in the Spanish Navy for the last thirty four years, carrying out different responsibilities in Communication and Information Services. He started in the CIS world as project manager being a junior officer, to finally become, as a senior one, the CO of the Spanish Navy CIS Support, commanding a structure of 700 hundred people.

Other relevant CIS assignments during his career were being Computer Science professor at the Spanish Naval Academy and Head of its CSU (CIS support unit) for three years. In the field of CIS planning, Astorga was Head of Information System Section in the Spanish Navy Staff, where he was in charge of Information Systems long term planning for the Spanish Navy. He also served as the Spanish NATEX in the NCIA and the Co chairman of the Working Group of National Technical Experts. Alongside his main duties he has had various other responsibilities (including commanding two warships) and a broad international experience, living and working in four different countries. After graduating from the Naval Academy he continued his education, throughout his career, with a very broad scope: Joint War College, a PhD in International Politics and a Master Degree in Business Administration.

Among other positions, Dr. Astorga served as the Director of Strategy and Policy Department in the Spanish Joint War College (2018-2019), Commanding officer of the Spanish Navy CIS Support Structure (2016-2017), Plans and Policy Head of the French maritime HRF (2013-2015), Naval Attaché in Morocco (2010-2013), Spanish Navy Staff, CIS Division, Information Systems (2008-2010), Commanding Officer of patrol frigate "Vencedora" (2005-2007), Tactical Instructor for the Royal Moroccan Navy (2002-2005), Professor at the Spanish Navy Naval Academy (1999-2002).

Astorga holds a PhD in International Security as several well as Master Degrees in International Security and Defense, Business Administration, System Analysis. He additionally graduated from the Spanish Naval Academy, Spanish Command and Staff College and US Naval War College.

What are the missions of the NATO Communications and Information (NCI) Agency?

The Agency has two primary missions. The first is to act as a provider of Communication and Information Services (CIS) and capabilities for the NATO Alliance's organizational and command structure (which we can generally refer to as the "NATO enterprise"), to ensure its consistency and interoperability with the NATO CIS architecture. This has to be done in a secure manner, while also providing the Allied nations with the CIS services they need in order to allow interoperation.

Its second mission is to offer and guarantee CIS support for NATO's operations, as established in the Command and Control agreement signed between the Supreme Allied Commander Europe (SACEUR) and the NCI Agency's General Manager.

To fulfill these missions, the Agency is responsible for NATO's CIS architectures, along with centralized planning of the systems, their engineering, configuration control, and technical support. The Agency also operates and maintains the CIS systems and facilities for the Alliance.

In addition, it provides cyberdefense for NATO's networks and systems, and it acts as Host Nation for development of CIS capabilities. These are typically subject to industry contracting, through a competitive process managed by the Agency itself, which then acts as the project's management entity.

To summarize, the Agency has a critical role across the entire spectrum of generating and providing information technology capabilities and services for NATO.

And what role do you play as Chair of the NCI Agency Supervisory Board (ASB)?

The ASB is responsible for providing strategic guidance for the Agency, as well as operational guidance, including approval of the business plans and financial plans. It is also responsible for approving the Agency's internal organization and any changes made to it,

for approving the Agency's reports, and for monitoring the Agency's performance and the activities it carries out.

As Chair of the ASB, I oversee the various committees and subcommittees that are responsible for performing those duties. I also propose the agendas for the committee meetings, and with assistance from the Secretary of the NATO Communications and Information Organization (NCIO), I prepare the documents those committees will use when discussing their resolutions. It is well known that all of NATO's decisions are made unanimously, and this requires a significant amount of coordination work to help form a consensus.

Other important duties of the Chair are coordinating with other high-level committees, such as the Resource Planning and Policy Board (RPPB), as well as supervising hiring for the Agency's executive personnel (level G22 or higher).

The agency has a critical role across the entire spectrum of generating and providing information technology capabilities and services for NATO

What are some of the challenges the Agency is now facing, in terms of the need to respond to the new NATO 2030 strategic concept, and other challenges presented by the new Strategic Context?

As part of its Madrid 2022 Strategic Concept, NATO emphasized the need to improve the organization's technological advantage, as a key element to strengthen deterrence and defense. A new vision for the Alliance's digital transformation was created in order to implement that Strategic Concept, and as a way to define how NATO would obtain the technologies needed to carry out multi-domain operations, while ensuring interoperability in all environments, improving situational awareness, and facilitating data-based policy advising and decision making.

Within that scenario, there are two elements that represent particular challenges: on one hand, there is the need to generate new capabilities on a much larger scale than previously required. This in turn forces us to think about the structural changes that the Agency will have to make in order to handle those demands. On the other hand, there is a specific need to generate new CIS capabilities. In this case, we will be incorporating emerging and disruptive technologies at the appropriate speed – although some of them cannot really be described as emerging anymore – such as artificial intelligence, quantum computing, and autonomous systems.

It is also clear that geopolitical changes in the Euro-Atlantic area are creating an additional challenge, because this has led to an urgent need to strengthen NATO's capacities for deterrence and defense. This is now requiring the Alliance – and therefore the Agency also – to move at a faster and more intense pace when incorporating new capabilities, compared to the previous situation when the region was more stable. And these new capabilities will certainly have to take these emerging technologies into account, but with a balanced assessment that weighs the risks of introducing them too quickly – before they have really matured – against their potential for obsolescence, where systems may have already lost their usefulness by the time are put into service.

In February 2023, NATO launched a new initiative known as Alliance Persistent Surveillance from Space (APSS), with the NCI Agency having a leading role. Could you describe this initiative for us, and tell us something about the constellation known as Aquila?

For the Alliance, space and access to products and services generated from space are fundamental aspects of improving situational awareness, and for allowing decisions to be made based on information that is pertinent, reliable, and up-to-date. Currently, NATO does not have its own capabilities in this area, and it is also

unable to securely and effectively aggregate and make use of the information being generated by the space systems of the various Allied nations.

The APSS initiative has therefore been designed to improve that situational awareness, along with the subsequent decision-making, through a specific program for accessing data generated from space and for integrating those data into NATO's systems.

One of the key elements of APSS is Aquila[1]. This is a virtual constellation of satellites that belong to members of the Alliance, and it represents a way of making sure that NATO will have access to the information it needs, without having to operate and manage its own space-based sensors.

APSS was initiated in 2022, and its implementation requires a variety of activities to allow creation of the virtual constellation, distribution and disclosure of the data, assignment of missions for the space segment, etc.

The Agency is committed to helping our partners maintain NATO's technological advantage. The Defence Innovation Accelerator for the North Atlantic (DIANA) represents an opportunity to do this. How is the Agency participating in that initiative?

DIANA is taking its first steps as NATO's innovation accelerator, and it is now being given the governance and management mechanisms necessary to become fully operational. For 2023, there are three areas for development included in its strategic guidelines: energy resilience, secure information sharing, and sensing and surveillance. Of course, not all of these subjects are related to CIS, and that is not the accelerator's purpose.

DIANA is an Agency that is independent from the NCI Agency, and a Service Level Agreement (SLA) has therefore been signed with the NCI Agency for providing its CIS services, under terms similar to those established for NATO's other bodies and agencies.

In relation to R&D, DIANA is oriented around innovation driven by the private sector. Although we have not yet experienced the potential for cooperation between DIANA and the NCI Agency in this area, we can anticipate that it will take place through specific Programs of Work, which will require the use of the NCI Agency's technical resources or experts, in a manner similar to what is done with NATO's Allied Command Transformation (ACT) or its CIO Office.

Since the Agency's top priority is providing support for operations and exercises, how are these services being provided to the Alliance?

One of the NCI Agency's missions is the ability to ensure ongoing CIS support for all of the operations and exercises in which NATO is involved, in accordance with the Command and Control agreements established between SACEUR and the Agency's General Manager.

However, this may be done in a different way in each case. Units from the NATO Force Structure usually implement and make use of their own systems, which have to be interoperable with the NATO Command Structure architectures and standards. This is where the NCI Agency generally takes on the main role as a service provider and manager for the systems.

To give one practical example, in Afghanistan the NCI Agency was responsible for ensuring continuity of the Alliance's communications in the field, with a significant part of this work subcontracted to a civilian company from an Allied nation. When the decision was made to withdraw from the country, technicians from the Agency (and from that company) were at the Kabul airport until practically the final moments of the evacuation, because the services the Agency was providing were essential for the airport's operation.

[1]Aquila is the Latin name for the "Eagle of Zeus" from Greek mythology, known as the carrier of Zeus' thunderbolts

Initiation of Phase 1B of the NGWS/FCAS Program's Remote Carrier Technology Pillar

At the end of March, a meeting was held to formally initiate the activities for this new phase of the program in which GMV is participating, where the focus will be on developing new concepts and technologies based on a set of unmanned vehicles

On March 28th, the kick-off meeting (KOM) for Phase 1B of the NGWS/FCAS program's Remote Carrier Technology Pillar was held at AIRBUS Defence and Space's facilities in Munich. This event reflected an entire year of work efforts, characterized by some times of uncertainty for the program, which have fortunately now been overcome. The meeting marked the formal initiation of activities for this new phase of the program (which was formally awarded on December 15, 2022), with GMV participating as a

member of the consortium known as SATNUS.

The Remote Carrier Technology Pillar is focused on developing new concepts and technologies based on a set of unmanned vehicles, in coordination with the new NGWS/FCAS manned combat aircraft. Its primary objective is to mature technologies and minimize development risks for the various types of remote carriers, and also for the manned-unmanned teaming (MUT) capabilities. Phase 1B, which will have a duration of 32 months, will conclude with a preliminary design review (PDR) for two remote carrier demonstrators, and it is also expected to produce significant progress in design and implementation of a first version of the MUT operations. In addition, the first of the experimental flight campaigns will take place during this phase, which will involve testing, in a relevant environment, of specific key technologies that are essential for proper functioning of the MUT capabilities, which represents one of the program's main areas of technological research. This particular campaign will be led by SATNUS and carried out using the MCSD air demonstration platform.

At the kick-off meeting, which was attended by all of the SATNUS industry partners, AIRBUS DS, and MBDA, as the client representatives for the three participating countries (Spain, Germany, and France), a review was performed with regard to the primary challenges that will have to be confronted, and responses were given to questions presented by the client.

The purpose of the overall contract, which has a price of approximately €8 billion, is to prepare and conduct demonstrations for the various next generation weapons systems (NGWS). One of the main milestones for these demonstrations will be the first flight of the New Generation Fighter demonstrator.

GMV's activities related to the Future Combat Air System (FCAS), along with its participation in other major programs such as EURODRONE and SIRTAP, is strengthening the company's track record in the field of aeronautics, which currently represents one of its main vectors for growth as well as an effective means of attracting talent and recruiting highly qualified personnel.

GMV is entering into this new phase with tremendous optimism, with full conviction that thanks to the commitments of the entire NGWS/FCAS family, it will be possible to turn all of these efforts into an unprecedented success.

GMV explores the adaptation of ARAIM to non-aeronautical sectors

ARAIMTOO, a European Commission (EC) project by a GMV-led consortium, recently ended. It has aimed to study the adaptation of Advanced RAIM (ARAIM) algorithms to non-aeronautical sectors.

ARAIM is a technology for providing solution positioning, navigation, and timing (PNT) obtained by satellite navigation (GNSS). ARAIM is based on an offline ground monitoring architecture that provides nominal performance and fault updates from multiple GNSS constellations that, through integrity algorithms, help GNSS receivers ensure reliability in PNT computation.

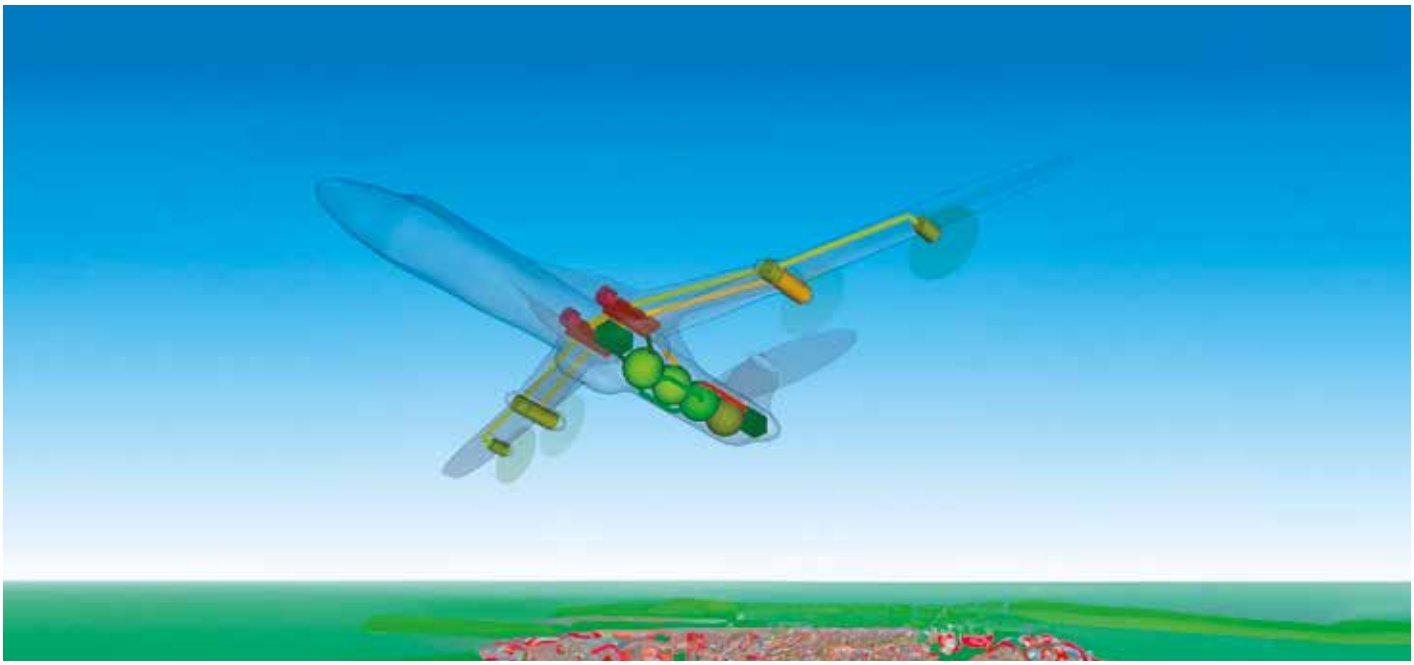
Although initially, ARAIM was created to be used in the aeronautical world, its use, directly or through extensions of the concept, was already considered when it was conceived for applications in other sectors such as drones, maritime transport, railway transport, automotive, etc.

ARAIMTOO has focused on exploring extensions of the ARAIM concepts for applying the algorithms to these sectors, prototyping these solutions in software tools, and carrying out extensive experimentation to test different solutions and demonstrate that the proposed evolutions of ARAIM can satisfy the user PNT requirements of the other GNSS applications in these sectors. GMV has also made public the most important results obtained under this project at the world's most important satellite navigation congresses, such as ION GNSS and ION ITM.

As a result of the project's success, GMV has recently won a public tender for the continuation of the project called ARAIMFUSE. This project, also financed by the European Commission, will explore ARAIMTOO's solutions in greater detail to take a further step towards implementing these solutions in sectors such as maritime, drones, and railroads, including GMV's participation in the relevant standardization forums.

GMV's know-how at the service of sustainability and ecology

HECATE, a European Union project to steer aviation towards a sustainable and climate-neutral future, has begun



The HECATE (Hybrid ElectriC regional Aircraft distribution TEchnologies) Project had its kick-off in January. Led by Collins Aerospace, under the Clean Aviation Joint Undertaking—the European Union's research and innovation program for transforming aviation towards a sustainable and climate-neutral future—HECATE is a step forward in GMV's strategy to implement the most innovative operating systems (e.g., XKY) for the next generation of aircraft in new hardware solutions.

As a recognized vendor to aeronautical manufacturers, air navigation service vendors, aviation organizations, and system operators GMV takes part in this hub for new ideas and bold innovations dynamically. Pulling together the best talent and capabilities of the private and public sectors, developing cutting-edge technologies, and making these available for a transformational leap in aircraft performance in the 2030s, the Clean Aviation Joint Undertaking will pave the way towards the EU's ambition of climate neutrality by 2050, in line with the ambitions of the Paris Agreement and European Green Deal.

Under this umbrella, the HECATE Consortium involves 28 entities uniquely positioned to develop and mature technologies in electrical distribution, targeting a TRL5 demonstration of an integrated high-power electrical distribution system. The project's ambition is focused on the maturation and development of breakthrough technologies while performing scalability and impact analysis to ensure safe and power-dense technologies that will enable entry into the service of hybrid-electric regional aircraft by 2035. As a result, HECATE aims to deliver transformative technologies considering high voltage electrical distribution for the electrical distribution of hybrid electric regional aircraft.

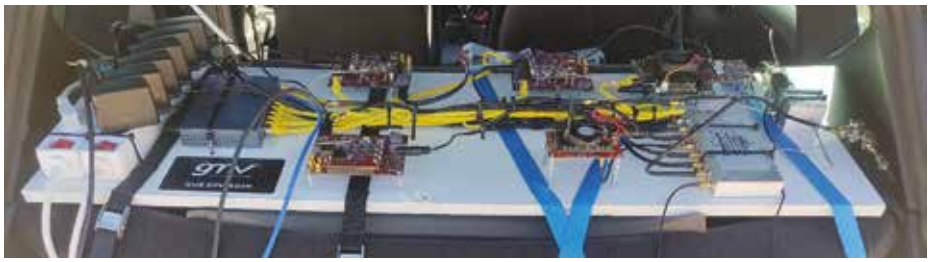
This project will address the challenges of system weight and power density, high-voltage challenges with lightning, arcing, and electromagnetic interference as well as optimized thermal management, and digitizing the design process with digital twins.

Aviation resilience against GNSS interference and cyber threats

AIRING (Aviation resilience to GNSS frequency jamming and cyber threats) a project developed by a consortium led by GMV and whose objective has been proposing a system concept to protect aircraft (manned and unmanned) against interference threats (jamming) and identity theft (spoofing) in satellite navigation (GNSS) has recently been completed. Funded by the European Commission in coordination with Eurocontrol, air navigation service providers, such as ENAIRE, and various technology centers such as NLR, FGI and AXENTEC have participated in the project.

To achieve its objective, the project has carried out a security risk assessment of current and future operating scenarios (2030), a selection of a set of threat detection, mitigation, and localization techniques. In addition, an operational concept has been defined that included completely new mechanisms for the exchange of information between interested parties, as well as a set of operational mitigation measures and contingency plans.

On the other hand, a laboratory test environment was created to allow the analysis of the subset of the proposed techniques to implement both on board and on the ground and more than 30 test scenarios were executed covering different types of interference and identity theft threats.



In addition to leading the project, GMV has been responsible for evaluating ground detection techniques, defining the analysis methodology and preparing the validation scenarios, an activity based on its deep knowledge and extensive experience in GNSS jamming and spoofing.

The project has included several field demonstration exercises in which computers were successfully subjected to combined jamming and spoofing attacks to assess their performance.

Finally, based on the conclusions reached during the project, a roadmap has been defined with actions and recommendations for the various actors involved, in relation to receivers as well as air navigation services.

Exploring New Horizons for Adaptive Navigation Systems Through Use of AI

The Artificial Intelligence in Guidance, Navigation and Control for Aerial Applications (AI-GNCAir) project is investigating the most advanced technologies in the use of intelligent data fusion, for self-positioning of aerial vehicles and for managing drone swarms for coordinated flights during military missions.

This project, led by GMV and taking place in collaboration with the Polytechnic University of Madrid's Center for Research on Information and Telecommunications Processing (UPM-IPTC), consists of two phases: a standalone first phase which is studying the possibility for improving upon traditional navigation solutions for unmanned aircraft, and a second phase focused on implementing an effective adaptive solution for collaborative navigation and autonomous task assignment.

As part of this project, the team held a workshop on February 14th at the facilities of the European Defense Agency (EDA) in Brussels, in the context of the corresponding CapTech meeting. Participants at this event included representatives from industry and from the European Union's various Member States, who exchanged ideas and discussed the challenges that artificial intelligence (AI) is raising for the future, in terms of its use in a safe, ethical, and effective manner. These are tools with great potential, and although their study remains in a very preliminary state, they will be fundamental for increasing the effectiveness of military operations in the future.

The workshop focused on the use of AI for trajectory planning and task management for a swarm of unmanned aircraft, for the purpose of missions involving target mapping, detection and/or tracking. Other topics of discussion were the current limitations affecting this technology, whether in terms of legislation or purely technological ones, and the event was understood to represent a starting point for establishing new steps, such as forums for exchanging knowledge and future workshops.

GMV supports the European Commission in the standardization of GNSS in drones

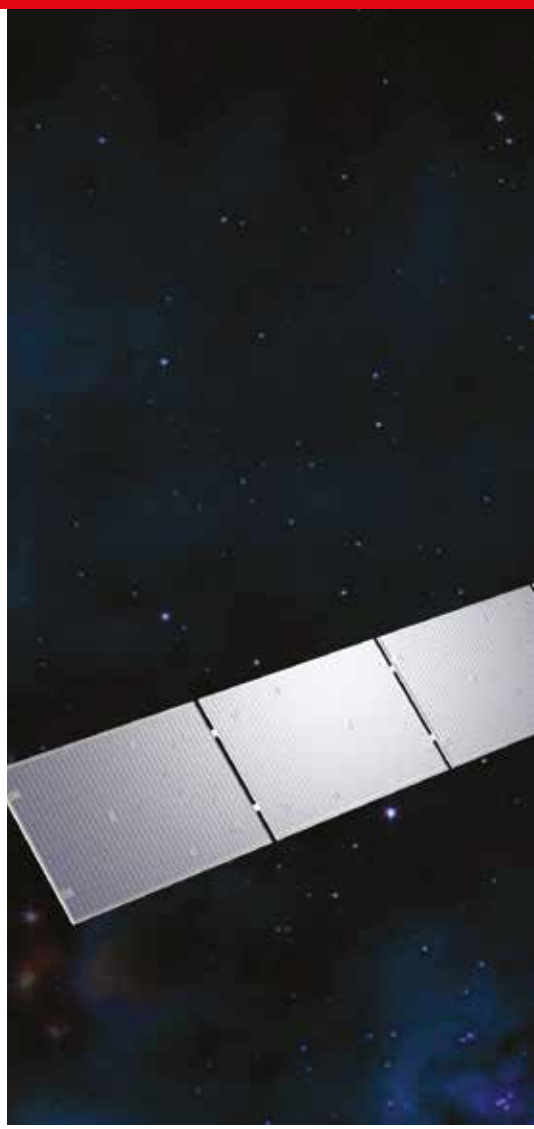
As part of a consortium led by VVA Brussels in which CATEC, MCI, and RP Legal & Tax are also collaborating, GMV is taking part in SONORA (Support to Standardisation Actions for EGNOS and Galileo in the U-Space), a 30-month project financed by the European Union's Research, Development, and Innovation (RDI) program.

SONORA aims to assist in developing the development of the U-Space and unmanned aerial systems sector, contribute to incorporating European Global Navigation Satellite System (EGNSS) services into its standards, and promote the implementation of EGNSS-based solutions in the U-Space.

Two flight campaigns are planned as part of the project, one in an open environment and one in an urban environment. The first, which took place in November last year at the ATLAS (Air Traffic Laboratory Tactical Center for Advanced Unmanned Systems) center located in Jaen, Spain, aimed to collect and analyze GNSS data collected by different equipment and technology to support the development and verification of standards and to evaluate several new EGNSS services, such as Galileo HAS (High Accuracy Service) and OS-NMA (Open Service - Navigation Message Authentication), in an unimpaired environment. For this purpose, different missions with unmanned aerial systems (UAS) were planned and carried out in real situations.

An initial analysis of the results from these tests has led to interesting conclusions regarding the GNSS configurations and frequencies used and the influence of the systems involved in controlling the aircraft on the total positioning error. It should also be noted that these UAV flights have been the first in the UAV sector to test OS-NMA and HAS systems. OS-NMA has proven able to distinguish between reliable and unreliable sources, and although it is still under testing, HAS is expected to reach an accuracy of a few dozen centimeters, thus surpassing that of EGNOS.

The second flight program will take place in the coastal town of Benidorm during the autumn of this year. It will analyze the results of a study similar to the first trial but in a more challenging urban scenario in terms of navigation and will include the use of GNSS receivers hybridized with other technologies such as IMUs. The main aim of the experiment will be to gather relevant data about EGNSS services to assist in developing groundbreaking air mobility applications, e.g., urban air mobility.



GMV will develop the future Galileo Second Generation capabilities

GMV is selected by the European Space Agency (ESA) for the development of the Galileo Second Generation System Test Bed (G2STB)

The European Space Agency (ESA) acting on behalf of the European Union Agency for the Space Programme (EUSPA) and in the name of the European Union represented by the European Commission (COM) has awarded GMV a contract for the development of the Galileo Second Generation System Test Bed (G2STB).

The G2STB project will ensure a smooth transition from the Galileo First Generation (G1G) to Second generation (G2G), capitalizing and building on the heritage of key G1G legacy system tools. In particular, the G2STB is one of the key infrastructure elements that ESA is developing for the correct functioning of the Galileo Second generation satellites. This new generation of satellites represents a major step forward for the Galileo constellation, incorporating numerous technology updates. ESA has prepared new procurements to ensure that the key technology elements required in the G2G ground segment are properly covered.

The G2STB will eventually replace and upgrade with state of the art capabilities two G1G existing facilities, the Galileo System Evaluation Equipment (GALSEE) and the Time and Geodetic Validation Facility (TGVF-X). The latter, developed and operated by GMV over the last decade, has played a key role in monitoring the Galileo signals and system validation activities during the Galileo Exploitation Phase. The TGVF-X has also contributing to the early validation of new capabilities and elements being rolled out in recent and upcoming Galileo System updates.

Under an iterative development approach and continuous evolution based on Scaled Agile Framework (SAFe), GMV will deliver four major G2STB versions over a period of five years. This methodology will ensure a continuous value delivery in the development of the different System capability Prototyping modules (ScPMs) of the G2STB. Among these modules, the G2 HAS data generator and monitor is of significant importance as it aims at further improving the Galileo High Accuracy Service (HAS), recently declared operational and for which GMV has also played a key role.

In parallel to the development phase, the G2STB will ensure the upgrade of the network of Galileo Experimental Sensor Stations (GESS) to cope with the new signals and capabilities ensuring the availability of a G2 capable worldwide

multi constellation network of receivers and bit-grabbers, independent from the operational Galileo Sensor Stations (GSS).

As project leader, GMV will lead a consortium of more than twenty partners including Thales Alenia Space Italy (TAS-I) as core team member and a total number of 20 entities from 8 different European countries.

The contract ceremony was performed on March 10 in GMV´s headquarters offices. Presents at the signing event were Jesús Serrano, CEO of GMV and Miguel Romay, GMV´s Satellite Navigation Systems General Manager. While on behalf of the European Space Agency were, Ennio Guarino, Head of the Galileo Programme Department and Miguel Manteiga Bautista, Galileo Second Generation Project Manager.

GMV shows its ground-segment experience at SpaceOps

The new edition of the International Space Operations Conference, SpaceOps 2023, was held from March 6 to 10.

SpaceOps is the technical forum on space mission operations and ground systems, bringing together scientists, academics, operators, agency representatives, and research institutes. This conference aims to be the location for exchanging knowledge about methods, trends, and tools, responding to the need to increasingly leverage the capacities and cost-benefit of space mission operations.

GMV was well represented on the various panels held. Eleven technical papers were accepted for presentation during the congress, all of them of outstanding quality, given the high level of interest among the attendees.

Additionally, GMV was well represented in the exposition area, presenting clients and visitors with the latest updates to GMV's products, including control systems for satellites, planning, orbital control, payload management, cybersecurity, and operation support.

GMV Participates at the Satellite 2023 Exhibition

GMV has taken part in the 42nd edition of "Satellite", the most important event worldwide for the telecommunications satellite industry. This year's gathering was held under the theme "Leaning In – Linking Up", and it took place in Washington, DC, from March 13-16.

GMV had its own stand at the event, where it presented its complete line of ground segment operational solutions for space missions, including ***Hifly*** (satellite control), ***FocusSuite®*** (orbit control), ***Closeap/Focusoc*** (collision risk management and associated services), ***GMV Flexplan®*** (satellite resource planning system), ***Magnet*** (tracking and receiving station control), ***Smartrings*** (configuration management), and ***SmartHz*** (payload optimization), and the company was also able to present the services it offers in the areas of network security (cybersecurity) and vulnerability analysis.

Satellite is the leading satellite communications event in the world, with the participation of the leading professionals in the satellite market, a sector that today is depended on by markets such as communication media, transportation, telecommunications, finance and even the consumer industry, on a stage that is increasingly interrelated and connected.

This gathering provides an outstanding setting for presenting real-time demos to showcase products for current and potential clients and customers, while allowing emerging needs in the space industry to be identified. It is also a unique annual opportunity for networking and sharing advances in the industry, with a complete program of sessions and presentations.

The Galileo High Accuracy Service, powered by core technology developed by GMV, is now operational

The Galileo High Accuracy Service (HAS) went live on 24 January and users around the world can now harness its high-accuracy positioning capabilities delivered by the EU Agency for the Space Programme (EUSPA) as Galileo Services' Provider. This milestone makes Galileo the first global navigation satellite system (GNSS) to provide such a service free of charge worldwide to anyone with a properly equipped receiver. With positioning accuracy down to decimeter level, this service is enabled thanks to an additional level of real-time positioning corrections delivered through a data stream within the existing Galileo E6 signal.

The core infrastructure responsible for the generation of this new corrections stream for high-accuracy positioning information has been developed by GMV.

The European Union Agency for the Space Programme (EUSPA) awarded a major contract to GMV in 2020 for the development of the "processing heart" of this service's infrastructure, the High Accuracy Data Generator (HADG), the engine that generates the real-time corrections stream. The purpose of the HADG is to ensure the continuous delivery of corrections under appropriate availability, continuity, and latency conditions. The data covers corrections to the GNSS satellite navigation message, mainly orbit and clock corrections, as well as other service parameters.

As project leader, GMV has led the main activities in the HAS' processing infrastructure development, namely supplying algorithms the for calculating high-accuracy corrections. This has been possible thanks to GMV's extensive experience in high-accuracy positioning technology, such as its GNSS-based ***GMV GSharp®*** solution.

The Galileo HAS is an open access service that transmits high-accuracy corrections in real time through the signal generated by the satellites of the Galileo constellation, specifically via the E6-B band and internet enabling an improved accuracy in the user positioning performance.

The Galileo High Accuracy Initial Service, now operational delivers sub-decimeter accuracy that can be applied in a wide range of sectors, including autonomous driving, geodesy, or agriculture. The HAS is a substantial improvement over other open service positioning systems as well as a catalyst for the development of high-accuracy solutions based on it.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Munich Satellite Navigation Summit

"GNSS - Empowering Mobility for Air, Land, Sea... and Beyond", was the theme of the new edition of the "Munich Satellite Navigation Summit", an event of global impact that took place from March 13 to 15, at the Alte Kongresshalle in Munich, Germany.

As well as sponsoring the event, GMV had a stand where it presented its products and services for the satellite navigation sector. The conference also featured sessions given by industry experts, and GMV, as one of the world leaders in global navigation satellite systems (GNSS), took part in several sessions. Irma Rodríguez, head of GMV's GNSS Algorithms, Products and Services Division, took part in the session "Precise point positioning (PPP)," while Andrés Juez, head of GMV's Satellite Navigation Low Earth Orbit Positioning Navigation & Timing division, took part in the session "Positioning, navigation and timing from low ear orbit."

This event is a conference of worldwide impact dealing with current and future satellite navigation. This convention is unique in its field, and it features a schedule of top-level presenters from around the world, representing industry, science, and government. They will offer the participants a broad global vision, as well as a wide range of individual perspectives, on the latest advances in the field of GNSS.

Organized by the government of Bavaria and the aerospace and satellite navigation cluster, this event represents an effort to stimulate advancement of applications and services in this important high-tech field.

Galileo Ground Segment reaches new milestone

In 2022, the GMV team carried out an intense qualification period for the new version of the Galileo Ground Control Segment (GCS). The assembly and qualification campaigns—afected by the difficulties, delays and costs present in the global supply market that began at the beginning of 2022—have culminated at the beginning of 2023 with the final delivery of the evidence and the declaration by the European Space Agency (ESA) and the European Global Navigation Satellite Systems Agency (EUSPA) of the completeness of qualification of the GCS v3.1.

Throughout this period, the joint and synchronized efforts of both the different GMV teams and their subcontractors have been key to achieving this objective, allowing GMV to reaffirm its position as a benchmark and European industrial leader within the Galileo program.

The new version of the GCS completes the recovery from obsolescence. The first step in this regard was taken in 2021 with GCS 3.0, and now includes a technological renewal in the backup center in Italy as well as a complete redesign of the KMF (Key Management Facility) element. This technological update has allowed GMV to increase the security of the control center, add new technologies, improve the global architecture of the system, have better and more versatile monitoring of all the components, as well as include dozens of operational improvements in the system.

In the coming months, GMV will begin the deployment tasks of this version in the different control centers and will begin the deployment of the technological improvements in the stations in charge of ensuring contact and data transmission with the satellites, which are distributed in various locations around the globe to ensure optimal coverage of the entire constellation.

Once this version of the control ground segment is deployed, one more piece of the next step of the Galileo program will be completed to complete the Exploitation phase (FOC2 Phase).

GMV sponsors the European Space Conference

GMV sponsored the fifteenth edition of the European Space Conference in Brussels on January 24 and 25 with the title "Securing the future of Europe in Space."

This annual event brings together senior representatives of government bodies, agencies, and European and international institutions, as well as prominent industry stakeholders, to take stock of the space domain and discuss the advances and challenges that lie ahead in the near future.

In addition to sponsoring the event, Enrique Fraga, CEO of EST Space Systems participated in the session on "IRIS²: A new European Flagship for New Challenges." Miguel Romay, general manager of satellite navigation, participated in the session "Satellite Navigation: Towards an updated generation supporting European sovereignty and resilience".

GMV contributes in the standardization of Galileo's timing and synchronization receivers

GMV is leading STARLITE, a European Commission (EC) project developed by a consortium aiming to develop the standardization process of Galileo's timing and synchronization receivers.

Galileo will soon offer users a satellite navigation timing service (GNSS) with an integrity layer that will provide greater reliability and ensure that users achieve a requested, pre-defined level of performance. Developing a specific standard for Galileo time receivers is a fundamental part of ensuring that the performance objectives of this service are met.

STARLITE aims to launch and support the standardization process of Galileo's time receivers. To this end, GMV has conducted technical work using theoretical studies and has also conducted experiments with its products and time receivers to develop an initial version of the standard. In parallel, the STARLITE consortium has become involved with the European standardization organization CEN/CENELEC, setting up the CEN/CENELEC JTC5 WG9 working group (WG) for the development of this standard.

As well as chairing the group, GMV is leading the activities and discussions to consolidate the standard within the group to reach a sufficiently mature version to be consensuated over the next few months for the official publication of the standard this year.

The Galileo time receiver standard will be the first satellite navigation-based standard as no other GNSS constellation has developed a similar standard. In addition, the GNSS time service offered by Galileo will be the first to implement an integrity layer, positioning Galileo as the most reliable GNSS system for these applications.

The use of Galileo receivers in maritime transport is getting ever closer

The ASGARD project (Advanced Shipborne Galileo Receiver Double Frequency, https://asgard.gmv.com) is currently carrying out an intense testing campaign in the laboratories of the JRC (Joint Research Center) of the European Commission and the BSH, a public body for maritime issues under the German Federal Ministry for Digital and Transport (BMDV).

Co-funded by the European Union Agency for the Space Program (EUSPA), ASGARD aims to accelerate the use of Galileo in maritime transport, thanks to the development of receivers that process E GNSS data. Vessels operating under the International Convention for the Safety of Life at Sea (SOLAS) must have a maritime GNSS receiver that meets the international standards of the International Maritime Organization (IMO).

In this context, GMV and Saab are developing a maritime navigation system incorporating a multi-constellation receiver (capable of receiving simultaneous signals from Galileo and other satellite positioning systems) and dual frequency that complies with European and international legislation, with the exceptional capacity to provide an additional layer of security and to use Galileo's Open Service Network Message Authentication (OS-NMA) mechanisms.

The tests that are being carried out at the JRC are focused on demonstrating that the system is compatible with the OS-NMA service, subjecting the receiver to a series of complex tests for resistance to spoofing attacks. As for the campaign that is being carried out at the BSH, it is related to IEC certification activities regarding the IMO international maritime standard on GNSS for E-GNSS navigators in the maritime sector.

These tests, which are essential for the development and evolution of the project, allow us to confidently face the acceptance test (Acceptance Review or AR), which is scheduled for May 2023 and in which the project will be examined and validated by both EUSPA and by external auditors.


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Sextans, a GMV´s navigation solution to support spaceborne missions

Sextans is a software defined GNSS receiver that provides accurate position, navigation and timing information to support multiple spaceborne applications. It is dual constellation system (GPS+Galileo) with 18 tracking channels and FFT acquisition capability. The dual frequency capability is foreseen in the near future's roadmap. The design is perfectly suited for high dynamics missions like satellites in LEO and launchers.

Sextans has been engineered to provide a flexible, configurable, extendible capabilities for spaceborne missions. What makes it exceptional is the approach to the signal processing – it is purely software. This approach provides flexibility that enables deep level of customization so the receiver can operate on a single processing core, or in parallel with other applications (e.g. guidance, navigation and control algorithms) on a multi-core platform.

Orbex Space is the first commercial customer of our product. Currently, GMV is finalizing the test campaign of the deliverable unit that shall be used at their Orbital Launcher. Thanks to the software design, we could customize and tune the product for the specific client's requirements rapidly. One of the major updates involves the implementation of an accurate PPS signal. The hardware platform (front-end, the processor board and the housing) was also customized for the client's needs and manufactured by our colleagues from CBK (Polish Space Research Center).

After the finalization of the test campaign for Qualification Model, and the internal tests at Orbex's premises, the flight unit will be delivered at the end of 2023. Its flight, after integration with the launcher, is recognized by our Team as a huge milestone, since that would be the maiden flight of our solution in the role of the launcher's primary navigation unit.

Interoperability and data at GSAW 2023

From February 27 to March 2, the city of El Segundo, California, hosted a new edition of the Ground System Architectures Workshop (GSAW), one of the main international forums to exchange knowledge, experiences, and technologies, bringing together world experts, developers, researchers, space sector suppliers, and the interested public to analyze the current situation in ground system architectures for the space sector.

GSAW's 27th edition, with the slogan "Stronger Together: Improving Interoperability for Users and Operations," focused on taking advantage of interoperability for corporate data and capacities, beyond the individual or grams for consumers and operators, and in improving the user experience.

In this context, GMV had a space where presented its portfolio solutions in this area, including demonstrations of them. The presented developments included: ***GMV Flexplan®*** (mission planning system), ***Flyplan*** (operations orchestration and automation system); ***Hifly*** (for real-time satellite monitoring and control), ***FocusSuite®*** (for flight dynamics operations), ***Smart*** (for telecommunications satellite payload management), ***Magnet*** (for ground segment monitoring and control), ***Archive*** (for satellite data exploitation and analysis), and ***FleetDashboard*** (tool providing global knowledge of the overall mission status).

GMV to develop the ground control center for Hisdesat's new satellites

The project includes cutting-edge innovations in the development and deployment of satellite control centers: communications security, satellite control system, satellite payload control system, satellite tracking and localization, as well as data Reception

Spanish government satellite operator Hisdesat has awarded multinational GMV a contract to build and develop the ground segment of the SPAINSAT NG program satellites.

These two new satellites, scheduled for launch in 2024 and 2025 respectively, will replace the operator's current SpainSat and XTAR-EUR satellites and significantly improve on their performance and capabilities.

The main control and tracking station will be located in Madrid (Spain) and will feature state-of-the-art technologies to provide service to the SpainSat NG satellites, the most advanced satellites in Europe for defense and secure communications. The redundant station will be located at INTA's Maspalomas Space Station.

GMV will be primarily responsible for integrating all the systems and subsystems and the horizontal services that will manage the two SpainSat NGs from the ground.

It will also deploy the control centers, which will be equipped with cutting-edge technologies, most notably in the control system for telecommunications payloads. This system is particularly complex for software-defined satellites such as the SpainSat NGs.

Finally, it will develop and implement the system responsible for monitoring the payload of the satellites' various frequency bands (X, Ka and UHF).

Last June, Hisdesat launched an international tender for the ground segment of the SPAINSAT NG program, divided into four lots due to its size. Competing against the sector's leading companies, GMV won the bulk of the project by submitting the strongest technical bids.

This new contract further tightens the close partnership between GMV and Hisdesat, a relationship that dates back to 2002.

GMV celebrates successful launching of the Amazonas Nexus satellite

On Monday, February 6, Hispasat's Amazonas Nexus high performance geostationary satellite was successfully launched from Cape Canaveral, Florida.

This satellite will be used to provide high speed Internet access throughout the Americas, as well as along the north and south Atlantic flight corridors and in locations as remote as Greenland and the Amazon rainforest.

Although the original Sunday launch time had to be postponed because of poor weather conditions, the satellite was launched on Monday aboard a SpaceX Falcon 9 rocket, representing an investment of €300 million.

The satellite will allow the latest generation of telecommunications services to be provided on the Ku band, for in flight connectivity services in North and South America and the Atlantic region. It also features Ka band capacity, to optimize communications between gateways and the satellite. This is a way of multiplying the total onboard capacity available for commercial use, which greatly improves the per-unit cost for that capacity when compared to traditional satellites.

GMV's participation in the project includes supply of the control center and flight dynamics system, installation of a new ground station for this satellite in Rio de Janeiro, a new satellite tracking and positioning system, and various ground equipment elements. The company has also provided a new control and management system for all of the ground stations being used to control the Hispasat fleet.

Another aspect of this launch worth highlighting is its ability to drive economic development in the communities being served. By improving connectivity in rural and remote areas, new business and employment opportunities will be created, which will in turn help spur economic growth in a variety of regions.

Launching of the Amazonas Nexus satellite represents an important milestone for the space industry, because it marks the start of a new phase in satellite communications, while also reinforcing the industry's commitment to using technology to improve the lives of people.

GMV provides the core software for the Greek SST System

GMV has been awarded a contract to provide the core software for the Greek Space Surveillance and Tracking (SST) System, which will contribute to the country's capacity for the European EU-SST partnership

The National Observatory of Athens (NOA), supported by the Ministry of Digital Governance of Greece - General Secretariat of Telecommunications & Posts, awarded a contract to GMV to supply the core software as a complement to the existing national SST capacity to run the Greek Space Surveillance and Tracking and Space Awareness (SST/SSA) Program.

The system comprises an operations center, the GR SST NOC, located in Athens at the Operational Unit BEYOND/NOA, and a network of optical telescopes in locations throughout the country to support space tracking and survey operations. It will use GMV's state-of-the-art COTS software for SST (***FocusSST***) to support the core processing infrastructure. This includes SST capabilities and functionalities such as sensor tasking, orbit determination, collision avoidance, re-entry prediction (in the operations centre), and optical data astrometrics and photometric reduction (in each of the network's telescopes).

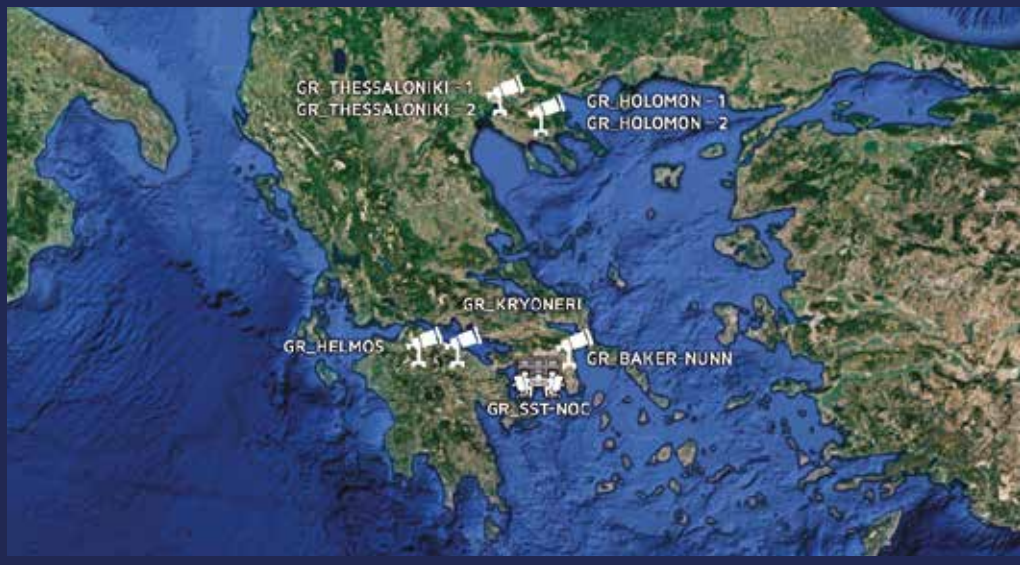
To foster the development of an SST capability in Europe, the EU established in 2014 (through decision No. 541/2014/EU of the European Parliament and of the Council of April 16, 2014) a Framework for Space Surveillance and Tracking Support. This Support Framework aims to develop an independent SSA/SST capability in Europe by EU SST.

Since then, the incipient national SST capabilities in the countries within the EU SST consortium have been federated in a coordinated manner: EU SatCen acts as the front desk for the SST services provided by the EU SST consortium.

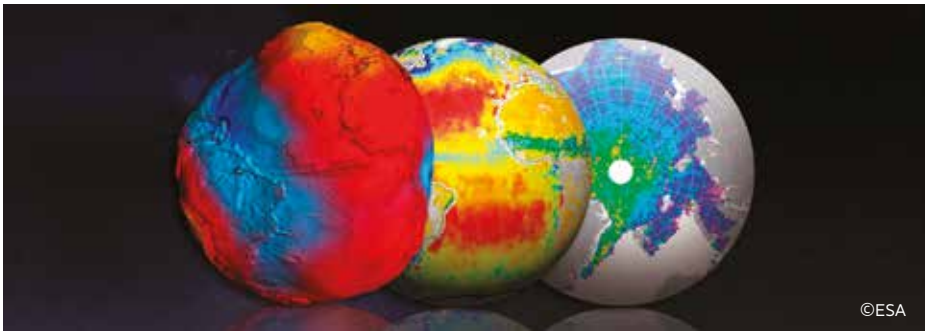
In November 2022, this EU SST consortium was enlarged to what is known as the EU SST partnership. This partnership, already foreseen in the Regulation (EU) 2021/696 of the European Parliament and the Council of April 28, 2021 (the EU Space Regulation), integrates eight new member states: Austria, the Czech Republic, Denmark, Finland, Greece, Latvia, the Netherlands, and Sweden. Being one of these new members of the EU SST Partnership, Greece has been mandated to contribute to the EU SST system with the capabilities of its national SST system, described above.

Both Spanish and Romanian branches of GMV will be involved in the activity, working with teams in Madrid and Bucharest.

With this new project, GMV strengthens its position as the European industrial leader in Space Surveillance and Tracking (SST). All in all, over 100 GMV engineers currently work at GMV on SSA/SST activities in seven European countries, making it the largest SSA/SST industry and team in Europe. GMV works intensively in this field for the EU SST (in Spain, France, Germany, Romania, Poland, and Portugal), for ESA (in addition to the previous list, from the UK), as well as in the commercial sector (providing collision avoidance services to more than ten operators and more than 80 satellites through its ***Focusoc*** operations center) and in the military domain.



GMV leads the development of the end-to-end performance simulators for three of the Earth Explorer 11 missions



The European Space Agency (ESA) has awarded GMV the contracts for the development of the end-to-end mission performance simulators for three of the four new Earth Explorer 11 candidate missions: CAIRT (Changing-Atmosphere InfraRed Tomography), which would be the first limb-sounder with imaging Fourier-transform infrared technology in space; WIVERN (Wind Velocity Radar Nephoscope), which would measure global in-cloud winds, clouds and precipitation; and Nitrosat, which would map reactive nitrogen compounds at landscape scale. The missions are currently undergoing Phase 0 system studies and, after a down-selection in autumn 2023, two of them will be selected to go into Phase A. Then, one of the missions will be selected for implementation at the end of Phase A.

GMV has the leading role in all three activities in which the consortia include scientific team experts in the fields relevant to each mission. For CAIRT: Karlsruhe Institute of Technology, Instituto de Astrofísica de Andalucía and Forschungszentrum Jülich. For WIVERN: Politecnico di Torino and CIMA Research Foundation. For Nitrosat: SPASCIA and, acting as consultants, Université Libre de Bruxelles and Royal Netherlands Meteorological Institute. In addition to being the prime of the activities, GMV is responsible for the requirements specification, architecture design and interfaces, implementation of the geometry module and the observing system simulator, the integration, verification and validation of the complete simulator and the mission performance assessment campaign.

End-to-end mission performance simulators for Earth observation missions are used to assess the mission performance, support the consolidation of the technical requirements and conceptual design, and allow end-users to assess the fulfilment of requirements by the mission. This is the first time that the development of these end-to-end simulators starts during the mission pre-feasibility studies, which confirms the importance of these tools for the mission assessment.

The award of the three contracts consolidates the leading position GMV has reached in the development of end-to-end mission performance simulators.

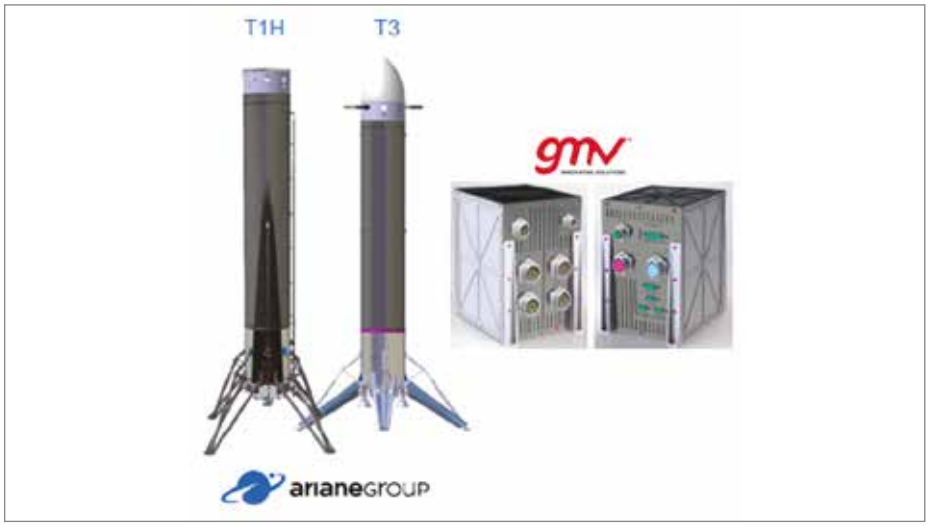
GMV shows its firm commitment to space sustainability

As proof of its staunch commitment to space security and sustainability, GMV attended the 2nd ESA NEO and Debris Detection Conference, held in Darmstadt, Germany, from January 24 to 26.

As a world leader in studying, monitoring, and preventing the proliferation of space debris, a market in which it has been operating for over 20 years, GMV had a notable presence at this conference organized by the European Space Agency (ESA), which focused on the progress made in this field after exploring the synergies between search programs, orbit determination, and risk management for NEO and space objects.

Diego Escobar Antón, head of GMV's SST Systems Southern Europe, Technical Coordination and Products (S3T) division of EST Space Systems, took part in the panel "Better together—highlights and prospects for NEO and debris detection in observation networks," giving his vision and experience in studying and detecting space debris, focusing on the opportunities offered by today's data networks and their relevance for supporting sustainability and space security. Additionally, given GMV's leading position in the areas covered by this conference, it participated with seven presentations and four posters.

GMV is taking part in the design of the European reusable launcher Themis



The kick-off meeting for the project SALTO took place by videoconference in December 2022. The project will facilitate the first flight tests of the Themis reusable stage demonstrator in Kiruna, Sweden.

SALTO is coordinated by ArianeGroup and is a joint venture involving 26 partners from 12 different countries. By bringing together industry, research institutes and start-ups, it aims to accelerate Europe's transition to increasingly innovative, competitive, and eco-friendly access to space.

GMV is taking part in the innovative design and development of key technological building blocks for Themis to pave the way towards next generation of reusable launchers. In particular, GMV will focus on the development of a cost-effective modular processing unit (MPU) flight model for Themis 3 (T3) stage. The main function of the MPU is to safety distribute power to relevant launcher equipment with independent buses following a modular, configurable, and cost-effective approach. The MPU will be an evolution of previous heritage of GMV launcher avionics, having as an intermediate step the development of the power conditioning and distribution unit (PCDU) for the intermediate Themis 1 Hop (T1H) demonstration stage.

The Themis reusable rocket road map consists of several stages of building blocks development and demonstration tests. T1H includes two vertical hop tests and landing and one vertical hop with lateral movement, reaching a height of between 30 and 100 meters. In T3 a loop test will be conducted at the Kourou test site, with a target height of 60 kilometres.

GMV is in charge of the full design and development of the MPU. This involves overcoming various challenges to cover modularity, integrating voltage, current and temperature measurements to facilitate and control MPU management during flight, namely for switching different channels on and off; providing pulse-width modulation (PWM) outputs to equipment, and protecting failure propagation and high-voltage interlock.

Growth2 for your SmallSat business

In February, GMV attended the 8th edition of the SmallSat Symposium, which was held in the heart of Silicon Valley in Mountain View, California. This year's event was entitled "Growth2 for Your SmallSat Business", and it brought together an impressive group of speakers and panelists from a wide range of public, private, and governmental organizations, to identify essential trends and learn about the latest disruptive technologies. SmallSats now represent 97% of all satellites launched, it is important for their future to create an ideal environment for open communication and development of a consolidated vision.

The program for this conference covered an extensive range of subjects, such as the current SmallSat market, regulatory aspects, investment, and emerging technologies and concepts such as the Internet of things, in space services, megaconstellations, machine learning, and cloud computing.

As a worldwide leader in the satellite ground control market, GMV took advantage of this opportunity to participate in the conference with its own stand, where it showcased the company's product lines for satellite control (***Hifly***), flight dynamics (***FocusSuite®***), mission planning (***GMV Flexplan®***), ground station monitoring and control (***Magnet***), payload management (***Smart payload***), collision avoidance services (***Focusoc***), and data processing (***Prodigi***).

This event also represented a perfect forum for discussing the future of the industry, because right now there are hundreds of SmallSat projects already in progress, with ongoing near term growth expected for this market.

GMV contributes to the navigation payload of ESA's Moonlight program

Moon exploration is emerging as a key global strategic priority in space exploration. Several commercial and institutional missions to the Moon are being planned, with major contributions from ESA such as the Orion service module, the Gateway lunar station, and multiple lunar robotic missions. Although there are a wide variety of future missions planned for the Moon, a lunar communication and navigation system (LCNS) is not yet available.

In response to the planned demand for future lunar missions, the European Space Agency (ESA) has defined a roadmap for Lunar PNT (positioning, navigation, and timing) service provision. In line with this, an ESA project to develop a prototype lunar navigation payload as part of an LCNS has been initiated to reduce the risk of implementation within future stages of the ESA Moonlight programme.

As part of the LCNS payload development project, GMV will support SSTL (Surrey Satellite Technology) by taking responsibility for signal generation aspects, utilising its vast knowledge and heritage in PNT and FPGA software development.

The future of satellites at SSSIF 23

From February 20th to 23rd, the 4th edition of the Small Satellites & Services International Forum (SSSIF) was held in the Spanish city of Málaga. This gathering brought together industry experts to analyze and discuss the main challenges facing the small satellite market, as well as the space industry in Europe and the United States. GMV participated as a platinum sponsor, and some of the company's top executives were also present at this event.

The development of "cubesat" nanosatellites has led to the appearance of new technological opportunities, which in combination with artificial intelligence, are allowing data to be collected and processed more quickly and efficiently. In addition, the technology applied to these satellites has a wide range of uses, covering everything from agriculture and mining to predicting and monitoring natural disasters.

During the opening session, Jorge Potti, GMV's Corporate Strategy Manager, gave a talk summarizing the industry's current situation. He also discussed some of the major opportunities for the future, with highlights including secure communications and satellite navigation. Various representatives from GMV also participated in some of the roundtables held at this 4th edition of SSSIF. Enrique Fraga, GMV's General Manager for Space Systems EST, served as moderator for the "Spanish Space Agency" discussion, which featured a panel of experts. In addition, Miguel Ángel Molina, GMV's Deputy General Manager for Space Systems EST, joined the panel in the "Ground Segments" discussion, and Mariella Graziano, Manager of Strategy and Commercial Development for Science, Exploration and Transportation for Space Systems EST, participated in the session entitled "Small Satellites & Defence Applications", as well as the "Women in the Space Sector" roundtable discussion. Finally, José M. Legido, GMV's International Markets Manager for Secure e Solutions, participated in the roundtable entitled "Cybersecurity in Space".

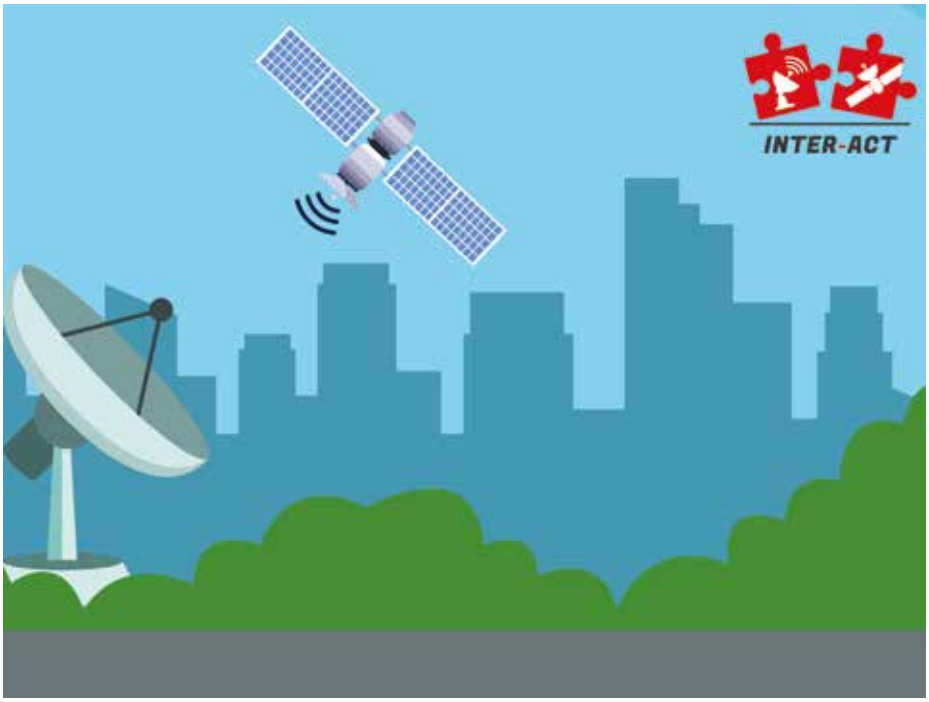
ESA relies on GMV to standardize attitude and orbit control interfaces

Based on its expertise in developing AOCS algorithms to support the standardization process of the interfaces between the onboard AOCS S/S and the ground segment, the European Space Agency (ESA) has recently awarded GMV the INTER-ACT (INTERfaces for Attitude and orbit ConTrol) project.

Nowadays, each mission uses its own AOCS algorithms differently. Therefore, a significant amount of effort is invested each time to define interfaces to ground. The main goal of this activity is to develop a set of common AOCS interface functions applicable to a set of “typical” use cases based on ESA missions. This will significantly minimize effort and cost on the mission development, both on the Agency and Industry side, by the increased re-usability of AOCS operational and development tools and processes across ESA missions.

For this purpose, Portuguese and Polish GMV teams come together to consolidate the standards proposed by ESA for the onboard parameter profiles and thruster modulators. Defining the interfaces with the ground segment, in terms of parameters to exchange and operability constraints, is also a goal. The GMV team is supported by three Large System Integrators (Airbus Defence & Space, Thales Alenia Space, and OHB) that will work as consultants in relevant use cases. This participation is a crucial factor in guaranteeing viability and fostering the adoption of these standards in future ESA missions.

This contract consolidates GMV’s strong path in developing relevant AOCS/GNC solutions in several ESA missions. It also highlights the key role that GMV has in building the future of these solutions through the definition of standards to reduce cost and increase speed and interoperability of different systems and procedures.



Satellite communications, a critical piece of defense and security

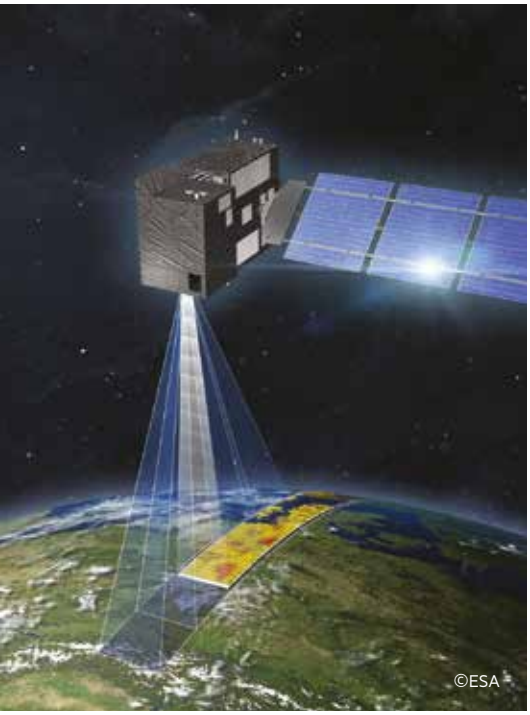
In February, GMV attended the 6th edition of GOVSATCOM. This is an annual conference for European Union defense and security, which took place in Luxembourg. The event, which is considerably important for international SATCOM actors in the satellite, government, institutional, and defense landscape, brought together a broad group of experts to create a debate forum to drive Europe's competitiveness in the fields of defense and security.

Satellite communications have become an essential piece of defense, security, emergency response, and humanitarian and diplomatic efforts in remote settings or with little existing infrastructure, giving global connectivity a crucial strategic role.

As a particularly important actor in the industry, GMV attended the event where it had its own booth and presented some of its space sector services and products, which are associated with the ability to control, manage, and optimize the use of the space and land infrastructure needed to provide the required services efficiently and ensuring proper operation of satellites and the communication networks involved.

Miguel Ángel Molina, GMV's Space Systems EST Deputy General Manager, took part in the session on "The many threats to Space Systems and Capabilities: from interference, space debris to space situational awareness," where he presented on the need for robustness, resilience, and sustainability that directly affects current and future satellite communication systems.

GMV helps define the requirements of the Sentinel expansion mission CO2M



The current set of Sentinel missions are part of the heart of the Copernicus Earth observation and monitoring program run by the European Commission. Data from Sentinel satellites, developed by the European Space Agency, help address challenges such as urbanization, food security, rising sea levels, diminishing polar ice, natural disasters, or climate change.

The Copernicus program must be constantly evolving and ensure that it responds to the needs of a large number of users from different fields. With this objective, six Sentinel expansion missions are currently being developed to expand the capabilities of Copernicus and thus cover the additional needs of its users.

The European Space Agency (ESA) has awarded GMV two relevant contracts within the framework of CO2M, a Sentinel expansion mission that aims to measure atmospheric carbon dioxide produced by human activity.

Through the first contract, GMV will develop the mission control system (MCS), based on the existing SCOS-2000 infrastructure, extending it to respond to technical challenges related to adapting to the new characteristics of this generation of Copernicus satellites. GMV has also been awarded the contract for the development of the mission's operational simulator. The project is noteworthy as CO2M will be the first mission based on the new ESA simulation infrastructure, SIMULUS11.

GMV assesses impact of Turkey earthquake

As part of its emergency management efforts, GMV is conducting an impact assessment of the earthquake that struck Turkey and Syria in the early hours of Monday morning on February 6. GMV is using optical imagery of the highest resolution to keep the EU Civil Protection Mechanism's Emergency Response Coordination Centre (ERCC) apprised of the situation facing the population and infrastructure in several affected cities (Gaziantep, İslahiye, Düziçi and Bahçe).

GMV is assessing how the population and infrastructure have been affected by one of the largest quakes in the last decade, compiling all information from high-resolution satellite imagery. These images show the challenge faced by rescue teams and reveal the widespread destruction caused in towns and villages across the region. Completely flattened residential areas, makeshift tents set up on soccer fields, and heavy traffic jams on roads, many of which are closed, are some examples of what they have captured.

This action is being done thanks to the Copernicus program, which keeps satellites and Earth observation services operational to support management and decision-making in different areas, particularly in the field of emergency management.

GMV is one of the main suppliers of Copernicus program infrastructure. In a management capacity, it monitors the database architecture and ensures its integrity, analyzes the data required by the service chains, and identifies the most suitable technologies to keep the entire program operational.

GMV actively participates in the Copernicus Emergency Management service

GMV renews the rapid mapping service framework contract of the Copernicus program until 2029

GMV´s Portugal subsidary has once again been awarded, within a consortium, the renewal of one of the framework contracts for the Copernicus emergency management service, in particular, the rapid mapping service (CEMS).

CEMS provides detailed information supporting all phases of the disaster management cycle under request, covering all types of events, natural and artificial, anywhere in the world. One of its key strengths is the ability to provide information quickly and effectively in the aftermath of a disaster. Time is of the essence, and the ability to provide information rapidly can make a significant difference in the outcome of the disaster response and recovery efforts.

Rapid Mapping consists of the provision of geospatial information within 3h to 12h from the service activation and satellite imagery acquisition, supporting emergency management activities immediately following a disaster. The service portfolio includes different types of products: to ascertain the situation before the event (reference product), to roughly identify and assess the most affected locations (first estimate product), assess the geographical extent of the event (delineation product), or to evaluate the intensity and scope of the damage resulting from the event (grading product).

The information generated by the service can be used as supplied (e.g., as digital or printed map outputs), or it may be further combined with other data sources (e.g., as digital feature sets in a geographic information system). In both cases, it supports emergency managers' geospatial analysis and decision-making processes.

The service provides data to entities and organizations at regional, national, European, and international levels active in emergency management. The EMS can be triggered only by or through an Authorized User (AU). Authorized Users include National Focal Points (NFPs) in the EU Member States and countries participating in the Copernicus program, European Commission services and the European External Action Service (EEAS).

This new contract will run until 2029.

Final Field Testing Completed for CoRob-X project

From January 21st to February 11th, on the Spanish island of Lanzarote, GMV and its European partners conducted the final phases of field testing for the CoRob-X project, which stands for Cooperative Robots for Extreme Environments.

CoRob-X is part of the Strategic Research Cluster (SRC) on Space Robotics Technologies, coordinated by the PERASPERA project as part of the European Union's Horizon 2020 program. Led by DFKI, the aim of CoRob-X has been to develop and demonstrate technologies focused on multi-agent robotics, with the aim of improving the potential for collaboration among different robots. The main application is lunar surface exploration, with a focus on areas that are difficult to reach, such as craters and lava tubes.

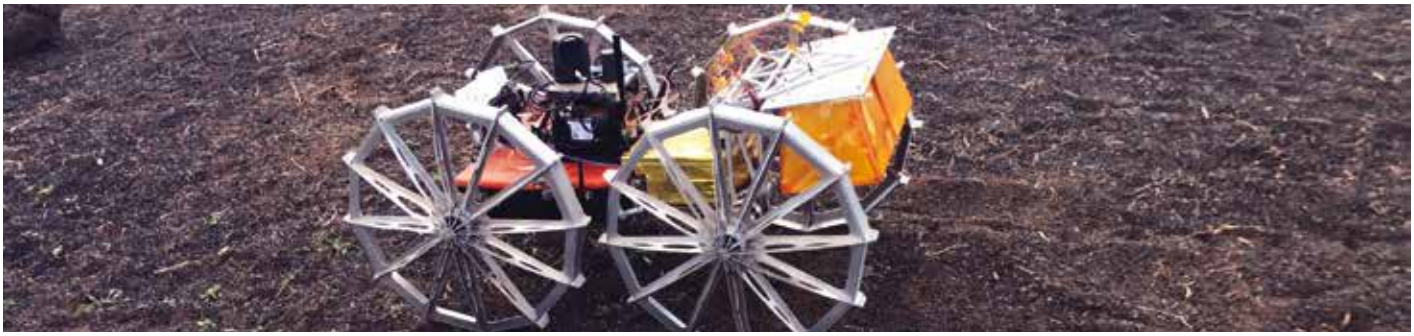
The testing carried out on Lanzarote was designed to demonstrate the ability of three robotics demonstrators to work in collaboration, for the purpose of exploring lava tubes. The island offered a setting on Earth with characteristics similar to those of the surface of the moon. The testing was performed using SherpaTT, which is a heavy rover weighing more than 200 kg, together with two other lightweight rovers known as Coyote and LUVMI.

During the first phase, the three rovers analyzed the ground surface surrounding a lava tube, with each assigned to a different area. The goal was to create an overall three-dimensional map, using the separate mapping produced by each of the rovers. During the second phase, the LUVMI rover approached the entrance to the lava tube and positioned a cube shaped device inside. This equipment contained sensors with the ability to perform a preliminary analysis of lava tube's characteristics, while also providing communication capabilities inside of it. During the third phase, the Sherpa rover used its robotic arm to help the Coyote rover rappel down into the lava tube. This required the use of multiple systems on the two robots (perception and localization, guidance for both rovers, manipulation of the robotic arm, etc.), all of which had to take place in a particularly difficult and hazardous environment. To complete the testing, the Coyote rover explored the inside of the lava tube and performed three-dimensional mapping of it.

All phases of the mission were completed successfully, and thanks to participation by reviewers for the Program Support Activity (PSA) and from the European Research Executive Agency (REA), satisfactory execution of the testing could be officially confirmed.

These new tests supplemented other testing that GMV performed in January in the Spanish province of León, which was also focused on use of these technologies in environments with difficult access. In that case, the tests included mining activities as well as construction of underground infrastructure. Successful completion of all this testing brings the CoRob X project to a close, along with the key role played by GMV.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101004130.



EMRS Tested Successfully in Lunar and Martian Analog Environments

The test were carried out at DLR's PEL (Planetary Emissivity Laboratory) and at GMV's SpoT (Surface Planetary Testbed)

GMV is leading one of the two Pre-Phase A studies of the European Moon Rover System (EMRS).

This project focuses on finding the best solution for a potential future European rover, with the ability to carry out different missions in different places on the lunar surface. As such, the GMV's EMRS team (OHB, AVS, HTR, DLR) has selected a modular approach, allowing different capabilities to be added to the rover and the egress with minimal changes. By design, EMRS is intended to be used for Polar Explorer, Astronomical Lunar Observatory, and in situ Resources Utilisation missions and other non-polar geological missions (f.i. equatorial).

In only nine month the GMV's EMRS modular solution has shown not only its suitability to be used in various mission configurations, but its capability to achieve a balance between versatility and system optimality, making flexibility the key design driver.

The solution proposed in EMRS has been tested in two analogue facilities, DLR's PEL (Planetary Emissivity Laboratory) and GMV's SPoT (Surface Planetary Testbed), the former analogous to the Moon and the latter to the Martian surface. The test results showed that the proposed solution, first the locomotion system, can traverse difficult terrain, climb slopes greater than 25° and overcome many obstacles while maintaining high performance, both on lunar regolith and on the ground.

Excavation tests have demonstrated the ability to excavate in lunar regolith, essential for human life on the Moon.

The GMV's EMRS showed the need and the feasibility to think modular when talking about future lunar exploration.

GMV is welcoming the future space ecosystem

The space industry is shifting with the increasing influence of private companies in what is known as New Space. Driven by affordability and the benefit to end users, the New Space actors are leading a paradigm shift that makes space more accessible than ever before. However, with more and more spacecraft being launched into orbit, it has become crucial to incorporate sustainability as a core vision in future spacecraft development. An answer to this is On-Orbit Servicing (OOS), allowing refueling, repair, and waste management through robotic tools that, together with a modular spacecraft design, can not only achieve the life extension of the equipment but consequently generate an opportunity for worldwide revenue in the range of $6 billion by 2030.

In this context SCHUMANN aims to strengthen the foundations of this future space ecosystem through two complementary developments, namely the Functional Satellite Module (FSM) and the Design and Development Specification for the Spacecraft Construction Kit (DSSCK) in which GMV takes part.

The Functional Satellite Module consists of a Refuellable Tank and a Refueling Experiment. It will demonstrate that a “side” standalone module can be integrated at a late stage into an OOS mission. While the “Design and Development Specification for the Spacecraft Construction Kit” consists of specifications and tools to guide and support FSM developers to make their modules compatible and usable in a single ecosystem.

GMV is also part of a pan-European project which received a grant agreement from the European Commission in January 2023. As part of On-Orbit Servicing (OOS), the EROSS IOD project aims to prepare and carry out the last remaining steps to fly a pioneering European mission by 2026 with a customer-driven approach.

In this project, in which 17 partners are participating, GMV leads the use of ERGO, an environment for high levels of on-board autonomy, and ESROCOS, a European operating system for orbital and planetary robotics. Its technologies will contribute to Europe’s competitiveness in all space domains, not only for OOS: they can be directly used on key missions such as next-generation Copernicus or Galileo and the telecommunication commercial constellations and satellites. Two commercial customers and one insurer have agreed to be in the project’s User’s Board.

The proposed demonstration will enable access to several market segments, in the short, mid, and long terms, regarding On-Orbit Servicing for unprepared and prepared clients and also In-Orbit Assembly and Manufacturing.

Both projects have the challenging contributions of the Portuguese and Spanish GMV teams.

European H2020 PERIOD project undergoes successful final testing

The final tests and demonstrations of PERIOD (PERASPERA In-Orbit Demonstration) were successfully completed in March. PERIOD is one of the Horizon 2020 projects being carried out as part of the third phase of the Strategic Research Cluster (SRC) for Space Robotics Technologies, managed under the European PERASPERA project. The final testing included an ambitious and novel in-orbit demonstration (2026).

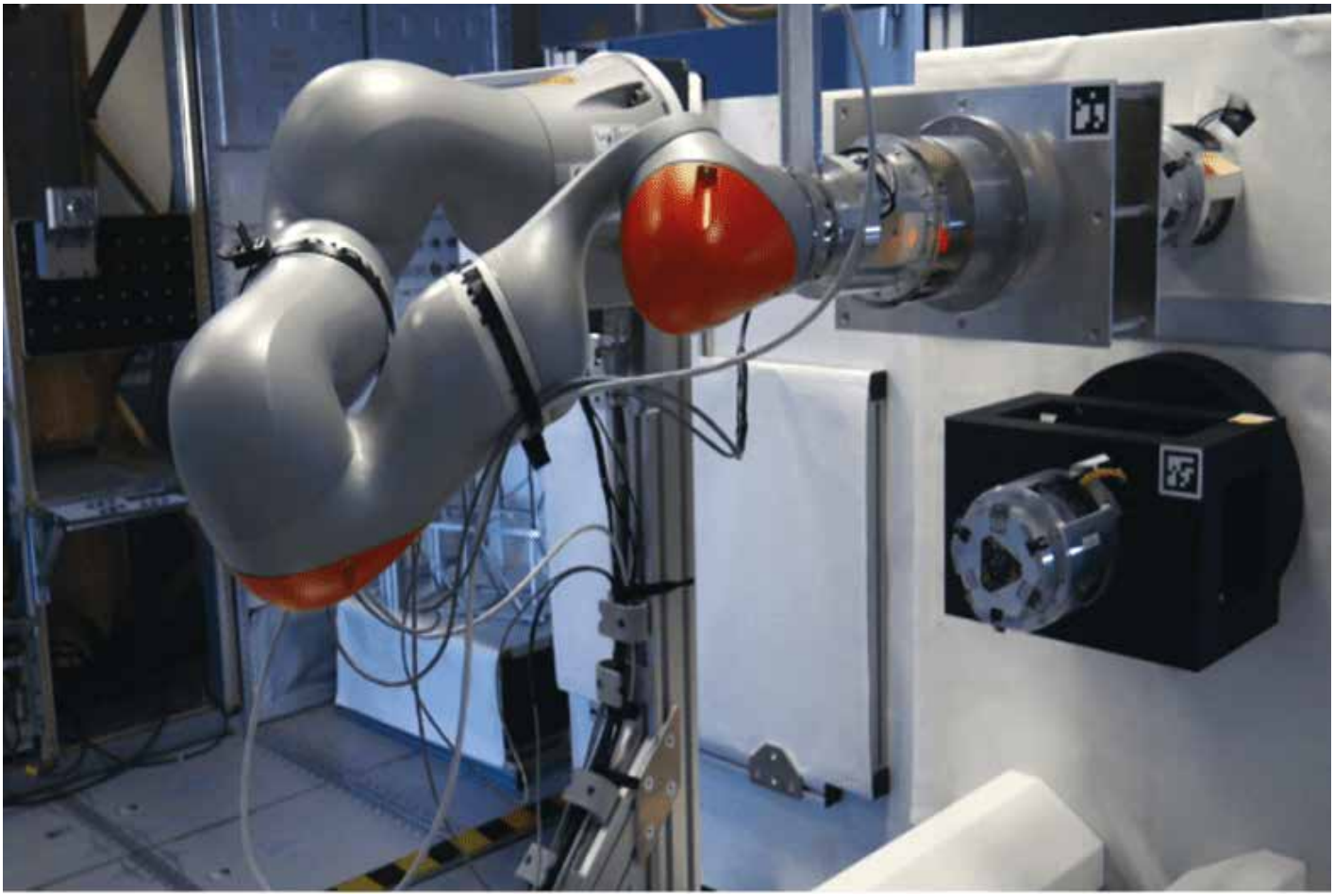
PERIOD's main goals are to define, implement, demonstrate, and disseminate the technological maturity in Europe of the orbital concepts known as in-space manufacturing and assembly (ISMA) and satellite refueling. The hope is to bring these concepts to market in the not too distant future in Europe's institutional and commercial frameworks.

The demonstration scenarios defined in PERIOD were carefully chosen to convince the scientific community and other stakeholders of the possibility of manufacturing, assembling, and refitting in-orbit satellites and/or large antennas, as well as using the International Space Station (ISS) as a possible orbital refueling station. Manufacturing includes building an antenna, assembling the satellite components, and refitting them in the same orbital factory using the autonomous "Motion Planning & Execution" subsystem based on ERGO and ESROCOS, two previous projects of PERASPERA.

GMV forms part of a consortium of seven partners led by Airbus Defence & Space GmbH. GMV's involvement in this project was particularly important, allowing for the reuse and adaptation of the ESROCOS and ERGO frameworks, as well as for the requirements specification, design, implementation, integration, verification, and validation of both frameworks during the project.

During the project's final months, two activities were carried out in parallel to verify and validate the objectives defined in PERIOD. Both activities were satisfactorily carried out in accordance with the requirements and standards set for the project.

The PERIOD project is taking place within the framework of the European Union's Horizon 2020 research and innovation program (grant agreement no. 101004130).



Artificial intelligence under debate

On January 25, Fundación Círculo de Tecnologías para la Defensa y la Seguridad hosted the conference "The Impact of Artificial Intelligence in the Defense and Security Sector" at the Higher Technical School of Telecommunication Engineers of the Universidad Politécnica de Madrid (Escuela Técnica Superior de Ingenieros de Telecomunicación de la Universidad Politécnica de Madrid).

The event was a great success with more than 200 attendees, including the Admiral General Director of Armament and Material of the Spanish Ministry of Defense, Aniceto Rosique Nieto, and the Major General Director of CESTIC, José Mª Millán Martínez, as well as more than 20 exceptional speakers from the university, the administration and companies in the sector.

José Luis Delgado, head of GMV's Defense and Security SCIS section, presented some of GMV's projects, such as the CLAUDIA project (Cloud Intelligence for Decision Making Support and Analysis) of the European Defence Agency, where artificial intelligence has proved to be a decisive enabler, applying natural-language processing to analyze huge amounts of open-source data in a hybrid warfare environment or artificial-vision techniques in tactical cloud deployments.

The conference was concluded by Teresa Riesgo, Secretary General for Innovation of the Ministry of Science and Innovation.

GMV to increase Europe's maritime surveillance capabilities

GMV has secured a contract from the European Defence Agency (EDA) to develop the new software applications of the third phase of MARSUR

At the end of 2005, European leaders agreed to launch a project devoted to maritime surveillance (MARSUR) through EDA, with the aim of creating a European network that would link together existing national systems. Common standards were needed to ensure maritime safety and security, as the European Union has more than 14,500,000 km² of sea area under its remit, over which around 12,000 vessels sail every day.

Since its inception, MARSUR's capacity has evolved through different phases

to integrate various technological improvements. While the previous phase of the project (MARSUR II) focused on network maintenance and updating MEXS, the software that ensures the automatic exchange of maritime surveillance data between participating countries, MARSURIII will upgrade the MEXS and user interface (MUI) technology, enable the exchange of restricted information, and improve the system's interoperability with other maritime security networks, mainly with the EU's Common Information Sharing Environment (CISE).

The overall objective of MARSURII, awarded to GMV, is to improve the operational use of MARSUR in maritime missions and operations carried out under the EU's Common Security and Defense Policy (CSDP), the policy framework through which Member States are developing a strategic security and defense culture in Europe to preserve and strengthen international security.

The new software applications to be developed by GMV for MARSURIII will be based on the company's ***Socrates*** system. This system comprises a set of tools that provide solutions for maritime surveillance, enabling data exchange between all network users, especially between emergency response teams; inter-agency task allocation for surveillance missions, providing decision support to optimize resources; advanced image analysis and exploitation capabilities; video playback with the possibility for simulcast, metadata display, etc.; and lastly, a data repository capable of data mining, delivering advanced report generation capabilities.

GMV has an extensive track record in creating information systems and software applications for maritime surveillance. GMV has been involved in major EU projects such as EUCISE2020, OCEAN2020 and EUROSUR, and in EC R&D projects for maritime surveillance such as CLOSEYE, ANDROMEDA, MARISA and PROMENADE. GMV has also added new functions to the Spanish Navy's SMACS-IT program, an adapter for the EU CISE that connects to MARSUR and has allowed GMV to gain experience in the project. The company also took part in drawing up the Interface Exchange Requirements (MARSUR IER) in a contract awarded by the EDA in 2010.

GMV is a pan-European company with facilities and technical staff in seven EU Member States, namely Spain, Portugal, France, Germany, the Netherlands, Poland, and Romania, enabling it to provide comprehensive operational support to the MARSUR network and its end users.

GMV studies the feasibility of applying 5G technology in defense

Following the 2016 EU Global Strategy that defined strategic autonomy in the field of security and defense as a long-term objective, the European Defense Agency (EDA) was tasked with identifying the "Key Strategic Activities" (KSA). These ranged from technological expertise to industrial manufacturing skills that Europe would need to acquire, maintain or further develop in order to produce the defense equipment it needs on its own. The goal of the KSAs is to identify, and then support, those critical industrial technologies and skills without which an adequate level of strategic autonomy is not possible.

Communications systems play a particularly relevant role in armed conflicts with a profound impact on defense, which is why 5G communications in this area were identified as one of those key activities. 5G mobile communications provide outstanding technological advantages compared to previous generations, among which are: a higher data transmission rate, greater mobility capacity, greater density of connected devices, improved equipment life thanks to lower energy consumption and reduction of communication latency. However, there are some important challenges which may require changes to the system to adapt it to the defense scenario.

In line with these challenges, the European Defense Agency has awarded a consortium led by GMV, a project whose objective is to study the application of 5G communications in defense in order to identify the main security challenges and concerns as well as the possible countermeasures for the specific military environment where these types of solutions can be implemented.

The project aims to achieve a broad understanding of the risks associated with the adoption of 5G networks by the armed forces of the participating member countries. To this end, for the project's duration different military scenarios, purposes and types of 5G networks will be analyzed in order to identify and assess the risks associated with each of these situations.

GMV, invited by the EDA to analyze the challenges of multidomain operations

On February 14, the European Defense Agency (EDA) organized the "1st Workshop with industry on Multi-Domain Command and Control Systems (MDC2)", an event bringing together 15 member states, 11 European industries, and research organizations, including representatives of the European Union's Military Staff (EUMS) and Military Planning and Conduct Capability (MPCC).

This workshop provided an overview of the current and future state of C2 systems in a multi-domain environment, the research and development efforts undertaken by industry to create solutions tailored to the Union's defense needs, and a set of proposals to be taken forward by member states.

These initiatives are the first step towards a common understanding of the challenges and opportunities arising within the EU framework. Participants shared their perspectives on key issues for C2 systems, such as interoperability, security, and adaptation to new communications technologies. This forum provided an opportunity to exchange views and positions on key issues and practical recommendations to Member States to promote concrete actions in research.

It also sought to promote technologies and innovation and to shape the capabilities of future systems in areas such as processing, data analysis, security, and interoperability, taking advantage of the potential of new technologies.

Vicente de Ayala, GMV's Defense and Security Project Manager, took part in the event, offering the company's experience in developing C4ISR command and control and interoperability systems.

Puertos del Estado renews its confidence in GMV

Puertos del Estado has recently turned to GMV for updating and upgrading its AIS network (Automatic Identification System).

The AIS network of Puertos del Estado aims to provide users with real-time information on vessel identification data, position, course, speed, type of cargo, port of destination, arrival time, and other data, incorporating various value-added functions for port operations and management of navigation aids. In addition, all the information that arrives is stored, allowing its later use for statistical purposes, investigation of incidents, or carrying out studies.

The AIS network of Puertos del Estado has been developed, implemented, and maintained by GMV from 2005 to the present day. It is based on ***Shiplocus***®, GMV's multi-application platform for port management and traffic operation, which receives, processes, and distributes the location information transmitted by ships through their AIS terminals following the requirements laid down by the International Maritime Organization (IMO).

Shiplocus® covers the needs of port administrations and operators in different areas and services, allowing the monitoring and tracking of ships in real-time, improving the optimization of port planning, the integration in intermodal transport, the management of port calls, the operation of marinas, the monitoring and control of navigation aids and the emission of hydro-meteorological data from the State Ports systems.

These tools are highly useful in ports, both for planning and port operations, and they are used in control centers, operations, and navigation aid departments.

The new contract includes maintenance, operating assistance, network status monitoring, and incident management. Under this new contract, GMV will also adapt the network to a new version of ***Shiplocus***® incorporating new functions related to the calculation of ship emissions and the generation of reports.

GMV validates Romania's integration into the ASCA program

From January 16 to 23, GMV received a delegation from the Romanian army to carry out bilateral tests between the Spanish command and control system TALOS, developed by GMV, and the IFATDS system deployed by the Romanian army on its rocket launcher batteries.

These tests aimed to validate Romania's correct implementation of the ASCA protocol (Artillery System Cooperation Activities), with a view to Romania's recognition as a member nation of the program and its participation in Dynamic Front, the annual live-fire exercise carried out in Germany.

The ASCA program defines an interoperability protocol that allows real-time digital communication between international artillery and command and control systems to minimize the problems associated with using language and transmitting information by radio, providing a secure and standard means to transmit the information necessary to conduct operations in multinational deployments. Spain has been a member nation of the program since 2022.

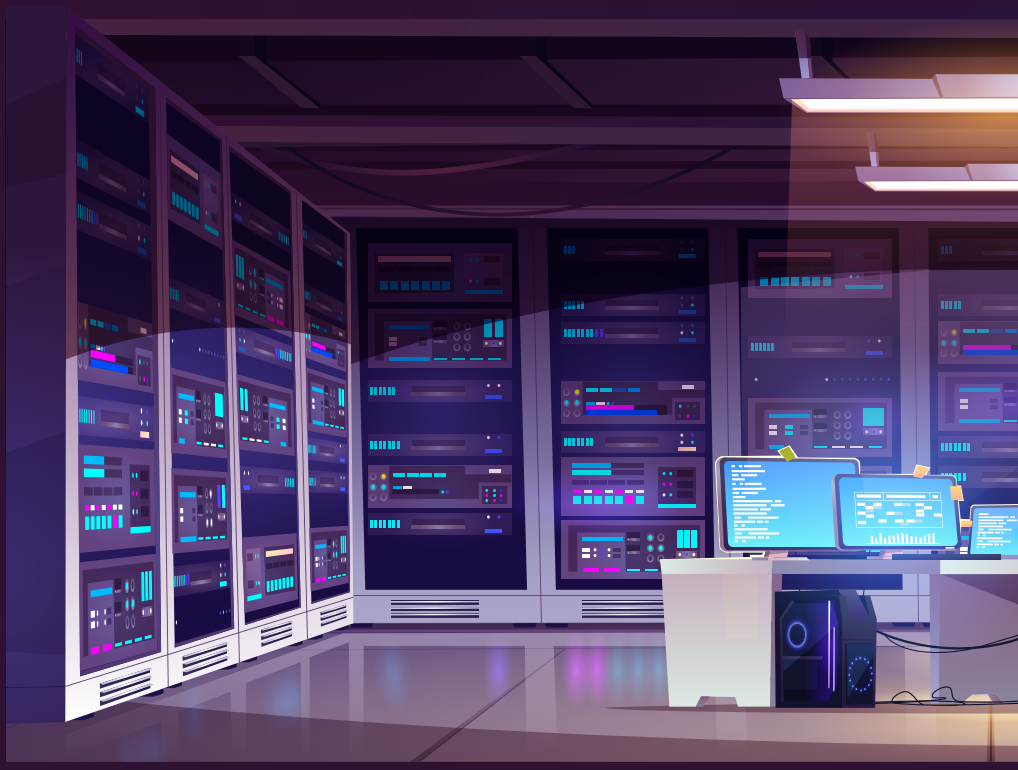
To be recognized as a member nation of the program, each country must successfully pass the program's technical testing protocol with at least two other member nations, for which Romania officially requested Spain to participate as a second test subject in November 2022.

To achieve this recognition, Romanian army personnel and two representatives of its sponsor nation (the USA) visited GMV's facilities to carry out these tests. After two weeks of exercises, GMV validated that the Romanian system meets the necessary criteria to qualify as a member nation of the program, thus qualifying it for future participation in NATO exercises.

Opinion

The future of cybersecurity incident response centers

One of the current challenges in the world of cybersecurity is the ability of organizations to have specialized cybersecurity incident monitoring and response teams capable of providing service in a global scenario where cyberattacks and attempts to take advantage of cyberspace as a means to develop illicit activities exceed any predictions we had a few years ago. Therefore, developing such capabilities internally or outsourcing these services is on the table for most organizations of a certain size as an essential axis of their continuity strategy. From the standpoint of these specialized teams (CERTs, SOCs, CSIRTs, etc.), the needs and workload have changed substantially, and their technological and procedural progress is, therefore, necessary to meet current challenges. As part of this necessary progress, certain basic elements will underpin the work of the response teams in the coming years.

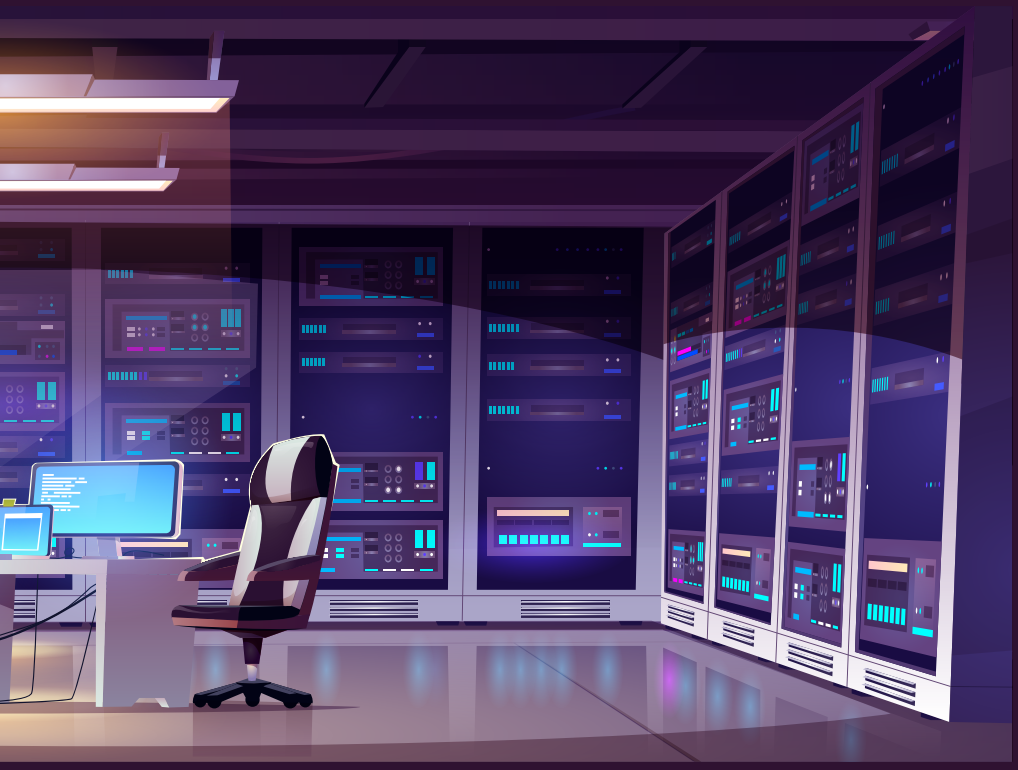


Firstly, the volume of cyberattacks we are facing requires the development and deployment of advanced automation systems in response, supported by artificial intelligence models, capable of accurately distinguishing those events that require the need for human investigation from events that can be managed directly by virtual agents whose functionalities must include autonomous interaction with other information systems, as well as with the organization's users.

A second basic element, which will be central to the response centers, is developing and implementing technology capable of increasing the organization's visibility when dealing with a possible security incident. Adopting new service deployment paradigms such as cloud environments and the need for encryption of communications and data work against response teams, who need as much information and context as possible to adequately investigate any clue that could lead to an incident with an impact on the organization.

In addition, the forecast is to have more and more response teams whose work must be uniform and traceable. This is why it is necessary to progress from

The volume of cyber-attacks that companies are currently facing requires the development and deployment of monitoring and response systems with new features and supported by new technologies



Óscar Riaño
Head of GMV's CERT

the current work models based on procedures and playbooks to models based on centralized operation and analysis tools, which will ensure that the work is carried out in the same way under any circumstance, abstracting the work teams from the specific security tools implemented in each organization.

Finally, another area where progress is being made and will form a central basis of the operations of any response team is sharing high-quality information with other specialized centers and the ability to leverage this information in the security architecture deployed by an organization securely and transparently. It will be important to design and implement agile information sharing and scoring technologies incorporating additional aspects to current systems for storing indicators of compromise of attacks and cybercriminal groups.

In summary, the challenges we response teams face are evident, and the advances in our capabilities towards new detection and response models is necessary to respond to the current and future needs of the organizations we serve, accompanying them with agility in their digital transformation process and adopting new IT paradigms to provide their services.

Main threats for the agri-food sector and how to protect against them

More than a hundred companies from the Andalusian agri-food sector took part in the cybersecurity forum organized by the Andalusian Council of Chambers of Commerce and the Regional Ministry of Agriculture, Fisheries, Water, and Rural Development. The aim of this gathering was to improve the mechanisms and measures in place to secure digitally managed data and systems.

In this meeting, which was held at the end of 2022, it became clear what the main threats are in the world of digital transformation, how to face them, and address the upcoming challenges that this leading sector faces in the Andalusian economy must face.

During his presentation, Javier Hidalgo, solution architect and cybersecurity expert in the Industry area of GMV's Secure e-Solutions sector described the main cyberthreats and gave examples of the different types of cyberattacks to which the supply chain is susceptible. He also commented on the principles of cybersecurity and good practices to be observed in the agri-food sector.

Offering insights and recommendations, he highlighted the importance of designing security strategies on the premise that every company will suffer an intrusion sooner or later. He also clarified that vulnerabilities come not only from technology and external attacks, but also from human errors that need to be corrected and prevented. According to the expert, the necessary controls and appropriate processes must also be put in place to monitor who and what enters and exits the company's premises, for instance personnel who do not report for duty or information exchanged with a third party.

To conclude, Hidalgo pointed out that to integrate cybersecurity we must understand the security risk posed by the supply chain, establish controls and requirements to meet security responsibilities, perform security validation activities in the supply chain management cycle to check the state of security, and continuously improve security by embracing cybersecurity by design, building relationships of trust with suppliers, and realizing that supply chain cybersecurity must be a shared responsibility.

GMV, in UAX's 1st Cybersecurity Week

In February, Madrid's Universidad Alfonso X el Sabio organized the 1st Cybersecurity Week, inviting experts from various leading companies to share their cybersecurity knowledge and experience with students.

GMV did not hesitate to join in this UAX initiative with the participation of Juan Ramón Gutiérrez, head of the forensics and threat intelligence services of GMV's Secure e-Solutions sector, who gave an exciting paper titled "Cyberintelligence as a tactical advantage against the adversary."

Gutiérrez shared with the students how intelligence is the first link in the defense against the current sophisticated cyberattacks and represents the way to gain an advantage over adversaries.
So it is necessary to apply all knowledge about their behavior and attack techniques to anticipate and improve monitoring and response systems.

Security and cyberdefense conference

On January 25 and 26, the 10th Security and Cyberdefense Conference of Madrid's Universidad de Alcalá de Henares was held. On the first day, Clara Sánchez Lobato, GMV's IT Talent Acquisition, and Enrique Díaz-Romeral, cybersecurity technician of GMV's Secure e-Solutions sector, explained all the latest news on security and cyberdefense and the professional possibilities offered by GMV in this area.

On the second day, David de la Hoz, head of GMV's DevSecOps and Security Monitoring Section, gave a workshop under the title "DevSecOps: containerized security."

Opinion

SASE: Cybersecurity for the distributed company

If we had to sum up how our lives have changed in these last few turbulent years, everyone would have their own story to tell, but on the labor front, many of us would agree on the same aspect: the consolidation of teleworking as a necessary mechanism for any modern company. And having realized this need, the cybersecurity managers of these companies have had to delve deeper into how to enable remote and secure access to the organization's systems: we can no longer rely on emergency solutions, which are difficult to scale and have security risks. In this context, the SASE model (Secure Access Service Edge) presents itself as the most logical way to protect these resources and offer the same functionality to all users regardless of their location.

To understand the SASE model, let's remember that, until a few years ago, cybersecurity protection mechanisms were quite analogous to the real world. The classic example is the castle, with its moat, walls, and watchmen: the idea is to protect the most important spaces with a group of defenses in the same way that we protect networks with firewalls. The key is that only those in the castle's innermost areas will have access to the "crown jewels".

There are several problems with this approach: first, remote users. How do we allow someone access from an unknown location? Also, what happens if, despite the controls, someone improperly accesses the internal network? And how do we protect resources that are not centralized but distributed among centers and Cloud providers?

Faced with these limitations, in 2010, the concept of Zero-Trust emerged, which applies the principle of least privilege in network access: no user or device has access to systems simply because of its location on the network but has to prove its identity at all times with a series of authentication and authorization controls. This is particularly well suited for remote users, who no longer have the limitations of a classic VPN. SASE incorporates the Zero-Trust philosophy and adds other services designed for cloud infrastructures, such as CASB (Cloud Access Security Broker) to control the use of corporate or third-party SaaS services; Proxy and FWaaS or cloud firewalls; CPSM (continuous security assessment of Cloud infrastructures), etc.

José Pedro Mayo
Head of Solutions Architecture and Design Section GMV's Secure e-Solutions sector

"The Secure Access Service Edge (SASE) model is presented as the most logical approach for protecting secure remote access to an organization's systems"

By doing so, SASE not only improves the company's security position in a Cloud scenario but also allows its employees to work from anywhere with the same capabilities they would have in an office.

GMV, awarded as “Partner for the best integration of email security with a SOC”

At the end of the year, Check Point España recognized GMV's role as “Partner for the best integration of email security with a SOC” during its annual prize-giving ceremony.

Nathalie Dahan García, Head of Partner Strategy of GMV's Secure e-Solutions sector, received the award from Cristiano Voschion, Head of Sales EMEA, Harmony Solutions of Check Point.

Nathalie thanked Check Point for the award and the positive working relationship over the nearly 25 years of collaboration between the two companies. She also thanked Rodrigo Nalda, CISO of Santillana, for his confidence in GMV's team and his presentation at the event.

APD Colomabia organized its event Ten ideas for 2023

The Colombian delegation of the Asociación para el Progreso de la Dirección APD organized its annual event, “10 ideas for 2023” on February 8 in the Colombian capital.

Óscar Gaspar, GMV's Country Manager in Colombia, was invited to participate in the event with nine other executives of big companies to tell us about the trends that will have a considerable positive impact in 2023.

Gaspar highlighted three critical concepts for 2023: cybersecurity, data privacy, and innovation. In his talk, Gaspar reviewed the headlines in the field of cybersecurity in Colombia and the important consequences cyber-attacks cause in organizations to offer a series of recommendations for protection and cyber-resilience.

To conclude, Gaspar highlighted some innovative projects that GMV is spearheading, such as the CUCO, Agraria, and TARTAGLIA projects.

CUCO, subsidized by the CDTI and supported by the Ministry of Science and Innovation under the Recovery, Transformation and Resilience Plan, has emerged as Spain's first big business quantum computing project. In the field of agriculture, AgrarIA is set to investigate the application of artificial intelligence (AI) to the agricultural production value chain to enable an efficient, productive and sustainable transformation of the sector And in the healthcare field, GMV is leading the TARTAGLIA project for setting up a federated network with artificial intelligence to speed up clinical and healthcare research in Spain. The last two projects are financed with funds from the Recovery, Resilience, and Transformation Plan and by the European Union, with the Next Generation EU funds.

IORT offers significant improvements in treating early-stage breast cancer

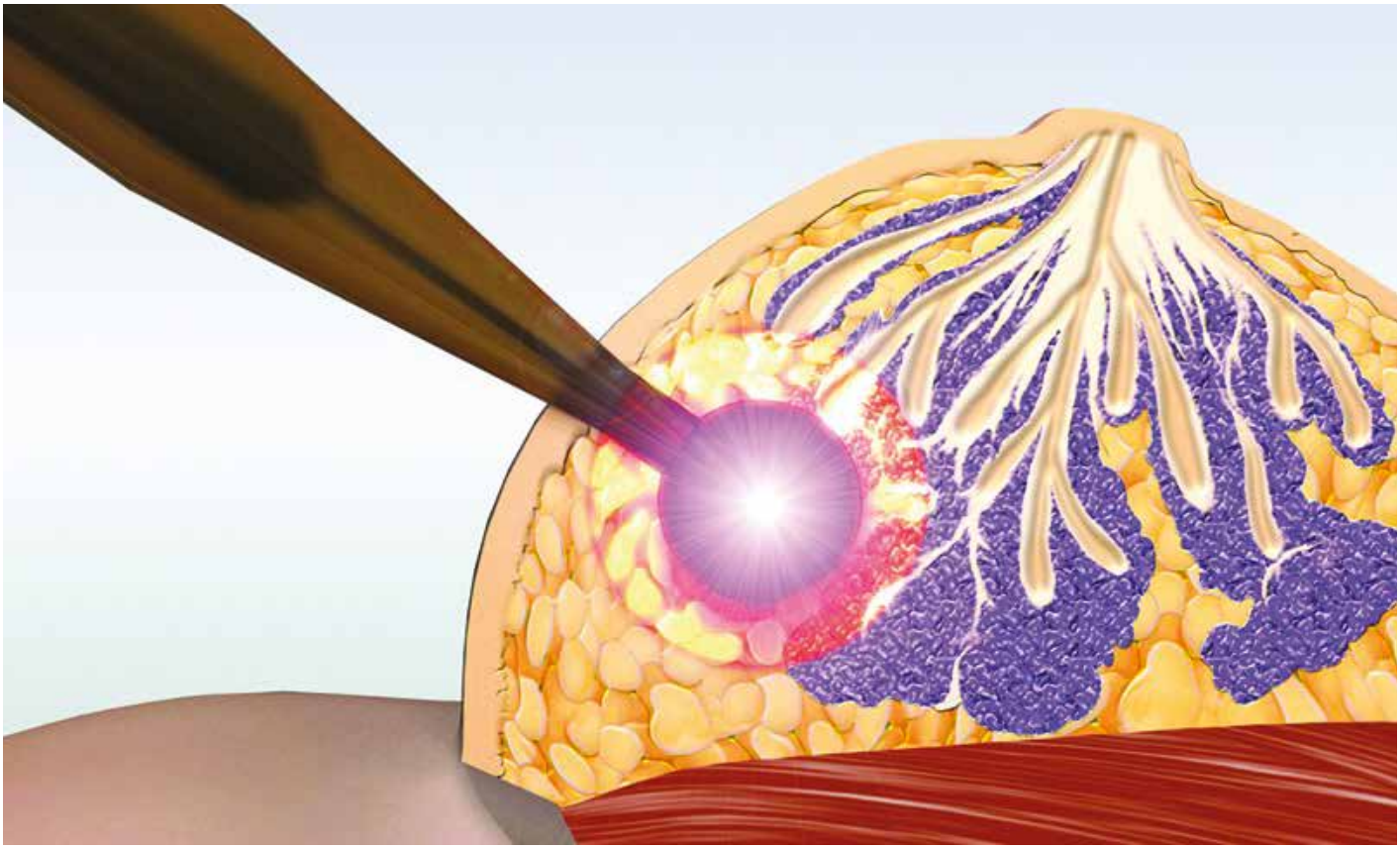
The follow-up with nearly 2,300 women who have had breast cancer and were treated right after a lumpectomy with a single dose of intraoperative radiotherapy (TARGIT-IORT) to peritumoral tissues with Carl Zeiss Meditec's INTRABEAM® device(incorporating ***Radiance™*** planner from GMV) have revealed greater tumor control efficacy and lower mortality. These findings are from the TARGIT-A clinical trial published a few months ago in the International Journal of Radiation Oncology, Biology and Physics*.

Even having undergone a lumpectomy or surgery to remove the cancer or other abnormal breast tissue and some of the surrounding normal tissue, but not the breast, surgery as a single treatment has been observed to have an increased risk of local recurrence in its tumor bed (recurrence). Dispensing a high dose of radiation to the tumor bed with IORT, properly planned with ***Radiance™*** software, has proven to be, in many ways, better than other therapeutic alternatives for treating early-stage breast cancer. The trial's results show that for certain cases, this should be considered as the new standard treatment for early-stage breast cancer.

The international clinical trial TARGIT-A, which had an 18-year follow-up, demonstrated that the scattered radiation accompanying total breast irradiation during external radiotherapy could induce the development of other types of tumors (lung, esophagus, etc.), and promote heart attacks, especially in women smokers.

As Carlos Illana, product manager of GMV's Secure e-Solutions sector, explains, one parameter of particular interest in assessing the efficacy of any therapeutic approach in oncology is progression-free survival of the disease and long-term survival. As demonstrated by the graphs produced during the clinical trial, "with external radiation therapy, the probability of death in the case of local recurrence is a little over four times as high, and the probability of death from causes not due to the cancer is approximately double, compared to treatments performed using intraoperative radiation therapy".

The trial also concluded that the TARGIT-IORT treatment can avoid the discomfort and toxicity caused by external radiotherapy after surgery. It also reduces pain and as an additional advantage does not require any travel by the patient for treatment, helping to reduce the patient's emotional stress.



GMV launches health-focused knowledge forum called *HealthTech Observer*

The forum's founding mission is to accelerate the uptake of digital technologies as tools for implementing patient-centered personalized and precision medicine, which is essential for the sustainability of healthcare systems

March 16th was the launch date for the ***HealthTech Observer (HTO)*** by GMV, which has the mission of accelerating the use of digital technologies as tools for health promotion and disease prevention, and as a way of applying a personalized, precise approach to patient-centered medicine. The HTO represents a space for bringing together knowledge and innovation, with participation by renowned professionals from the fields of clinical innovation, pharmacology, technology, and research on healthcare, health, and well-being.

The first initiative sponsored by the HTO was a gathering on intraoperative radiation therapy (IORT), which was attended by specialists such as Pedro Lara, chair of the radiation oncology group of the European Union of Medical Specialists (UEMS) and chair of the Spanish Ministry of Health's national radiation oncology commission, and Ferrán Guedea, radiation oncology director at the Catalonia Oncology Institute (ICO) and awardee of the Gold Medal from the French Radiation Oncology Society, both pioneers of IORT in Spain. Also in attendance were Gerard Plans, one of the neurosurgeons with the most extensive experience in treating malignant brain tumors with intraoperative radiation therapy, who is also head of clinical medicine at Bellvitge University Hospital and a neurosurgeon at the Teknon Medical Center, and Miguel Ángel Infante, a veteran hospital radiophysicist from the Quirónsalud Hospital Group, who has been involved with defining the requirements for GMV's ***Radiance™*** system from its beginnings, along with Carlos Illana, who led its development process and is now its product manager at GMV.

At this event, where more than 20 journalists and the director of sales and marketing from Carl Zeiss Meditec Iberia, S.A.U. were present, the specialists discussed the latest clinical trial results regarding use of IORT to treat breast and brain tumors, and they described the benefits that this approach offers for patients. They also explained the role played by GMV's ***Radiance™*** intraoperative radiotherapy planning

system, in relation to defining the dose of IORT to be administered, and for recording all of the parameters necessary for the subsequent surgical procedures.

According to the latest study published by MarketsandMarkets™, intraoperative radiation therapy products will represent a $66 million market by 2025, with GMV as the top supplier in Spain and among the top 25 suppliers worldwide.

Launching of the ***HealthTech Observer*** by GMV is part of the company's commitment to the United Nations Sustainable Development Goals (SDGs), including SDG 3, SDG 9, and SDG 17, and it is also in line with the priorities of the European Union's EU4Health program.

The future today: technologies that are changing us

Artificial intelligence, internet of things, virtual reality, cloud computing or blockchain are disruptive technologies that can help improve the competitiveness of companies. All this was discussed at the event organized by the GaiásTech Center of the Departamento de Innovación Tecnolóxica de área Sociedade Dixital de la Axencia para a Modernización Tecnolóxica de Galicia de la Xunta de Galicia, held last February and attended by José Carlos Baquero, director of GMV's AI and Big Data Division of Secure e-Solutions sector.

During the event, entitled "The future today: the technologies that are changing us". Baquero shared GMV's experience applying these technologies in the healthcare field. In particular, he explained how research using AI and big data tools can speed up the design of new drugs, among other things.

The director of the Axencia para a Modernización Tecnolóxica de Galicia, Julián Cerviño, for his part, alluded to the plan "Extratexia Galicia Dixital 2030" promoted by the Xunta to increase capacities around new disruptive technologies and favor their adoption by the different productive sectors. A plan that by 2025 contemplates that at least 25% of companies and 50% of administrations "use digital solutions based on AI, big data and cybersecurity."

PET technologies to guarantee the privacy of health data

The European Commission's digital strategy "Shaping Europe's Digital Future" proposed the creation of a single market for data to flow freely across the European Union. Last May, the Commission announced the launch of the European health data space (EEDS), the EU's first in a specific area with a guarantee of full compliance with its strict data protection rules. As stated by the Commission's first vice-president, this space will mark a new beginning for the EU's digital health policy with secure and reliable access to health data. Considering that citizens are the data owners, security and protection are indispensable requirements in data processing.

In the opinion of Pablo Gonzáles, Data Scientist of GMV's Secure e-Solutions sector, “to comply with security and protection standards, national and European healthcare data spaces need a sufficiently flexible federated governance model that accommodates all the requirements and preferences of the different communities and member states”. This governance will be much more simple if we harmonize the health data sets using a common data model like OMOP. This approach will also offer many more advantages when implementing the use cases, as “we will need to go a step beyond interoperability and start talking about semantics.” In this way, the different data-owning entities can share their data for the benefit of research, but they will have to be in a "common language" to make them useful.

GMV's technological proposal for guaranteeing the privacy of healthcare data is based on the PET technologies (Privacy Enhancing Technologies) used in the TARTAGLIA project, a use case shared by GMV's expert in the 20th edition of the Healthcare Data Security and Protection Forum organized last February by the Spanish Health Informatics Society (Sociedad Española de Informática de la Salud: SEIS).

TARTAGLIA is part of the R&D Missions in Artificial Intelligence program, which is part of the Digital Spain 2025 agenda and the National Artificial Intelligence Strategy. Financed by the European Union through the Next Generation EU funds. The actions will be reported to the Ministry of Economic Affairs and Digital Transformation (file no. MIA.2021. M02.0005), corresponding to the funds of the Recovery, Resilience, and Transformation Plan.

Harmonization of healthcare data will accelerate hemato-oncology disease research

Accelerating the pace of healthcare research, thanks to the possibilities of extracting evidence provided by big data technology and artificial intelligence from large volumes of patient data, directly impacts the accuracy of diagnosis and the choice of the most appropriate therapy for each patient. Both factors are driving progress toward the application of personalized, precision medicine.

To highlight the advantages of these technologies and identify the obstacles to be overcome when incorporating large amounts of data into daily clinical practice, as well as to facilitate the appropriate application of the work with them, the Spanish Society of Hematology and Hemotherapy (SEHH)in collaboration with the Spanish Association of Scientific Communication (AEC2) organized, last February, the event "Big data and hematological cancer."

Inmaculada Pérez Garro, Digital Health Manager of GMV's Secure e-Solutions sector, gave a paper on the importance of patient data harmonization at this special event. Having overcome the first challenge of obtaining a significant sample for research, something that involves a major effort of coordination between data-owning entities of different countries (since there are quite a few diseases suffered by a small group of patients, an insufficient sample for research), the second challenge is to harmonize them, or obtain consistent and coherent data so that they are compatible and comparable, unifying formats, definitions, and structures.

The directive demonstrated with several examples how harmonizing health data for each patient makes it possible to accelerate research into hematological diseases, especially blood cancers. The use of standardized clinical variables facilitates data sharing among hospitals and countries, which can in turn help improve machine learning algorithms and analytical models. In summary, as Perez Garro stated, “standardizing the data structures and their semantics helps drive discoveries and improves the precision of medical treatments. It also provides support for decision-making and orientation for new clinical trials.”

The more harmonized data are shared under the same standard (GMV works under the common European OMOP CDM model, in which it is certified), the greater the hope for patients who do not have effective drugs to treat their pathology since this opens up more research possibilities.

7th Health Hackathon

GMV took part as a jury member of the 7th Health Hackathon, an event hosted by the Asociación de Investigadores en eSalud (AIES), the COM Salud agency, and ITMEAS held at Madrid's Ramón y Cajal hospital at the end of 2022.

During the event, Carlos Royo, GMV's Director of Healthcare Strategy of Secure e-Solutions sector, who attended on behalf of the company, evaluated the finalist technological proposals for tackling the digital challenges of patient pharmacotherapeutic monitoring in the healthcare continuum, capable of improving the monitoring of chronic patients. Taking part on the jury alongside GMV's executive were representatives of SEFH, SEFAC, the Pharmacists' Council, SEMERGEN, SEMG, and representatives of patient associations.

The Health Hackathon is a co-creation marathon where multidisciplinary teams work for a few weeks on developing ideas and digital solutions to improve healthcare and enhance health communication not marketed or presented before. These projects must be useful for healthcare professionals and/or patients and be able to be integrated into the healthcare system.

These initiatives are based on truthful information that will promote education on healthy habits, training, and knowledge of diseases or treatment adherence. This work will lead to applications, chatbots, video games, etc., which will be useful, innovative, and scientifically rigorous.

Stadler Awards Onboard Communications Platform Contract to GMV

The project is part of the supply of the suburban trains from the railway manufacturer to Renfe

The Spanish national rail transportation operator Renfe has awarded supply of a second lot of suburban trains to the manufacturer Stadler, to be produced at its manufacturing facility in Albuixech near the city of Valencia. A total of 59 trains between 100 and 200 meters long will be supplied, as part of Renfe's renovation of its current rolling stock fleet.

GMV has already supplied two of the systems that Stadler will use to equip those trains: the onboard video-surveillance system (CCTV) and the exit signal alert device (DASS in Spanish). Under this new contract, GMV will also be supplying the onboard communications platform (PDCE in Spanish) for those trains. This system, which Renfe has already installed on its other trains, is a unified control and management system for the fleet, and its functions include positioning, communications, information capture, and mobile office features.

The onboard communications platform will allow the trains to be located at all times, even when travelling through tunnels, by combining positioning via an onboard GPS receiver and information from the train's odometer. That information can also be supplemented with other sources of positioning data from Renfe's own control center.

To communicate with the Renfe control center, the onboard communications platform will make use of redundant communication gateways installed on the train, to establish a data communication

channel with the control center that Renfe operates in the neighborhood of Delicias in Madrid. That control center houses and runs the server applications used by the onboard communications platform, and this in turn allows services to be provided to the operator terminals installed at Renfe's management centers distributed throughout Spain.

On the trains, the onboard communications platform interacts with a multitude of systems, including the passenger information system (interior and exterior LED screens), video-information system (interior LCD monitors), public address and intercom system, electrical metering systems, diagnostic systems, passenger counting systems, video-surveillance system, and train event recorders. The platform is able to collect real-time information from all of those systems, which can then be displayed at Renfe's operator terminals. In addition, historical data can be downloaded by all of Renfe's personnel with the appropriate access and viewing permissions.

Finally, in the case of the passenger information systems, video-information systems, and public address systems, the onboard communications platform will allow content to be displayed and replayed (text, audio, images, and video). This will give Renfe the ability to provide its passengers with precise, updated information regarding service status, along with all appropriate warnings and alerts in the event of an emergency.

GMV Renews its Communications Platform Maintenance Agreement with Renfe for its Suburban and Medium-Distance Trains

GMV has signed a one-year contract renewal with the Spanish national rail transportation operator Renfe, for its fleet of Suburban and Medium-Distance trains. With this extension, Renfe has once again placed its trust in GMV to fulfill its technological supply and maintenance needs.

The communications platform is based on GMV's product known as ***SAE-R®***. This product is based on a computer-aided dispatch / automatic vehicle location (CAD/AVL) system, which is interconnected with the onboard diagnostic systems, energy metering system, train event recorders, passenger information system (PIS), video-information (VI) monitors, public address and intercom system, video-surveillance system (CCTV), and passenger counting system.

The contract covers maintenance services for 342 trains that have GMV's onboard communications platform installed, which are distributed at Renfe's various base locations throughout the country. The services included are remote technical assistance for the incident management system, equipment repair at GMV's facilities, obsolescence management, stock of materials, on-site preventative and corrective maintenance work on the trains by GMV's technicians, and periodic monitoring of the work performed using GMV's online maintenance software.

With this set of maintenance services, GMV guarantees proper functioning of the system over time, to ensure operational continuity and prevent technical downtime and the resulting financial effects for Renfe's trains.

The supply contract for this system was first awarded by Renfe in 2008 for its fleet of suburban and medium-distance trains, after it had already awarded two similar contracts for installing the same system on its freight trains, high-speed trains, and long-distance trains. This all part of Renfe's ongoing process of technological innovation, which is pursuing the goal, among others, of establishing a uniform control system for its entire fleet.

GMV Renews Maintenance Contracts in Poland for Intelligent Transportation Systems

GMV has been trading in Poland since 2009, successfully implementing ITS systems for public transport in many Polish cities. Most of the systems launched in the first years of the company's operation are already past the warranty period, but, thanks to the constant cooperation of users with GMV, these systems are now being maintained and further developed. The end of the calendar year is the period when GMV systematically renews maintenance contracts with its customers.

So far, the largest and most complex system implemented in Poland by GMV is the Central Public Transport Management System in Szczecin, and the warranty period expired in 2018. At the beginning of 2023, GMV concluded its fifth consecutive post-warranty system servicing contract. Under this contract, in 2023, GMV is maintaining the Fleet Management and Passenger Information System within the scope of central software, onboard modules in 437 vehicles, and 93 LED panels at the stops. The contract also covers the complete electronic ticketing system with the central software, 36 stationary ticket vending machines supporting cash and cashless NFC and EMV payments, 317 mobile ticket vending machines supporting cash and cashless NFC and EMV payments, as well as 1,679 onboard NFC validators. In addition, other subsystems, such as the onboard CCTV video surveillance system with 1,165 cameras or the automatic passenger counting system, are also covered by GMV's maintenance.

Bydgoszcz is a city where GMV's systems of Public Transport Fleet Management and Dynamic Passenger Information have been operating since 2012. These systems are constantly extended with new elements, such as panels at the stops, and periodically covered by maintenance contracts. Under newly concluded contracts, in 2023, GMV is providing the Municipal Roads and Public Transport Authority with the services related to the upkeep and maintenance of the server infrastructure together with the SAE central software, 125 LCD panels at the stops, and GPS vehicle modules in 325 public transport buses and trams.

In Toruń GMV is carrying out post-warranty upkeep and maintenance of the tram system launched in 2014. In 2023, the service is being provided on the basis of another maintenance contract concluded at the end of 2022, covering comprehensive servicing of all elements of the Central Fleet Management and Dynamic Passenger Information System, including the SAE central software, vehicle modules in 51 trams, and 67 LED panels at the stops.

We are pleased that despite the passage of years, the implemented systems are still being maintained and developed, and their beneficiaries appreciate the high quality of the services provided by GMV and periodically renew their service contracts.

GMV extends the new User Information and Video Surveillance System for Urban Buses in Barcelona

TMB is once again relying upon GMV, by extending the contract that covers onboard equipment for almost 1,300 buses

At the end of 2021, GMV contracted with TMB (Barcelona Metropolitan Transport) the new User Information and Video Surveillance System for its 1,170 buses, which is currently in the deployment phase after the success of the pilot tests carried out last year.

TMB has once again placed its trust in GMV by expanding the project currently being implemented, through an extension of €845,000 to the current contract, which originally already amounted to more than €10 million.

This expansion includes supply of additional equipment for all three lots from the original contract. The expansion of Lot 1 includes supply of the architecture for the buses' onboard systems, which will now have 125 additional multipurpose CPUs. Lot 2 was related to the user information system, and it is now being expanded with supply of 136 more 29" screens and 3 more 21" screens. For the last of the lots, number 3, the video surveillance system increases with the supply of 479 interior cameras, 3 perimeter cameras and 1 bus lane.

The overall project resulting from this expansion therefore incorporates onboard equipment for nearly 1,300 buses and around 5,000 video surveillance cameras, which means fully equipping the system with enough stock for the entire TMB bus fleet. The traveler, along all TMB lines, will be able to enjoy the information through the information screens and will enjoy greater security thanks to on-board video surveillance.

With awarding of this contract extension, GMV continues to consolidate its presence in Barcelona, as a standout supplier for the city's transportation system and a leader in intelligent transportation system (ITS) technologies.

The new account-based ticketing system (ABT) for the public transport of MALTA comes into operation

In September 2022, GMV fully rolled out the new comprehensive, flexible account-based fare system (ABT) in the public transport of Malta replacing the existing fare collection system.

This project is about Malta's transition from a card-centric single-modal ticketing system to an account based multi-modal involving minimal investment and no hardware replacement.

Malta Public Transport (MPT) started operating Malta's country-wide bus public transportation network in 2015. The 400+ bus fleet operations were equipped with AVL, Video surveillance, PIS and Ticketing solutions provided by GMV, including developing the Tallinja transport card (Tallinja is a Transport card in Malta).

In 2020, the presence of additional mobility providers in Malta and the proactive approach of Malta Public Transport in terms of ticket portfolio offering led GMV to provide a single-token ABT solution. The solution is characterized by its flexibility to integrate external service providers, low budgetary requirements and the transparent transition.

Since the hardware wouldn't be renewed, the account-based fare system (ABT) identification token would be the Tallinja card (physical) without impacting passengers with aseamless transition. There was a transparent and automatic bulk transition of Tallinja cards into an account, keeping and maintaining the passenger profile and balances.

Electronic Ticketing Machine (ETM) can accept and validate both the ticketing system technologies solution at the same time without any impact on running the system.

A recent launch of a free travel scheme by Malta Public Transport went into effect on1st October 2022, which deployed an account-based ticketing system that was able to manage the fares/products configuration easily on the fly without the need to undergo any software development. Thanks to GMV's account-based ticketing system.

Currently, the GMV account-based ticketing system in Malta manages daily 500K+ accounts daily and processes 140K+ real-time taps in the back office. Since the old Tallinja cards now work as a tag UID (unique Identification) for account-based ticketing (ABT), it can be easily expanded to other service providers. Multi-modal titles/products or packages beyond mobility are easily configured and deployed in near real-time.

GMV Attends the 7th Conference on Sustainable Mobility and Intelligent Transportation Systems

On December 8th and 9th of 2022, GMV attended the 7th Conference on Sustainable Mobility and Intelligent Transport Systems held in Nicosia, Cyprus.

The primary aim of this conference was to promote sustainable development, by focusing on issues such as mobility, the circular economy, and environmentally friendly modes of transportation, among others. The topics covered included the need to promote the circular economy on islands through cross-border cooperation, encouragement of bilateral and multilateral relations, and enhancing exchanges of knowledge as a way of sharing best practices.

GMV had a notable presence at the event, including contribution of a talk entitled "Shifting Towards Account Based Ticketing (ABT) and EMV Card Payment Systems for Public Transportation" in the session on Investment in Intelligent Transportation Systems. This presentation was given by Iker Estébanez, International Business Develpment Manager of ITS in GMV who described GMV's experiences with a variety of international projects involving ABT and EMV technologies.

The conference also featured an exhibition space, which provided opportunities for organizations with active projects in the areas of sustainable mobility and intelligent transportation systems to showcase their latest innovations. GMV had its own stand, where those attending the conference were given demonstrations of the hardware and software systems that GMV offers to public transportation authorities and operators, which are designed to help them take advantage of the latest ABT and EMV technologies.

GMV is Expanding its Ticketing System for Palma de Mallorca's Municipal Transportation Company

GMV will be providing Palma de Mallorca's municipal transportation company (EMT) with a new expansion of its ticketing system. Palma's EMT had already installed GMV's ticketing system as part of the supply that was provided to the entire transportation consortium operating on the Spanish island of Mallorca. However, its main city of Palma has always maintained an additional line of collaboration with GMV, and it will now be expanding the onboard equipment it received through the consortium to cover its entire ticketing system, including the onboard software and its control center.

This new expansion is a further reflection of the trust that Palma's EMT has placed in GMV as its ticketing system supplier, and it comes after a previous expansion in 2022, which gave passengers the ability to recharge their transportation cards online, eliminating the need to use a physical recharging terminal.

With a total price of €490,000, the new expansion includes additional onboard hardware, an additional package of onboard systems, and a series of software developments customized for EMT Palma. The new onboard equipment for passenger ticketing will include 52 additional tablet-type devices with driver interface features, 59 driver ticketing terminals, and 74 onboard ticket validators.

With awarding of this expansion, GMV will further consolidate its presence in Palma de Mallorca, as a standout provider of ticketing systems in a city that is one of Spain's most popular tourism destinations.

GMV Renews Maintenance Contracts with Avanza in Madrid, Guaguas, and CityBus

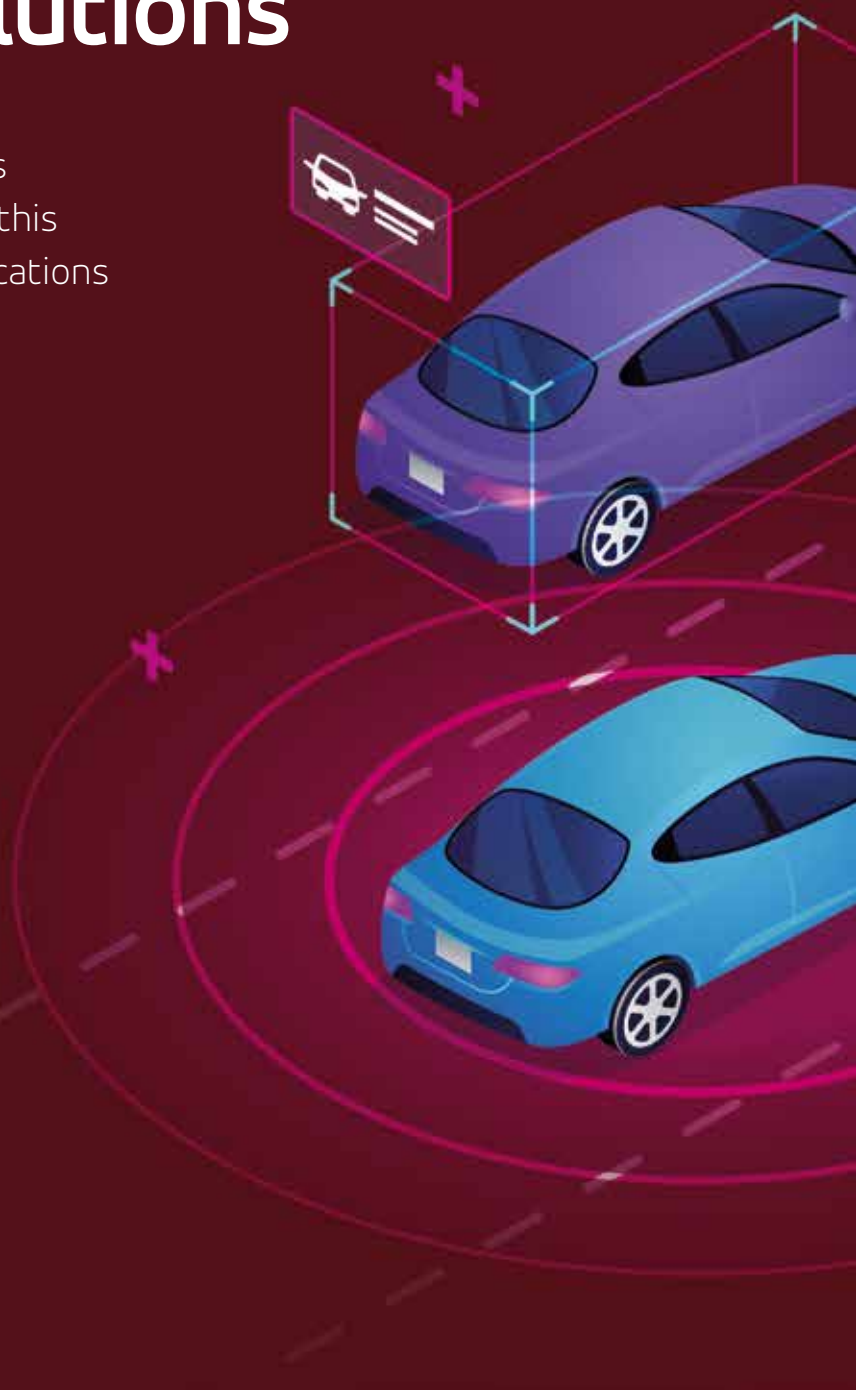
GMV has signed one-year renewals for its bus maintenance contracts with major operators in various locations, including Grupo Avanza, Guaguas, and CityBus.

In the case of Avanza, the contract renewal covers the comprehensive maintenance service provided for the onboard computer-aided dispatch / automatic vehicle location (CAD/AVL) systems and ticketing systems of the fleets operated by Larrea, Llorente, Interurbanos, and Etasa-Alacuber, for a combined total of 522 buses. This includes remote technical assistance, first-level and second-level corrective maintenance, equipment repairs at GMV's facilities, and 24/7 service availability for critical hardware or software incidents. These maintenance services are very similar to those being provided to the operator Guaguas in the city of Las Palmas on the Spanish island of Gran Canaria, with the primary difference being that in this case, the maintenance only covers the CAD/AVL system installed on its fleet of 256 vehicles.

Finally, CityBus operates a combined fleet of approximately 775 buses in the Moroccan cities of Fez, Tétouan, Meknes, El Jadida, Oujda, and Fquih Ben Salah. These vehicles all have an onboard ticketing system, and 260 of them also have a CAD/AVL system. In this case, the maintenance services are based on remote technical assistance and repair of equipment and line-replaceable units (LRUs) at GMV's facilities. Replacement parts are also being provided for those fleets so that the technicians working for each operator can perform first-level and second-level maintenance themselves, as a way to shorten repair response times and avoid the need for public transportation service interruptions.

GMV and u-blox Join Forces to Deliver Cutting-Edge Safe Positioning Solutions

Collaboration between both companies will represent a major step forward in this type of solutions for automotive applications



U-blox (SIX:UBXN), a global provider of leading positioning and wireless communication technology and services, and GMV a company leader in Navigation providing solutions for connected and autonomous vehicles proudly announce their partnership agreement to combine u-blox's GNSS receiver hardware with GMV's safe correction service, sensor fusion, and positioning engine. The end-to-end solution addresses the needs of automotive applications by providing a holistic safety approach that maximizes performance and minimizes time-to-market costs.

The collaboration between these two safe positioning pioneers is a significant step forward in the automotive positioning industry. From Q2 2023 onwards, u-blox will directly commercialize the solution, including integration service and certification support to be provided jointly by u-blox and GMV, for applications like ADAS Level 2+ and up to vehicle autonomy.

Regarding the partnership, Miguel Romay, General Manager of GMV Satellite Navigation Systems, said: "We are thrilled to partner with u-blox for a common purpose: deliver a comprehensive safe positioning solution for the automotive industry. Based on our combined expertise and experience, we will provide a cost-effective and reliable solution for the current needs of automotive Tier 1's and OEMs worldwide."

The collaboration between GMV and u-blox was forged at the recent Mobile World Congress (MWC) celebrated in Barcelona (Spain). The two companies will work hand in hand to integrate their respective technologies and provide a seamless solution for the needs of future automotive applications worldwide.

GMV Joins 5TONIC as a Collaborator for the ERASMO Project

GMV has signed a collaboration agreement with 5TONIC, which is an open-ecosystem laboratory for research and innovation on 5G technologies, funded by Telefónica and IMDEA Networks.

This one-year collaboration, which will end on 31 December 2023, has the primary aim of testing the 5G-based functionalities of the onboard unit (OBU) developed during the Enhanced Receiver for AutonomouS MObility (ERASMO) project, which is co-funded by the European Union Space Program Agency (EUSPA). That project is expected to result in a high level of maturity for fully autonomous driving.

The OBU will have a 5G modem and a global navigation satellite system (GNSS) receiver, as well as a visual inertial navigation system (VINS). It will also make use of additional sensors such as an accelerometer, gyroscope, and odometer, along with cameras that provide positioning estimates for autonomous vehicle navigation, with the highest possible levels of precision, integrity, and availability. In addition, the OBU will allow application of GNSS precise point positioning and real-time kinematic (PPP-RTK) corrections, by making use of the ***GMV GSharp®*** solution, and it will be able to combine GNSS data with data from multiple sensors to obtain optimal positioning information. The OBU will also contribute to improved autonomous driving performance, safety, and efficiency, because it will include cooperative V2X communication capabilities, for information exchanges between vehicles and their surrounding environment.

At 5TONIC, Ericsson España has implemented a complete 5G SA release 16 system, with an interior and exterior New Radio interface with mid-band and high-band coverage. Ericsson will be 5TONIC's key technological partner supporting GMV during its testing and validation activities for the ERASMO project's 5G-based technological developments, which will take place at 5TONIC's laboratory facilities.

This new agreement with the 5TONIC laboratory represents a key milestone, because it will allow the capabilities offered by 5G technology to be applied to more advanced autonomous driving, along with the other leading-edge technologies included in the ERASMO OBU.

EUSPA Awards Contract to GMV for Implementing "Galileo Solidarity Lanes"

As a response to the COVID-19 pandemic and the associated border closings, the European Union Space Program Agency (EUSPA) requested construction of the Galileo Green Lanes transportation system, to guarantee the flow of essential goods and medications between Member States.

This system allows tracking of the time it takes for transporters to pass through border checkpoints, to ensure that this time period never exceeds 15 minutes. It also allows the necessary policies to be implemented for ensuring compliance with the European Commission's C(2020) 1897 communication, on border management measures to protect health and ensure the availability of essential goods and services.

In our current post-pandemic scenario, the need for quick responses to any type of emergency has become clear, not just in relation to healthcare, but also for humanitarian purposes, or for any other valid reasons. For example, there is now the crisis produced by Russia's invasion of Ukraine, which has endangered exporting of grains, produced a flow of refugees out of that country, and required delivery of aid from the European Union.

To adapt the platform to this new situation, the EUSPA has awarded a contract to GMV for implementing the "Galileo Solidarity Lanes". The scope of this contract covers integration of additional new data sources and new types of information (including information about other means of transportation such as maritime shipping, information regarding sea and river ports, and monitoring of rail transportation).

This system expansion will give the European Commission the tools it needs to make decisions and implement policies, in the interest of ensuring the flow of goods and people throughout the European Union, distribution of grain supplies from Ukraine, and delivery of humanitarian aid to that country.

GMV and Qilimanjaro work on the first quantum computer in southern Europe

This project will enhance the impact of research and innovation, by enabling solutions that complement the capabilities of currently existing supercomputers

The Quantum Spain project, promoted by the Ministry of Economic Affairs and Digital Transformation through the State Secretariat of Digitalization and Artificial Intelligence (Secretaría de Estado de Digitalización e Inteligencia Artificial: SEDIA), will have southern Europe's first quantum computer by 2023, to which the research community will have access to develop artificial intelligence applications.

Financed with European funds from the Recovery, Resilience, and Transformation Plan, this project will be carried out by the joint venture formed by the startup Qilimanjaro Quantum Tech and GMV.

The new quantum computer will be installed in the Barcelona Supercomputing Center - Centro Nacional de Supercomputación (BSC-CNS) and integrated into the MareNostrum 5 supercomputer, the most powerful in Spain and among the most advanced in Europe and the world. Quantum Spain thus reaches a new milestone in its goal to create an effective quantum ecosystem in Spain.

This project will significantly increase the impact of research and innovation by enabling solutions that complement the capabilities of existing supercomputers. The new infrastructure will be available to the research community, companies, and public organizations.

During the presentation of this new development, made in the framework of the "Mobile World Congress," the Secretary of State for Digitalization and Artificial Intelligence (SEDIA), Carme Artigas, pointed out that this milestone represents "an unprecedented step towards creating an ecosystem in Spain that is attractive for talent and investment. One of our main objectives is a commitment to the future that will strengthen technological and industrial development in Spain and create highly skilled jobs."

Manel Martinez, technical leader of the UTE, assured that "for Qilimanjaro and GMV, the construction and commissioning of the two units of the quantum computer to be installed in the BSC is a major technological challenge that we are taking on with the commitment that this project will be a complete success and provide the right platform for giving a decisive boost to the development of quantum computing in Spain."

José María Legido, head of GMV's international area of Secure e-Solutions sector, was representing the company during the presentation of Quantum Spain and stressed: "GMV's outstanding commitment to this groundbreaking project in Spain, adding to our important work in the field of quantum computing, where we are already leading the CDTI's CUCO project for business development in the use of quantum computing, in which we already collaborate with Qilimanjaro, and which we are now jointly extending to the context of excellence in the academic world."

Innovation in Spain: A competitive perspective for companies

In an environment characterized by accelerated technological changes and persisting difficulties in the value and supply chains, innovation has become fundamental as a way to confront our current challenges. This is one of the conclusions from a major study on the views of business executives regarding innovation in Spain, produced by the CESIN Innovation Studies Group (Complutense University of Madrid and the Innovative Companies Forum) and the Spanish Association for Management Progress (APD), with collaboration from GMV, which was presented in March at a workshop entitled "Innovation in Spain: A competitive perspective for companies".

Teresa Riesgo, General Secretary for Innovation from Spain's Ministry of Science and Innovation, the country has some major strengths such as talent, assistance programs, broadband Internet, and commitment to renewable energies, so "Spanish companies have incredible potential for innovation, and our country is in second place in terms of funds received for innovation projects from the Horizon Europe program. However, even though we've moved up two places in the innovation rankings, we cannot allow ourselves to be satisfied with this". In relation to government policy, companies need to be the focal point of innovation programs, and public-sector agencies also have to play a role, although there is still significant room for improvement. In addition, Luis Fernando Álvarez-Gascón, GMV's General Manager for Secure e-Solutions sector and president of the Innovative Companies Forum, stated during his presentation on perceptions of risk and uncertainty associated with innovation, that "although more than 80% of executives are convinced that innovation has benefits, only 6% of them say that they are satisfied with their results. A company's culture needs to make innovation something that happens on a daily basis".

José Molero, Director of CESIN and Professor Emeritus from the Complutense University of Madrid, gave a presentation on the report entitled "Innovation (.ES): Vision, strategy, and management at companies", which includes the conclusions taken from a survey given to more than 500 company executives. As he explained, resistance to change, the absence of a culture of innovation, uncertainties, and difficulties with finding suitable professionals are some of the barriers to innovation noted by the senior managers who responded to the survey. Finally, the event was rounded out by a talk given by Pedro Mier, president of the Spanish ICT industry association AMETIC and chair of the Research, Development, and Innovation Committee for the Spanish Confederation of Business Organizations (CEOE).

Plenary Follow-Up meeting for the AgrarIA Project

At the end of 2022, Kimitec held a meeting at its offices in Almería for the partners from the AgrarIAproject, where those in attendance discussed the current status of their lines of work and the progress made during the first year.

During this plenary end-of-year meeting, representatives for each of the proofs of concept described the advances made on the activities they are leading, which involve research on the use of artificial intelligence for agricultural production, transformation, and distribution.

The aim of this strategic initiative is to accelerate digital transformation in the agriculture and food chain, using a cloud-based technological platform offered by Amazon Web Services (AWS). This will allow launching of initiatives to improve the service for its users and define new agricultural production methods.

Examples of this project's objectives include developing new natural products to control pests and diseases, applying the concept of digital twins to refrigeration and photovoltaic plants, developing cloud-based autonomous robotics with user interaction via 5G (cloud robotics), and research on the use of quantum computing in satellite imagery management to optimize agricultural production.

The AgrarIA project is funded by Spain's Ministry of Economic Affairs and Digital Transformation, through the R&D Missions in Artificial Intelligence Program of the State Secretariat for Digitalization and Artificial Intelligence (SEDIA) (file no. MIA.2021.M01.0004), using funds from the country's Recovery, Resilience, and Transformation Plan.

GMV participates in the Industry 4.0 working group for the "Spanish Gaia-X Hub" Data Space

The concept of a data space can be defined as a decentralized (federated) infrastructure that can be used in data ecosystems for reliable data sharing and exchange, as a way to improve interoperability by applying a combination of governmental, organizational, legal, and technical mechanisms. The AgrarIA project is an example where GMV is working on developing and implementing a data space for the agriculture industry. The aim is to produce a single platform that can combine a variety of cross-cutting technologies, which can in turn be put to a variety of uses across the food and agriculture value chains. These spaces will enable voluntary data sharing with shared governance and security mechanisms.

The "Spanish Gaia-X Hub" has been created in this context in collaboration with Spain's State Secretariat of Artificial Intelligence and various other public and private actors, and it includes a variety of industry-related data spaces such as those for Industry 4.0, Mobility, and Health.

The industry 4.0 data space working group of this Hub organized a working session on February 23 with the participation of Ángel Vicente Vázquez, architect of GMV's big data, to implement a solid ecosystem in the field of industrial data sharing. During this meeting the experts worked in teams to identify cross-cutting use cases of data sharing and exploitation in the industrial sector that could be targeted for funding under Component 12: Spain's 2030 Industrial Policy of the Recovery, Transformation, and Resilience Plan. The goal of events like these is to create a community that revolves around data, to encourage innovation and economic growth in the industrial sector, as a way of producing benefits for society as a whole.

As conclusions of the work carried out by teams during the workshop, use cases were identified and selected for application in the industrial sector: characterization of the reliability of products and components, intelligent prediction of demand, intelligent reuse and recycling, a platform for sharing requirements and problems detected in assets, a platform for visibility of the supply chain in real-time, etc.

GMV as an example of innovation

Under the title "Innovative projects with a Spanish seal," Francisco Mochón, professor of Economic Analysis and chairman of the CTA innovation cluster (Andalusia Technology Corporation), analyzed on his blog "22 success stories of companies from different sectors and sizes," whose common denominator was a decisive commitment to innovation with a direct impact on the business's success.

The book also offers several conclusions, shared components, and trends in R&D&I management and innovation that aim to serve as inspiration, points of reference, and a stimulus for innovation in the rest of the productive fabric.

Among these examples is GMV, a company that from its early days sought out innovation as a transformative force for its clients, an engine able to increase profitability, save costs, improve sustainability, develop new products and services, new ways of producing them, and new business lines.

In the year 2000, GMV began a strategy of territorial expansion in different areas of Spain and chose Seville as the location for one of its regional offices. In fact, as a token of its commitment to innovation in the region, the company has been a member of CTA since this foundation was set up.

The future of electricity distribution grids: digitalization, data integration, flexibility and collaboration

The breakfast conference "Innovation and digitization of electricity distribution grids in the face of the new energy challenge," hosted by enerTIC in February, was attended by Almudena Nieto, Head of Business Development of the Solutions Energy and Utilities area of GMV´s Secure e-Solutions sector to share challenges, new trends, and experiences in this field.

The market is currently experiencing a paradigm shift in relation to electricity distribution grids, and this is creating a series of new challenges that the industry needs to address. As a primary example of this, distributors have now become data managers, rather than just hardware companies focused on infrastructure. These days information has taken on a very significant role, but organizations are sometimes experiencing a lack of communication and difficulties with data integration and interoperability. This can in turn make it difficult to launch new projects, while also hindering innovation.

Part of the solution to this problem involves initiating a digital transformation process in which many of these companies are already immersed, with the handicap of having to deal with a lack of qualified personnel.

The participants in the colloquium confirmed the importance that technology and the digitalization of their business processes are acquiring. Among other aspects, they highlighted the use of digital twins, which allows for real-time viewing and, most importantly, prediction of what is happening on an electricity grid, which can in turn lead to more effective data performance. They also emphasized the need to increase financial and technological investment in low-voltage networks, with the aim of improving monitoring, energy efficiency, and automation.

Additionally, the sector is making great strides in physical and logical security. In relation to physical security, robotics and drones are becoming important allies for the industry, because they allow certain operations to be performed without putting the health of operators at risk. Virtual reality technologies are also being incorporated as a way to resolve problems at electrical substations, while use of the metaverse is also being explored for the purpose of training new professionals. An increasing number of companies in the industry say that they are making cybersecurity a top priority, as digital data takes on more importance while simultaneously being exposed to threats of theft or hacking.

FiturTechy, key trends in innovation that will mark the tourism of the future

FiturTechy, the section of Fitur specializing in innovation, sustainability, and technology in the field of tourism, organized in collaboration with the ITH (Hotel Technological Institute), once again presented the technology available and the technology yet to come to address the future challenges facing the sector.

During the event, which took place between January 18 and 22, much was said about the relevance of the data economy and the improvements brought about by sharing data. Although the truth is that, in the opinion of Joan Antoni Malonda, Head of Tourism Business Development of GMV's Secure e-Solutions sector, "there is still a certain reluctance among hoteliers to share their data with competitors. They are increasingly aware of its value but are afraid of losing control. And yet technology now makes it possible to share information without it leaving the organization, establishing that it is for exclusive use and for a limited time for which the hotelier gives permission. In this way, it can access information from all its competitors without sharing it."

Artificial intelligence is undoubtedly the technology gaining more and more weight in the sector. It enables companies to automate tasks—thus saving time and reducing costs—and make more accurate forecasts based on data.

Opinion

An industry where people and robots are shaping the future

Since its incorporation into our industries, we have seen the benefits that robotics has brought to perform repetitive, dangerous, physical, and monotonous tasks more efficiently and safely.

Now, with technological advances and connectivity, machines are becoming smarter and more connected to emphasize the added value that people bring to the business. We are facing a new industry that aims to merge cognitive computing capabilities with human ingenuity.

Analyzing these last few years, we can see that different types of robots have emerged that integrate sensors, lasers, and different technologies that enable them to process data from the environment in real time and make intelligent decisions autonomously.

Thanks to the use of artificial intelligence algorithms, they can understand, map, and even navigate collaboratively, share spaces with humans, and guarantee their safety in tasks such as inspection of an electrical tower, waste inspection in a landfill, detection of toxic substances in plants, etc.

By committing to automating processes, the people working in these roles go from doing a manual task of low added value to others of higher value, such as actively collaborating with the robot through its cloud platform.

This can mean a major change in the way of working, so it is essential to get people involved from minute one, involving them in the objectives and training them properly so that this change is seen as an opportunity.

At GMV, we have developed ***uPathWay*** as a Cloud Robotics platform that can be applied to any sector, considering the client's specific needs. This solution allows the circulation of vehicles autonomously without the need to carry out modifications or additional installations in the framework thanks to the use of its precise positioning service.

Eric Polvorosa
Marketing and Communication GMV's Secure e-Solutions sector

"Thanks to the use of algorithms, robots can understand, map and navigate, sharing spaces with humans"

For example, in the construction sector, these autonomous vehicles can reconstruct the environment to know the status of a construction site and thus optimize tasks such as classifying the types of materials (granite, marble, limestone, slate, sandstone, gravel, lime, plaster, cement, mortar, concrete, sand, glass, etc.) or perform inspection tasks by detecting possible errors in real time and sending the information to the system to be remedied as soon as possible.

GMV and its charitable commitment to the Banco de Alimentos

GMV continues to uphold the commitment it made back in 2020 to the Banco de Alimentos food bank and, thanks to the generosity of its professionals and the company itself, has contributed yet another year to the charity's work.

In 2022, GMV and its team's charitable efforts raised enough money to purchase and distribute 12,585 kilograms of food. This aid is especially crucial now, given the uncertainty and economic crisis caused by the events of recent years, which have widened the inequality gap and led many families to resort to humanitarian aid.

On 23 January, Ignacio Ramos Gorostiola, GMV's Corporate People Strategy & Infrastructures Manager, visited the food bank's premises in Madrid to get a first-hand look at how it operates and how it manages the donations it receives.

GMV set up this charity initiative in 2020 with the support of its employees, following the serious socioeconomic consequences of the COVID-19 pandemic. The successive waves of new cases and the impact they had on the most disadvantaged families prompted GMV executives to carry on with this project to give back, with every member of the company making a voluntary contribution. Over these three years, the GMV team has managed to raise a total of €114,000, which has undoubtedly played a pivotal role in supporting the charity's mission.

The Banco de Alimentos de Madrid provided food relief to more than 180,000 people with 27,330 tons of food in 2021 according to the latest data published in its activity report. Its work is focused on the Community of Madrid, and volunteers work in line with the 54 food banks across Spain as members of the Spanish Food Banks Federation (FESBAL), which in turn is part of the European Food Banks Federation (FEBA).

GMV, committed to sustainability and the environment

As part of GMV's commitment to environmental protection and sustainability, beginning on January 1st, all of GMV's locations in Spain are being powered by energy from renewable sources. This improvement is one of the measures included in the company's Environmental and Energy Management System (SGAE in Spanish), which has been implemented as a way to reduce resource consumption and greenhouse gas emissions.

This is a milestone that will allow GMV to make further progress in all of these areas, while also making a direct contribution to achieving the United Nations' Sustainable Development Goals (SDGs), which have the aim of preventing, halting, and reversing degradation of the world's ecosystems, by developing actions and policies that restore humankind's relation with nature.

With support from NUS Consulting, GMV has signed a contract with the company Foener Energía, which is now responsible for providing energy services derived from renewable sources, for all of GMV's locations in Spain. This will ensure that all of the energy being consumed there is green, clean, and non polluting.

2023: The Decisive Moment for Next Generation Funds

At this conference organized by the *El Economista* online news portal, GMV's president, Mónica Martínez, emphasizes the importance of public funding to support business activities

The President of GMV, Mónica Martínez Walter, has participated in the most recent conference from the series entitled "2023: The Decisive Moment for Next Generation Funds". This event was organized by the El Economista financial media portal, and it also featured participation by Nadia Calviño, who is First Vice-President of the Spanish government and its Minister of Economic Affairs and Digital Transformation.

Mónica Martínez participated in the first roundtable, which was moderated by the Director of El Economista and entitled "Taking the Leap Towards Industry of the Future", along with representatives from companies such as PwC España, Mondragon, Renfe, and Exolum.

After a brief presentation was given by each participant, this roundtable addressed subjects such as how to manage strategic autonomy, key aspects for a more industrialized Spanish economy, Spain's technological strengths and weaknesses for participating in the leap towards industry of the future, and the participants' views on which sectors are best prepared for leadership in that industry of the future.

During those discussions, GMV's president emphasized the value of public funding for supporting the business community, and as an example, she described the public financing that GMV received in its early days from the European Space Agency, which was the company's first client.

GMV's commitment to technological vocational training

On March 27, GMV's Global Talent Internship program brought in 21 students from higher-level vocational training courses. Together with them, GMV has now awarded 41 vocational training students with scholarships in 2023, joining the Madrid, Valladolid, Barcelona, Valencia, and Seville centers.

The new colleagues were welcomed at a reception and presentation by the GMV on the premises of its head office in Tres Cantos, Madrid, where they were shown GMV's business areas, its organization, and various other aspects of interest to help them make the most of this work experience period.

The 21 students entered GMV's team on a scholarship basis and will develop their knowledge in different areas of the organization in a real working environment with cutting-edge technological projects. Over a 3-month period, the scholarship students will complete their respective training in computer systems administration, multi-platform application development, web application development, and electronic maintenance. After the work placement, GMV offers real possibilities of joining the organization, based on the student's performance.

GMV's Global Talent Internship program is the company's commitment to quality training and promoting employability. Year after year the number of vocational training students receiving scholarships rises, clearly underlining the value of GMV's technical training and specialization in these courses.

GMV takes part in the new edition of the “O Espaço à Quarta” initiative

While worldwide figures of women students and graduates in higher education have increased steadily in the last decade, women are still a minority in STEM (Science, Technology, Engineering and Mathematics) fields, both in the numbers of graduates (especially at the Ph.D. level) and in the research profession. There is a focus of action here with massive potential. Women in science must serve as role models and encourage young girls to pursue careers in STEM fields. When women are represented in science, it sends a message that anyone can pursue a career in STEM, regardless of their gender. It is crucial to highlight that STEM fields provide excellent career opportunities, particularly in emerging areas such as data science, artificial intelligence, and renewable energy. And it’s also a matter of diversity.

Women bring diversity to scientific fields, which is crucial for scientific progress. A diverse range of perspectives, experiences, and ideas can lead to more innovative and effective solutions to scientific problems. As an example of our company’s commitment to increasing visibility and leadership opportunities for women in this industry, GMV has been a corporate member at the silver level of the Women in Aerospace Europe (WIA-E) since 2021.

It is in this context of outstanding work by women in the space sciences that Ciência Viva, Agência Portuguesa para a Cultura Científica e Tecnológica (Portuguese Agency for Scientific and Technological Culture), has promoted for the third consecutive year, the initiative “O Espaço à Quarta.” This is a cycle of online conversations about space and society. Its central theme this year is the space industry towards sustainability. Teresa Ferreira, director of GMV´s Space sector in Portugal, was part of the panel of the first session discussing “Women in Space,” together with representatives of other companies, the Portuguese Space Agency and several students. All sessions are available on the Pavilhão do Conhecimento - Ciência Viva YouTube Channel.

Promoting STEM vocations among young talents

In conjunction with the International Day of Women and Girls in Science, GMV undertook an initiative the week of February 13-17 to foster scientific and technological callings by inviting leading women to address over 450 students from 6th year (primary) and 1st year (secondary), from a variety of schools across the region of Madrid.

Several women from GMV, colleagues from areas such as space, defense, telecommunications and automation, shared with the students the versatility of STEM (Science, Technology, Engineering and Mathematics) training and their applications in day-to-day life, as well as personal experiences they've had throughout their careers.

They also talked to the students about the need to be inquisitive and curious about new things, thinking outside the box, without limits, and to be constant in order to reach their life goals. These students also had the chance to ask questions and talk with the speakers about their different questions and concerns.

Initiatives like this one by GMV are important, as they inspire young people to commit to training paths related to science, technology, engineering and mathematics, and also send out a message as role models, encouraging girls to turn any obstacles into opportunities.

EMERGE, a program to promote female talent

As part of its commitment to diversity and its desire to encourage new initiatives proposed by its professionals, GMV continues to support cooperative proposals and collaborative workplaces. The aim is to give the company's employees who may have similar concerns or uncertainties an opportunity to get together and share their ideas.

One good example of this is the EMERGE mentoring program at GMV. This is an initiative that arose spontaneously, created and developed by a group of women at the company. One of its primary goals is to give some of the women who work at GMV opportunities to serve as career role models for others.

Also as part of this program, three roundtable discussions were held during the month of February. These events were designed to give women from the company a chance to share their professional experiences. Our coworkers Patricia Cerrada, Laura Álvarez, and Silvia Simarro have all taken advantage of this rewarding program to talk about their experiences in detail.

Patricia Cerrada

Mission Analysis and Studies Project Manager

Due to previous experiences in Women in Aerospace Europe or STEM Talent Girl! initiatives, us female colleagues at FDO have always shared a persistent pattern observed when talking about women working in STEM: lack of role models, professional hyper demands, loneliness, etc. In February 2022, I took the chance to meet with women working in the FDO unit in Madrid and analyze if we could identify the same patterns in our working environments. Our conclusion was positive, although we all agreed in our perception of GMV as a company not actively trying to perpetuate those patterns.

We didn't need to think twice. We created what was later to become EMERGE (EMpowERing Gmv womEn): an activity-based program specifically designed to support GMV women, aiming to boost their personal and professional growth, reinforcing their image and, consequently, GMV's as well.

The initiative currently features a female mentoring program (ongoing plus new mentor-mentee meet-ups next March), periodic forums to discuss the issues at hand, and foresees specific training on leadership and communication. Moreover, three round tables took place as part of the EMERGE program in February 2023, where highly experienced female leaders of the company shared their professional paths and challenges and provided inspiring tips to the audience. After GMV-global disclosure of the initiative, there were several requests to join the program from colleagues in Sevilla, Boecillo and even Portugal, Poland and France.

Personally, as EMERGE's "mother," I can only I can only be grateful. EMERGE enables us to learn daily from great women, regardless of their professional status. Members' willingness to participate in all activities, recognition and acknowledgment of experienced women, male colleagues providing support and encouragement, but, most of all, helping women fight their limits, helping them understand that they can develop professionally however they decide to or, simply, standing side by side to prevent them from feeling alone are the best outcomes that EMERGE rewards me with every day.

Laura Álvarez

Flight Dynamics Engineer

It was only recently that I joined not only GMV, but also the working world in general, and I had plenty of doubts and uncertainties about the work I would be doing as an aerospace engineer. The STEM fields are very demanding, and the need to compete with so many other students sometimes made me question my own worth. In addition, I had doubts about whether being a woman was going to present obstacles when the time came to look for a job. I really didn't know how that small detail might end up affecting my ability to succeed in the workplace. Clearly, I needed some guidance or role models who could help me understand what I might find. So when I heard about the EMERGE program, I decided to participate. I feel truly lucky to have found this opportunity, to learn about the personal experiences of successful women in the industry, including some I would actually be working with.

Thanks to this program, I have been able to clear up many of my doubts, and also gain clarity about some other subjects I had never really thought about much. Working in a technical field requires close collaboration and a serious attitude, but I have gained confidence in my work and education. I have also learned that I don't need to worry about some of my earlier concerns, or at least that I should not let affect my personal development.

Hearing the stories of the other mentors and mentees has motivated me. It has given me encouragement and inspiration to continue doing what I love, without being held back by labels or prejudice.

This is why I now encourage all of my female coworkers to participate in the mentoring program, to hear the stories of other women at the company, while also having access to someone to confide in, as a friend and as a source of learning. Above all, it could help them discover the person they are capable of becoming.

Silvia Simarro

Flight Dynamics Engineer

The aim of the EMERGE program is to give visibility to women in the aerospace industry, by creating a space of respect and trust where we can all collaborate through our shared personal experiences in the workplace. This initiative began with the mentoring project, which helped us feel like we could be part of a network of mutual support, and one that has the aim of helping women improve their leadership abilities.

The program also gives us a chance to share our personal and professional ambitions, as well as our uncertainties: Can I find a balance between my work and my personal life? Can we feel like we belong, in a space typically occupied by men? What aspects of our education and training could we change, to give us a better understanding of our own value?

For me, the EMERGE program has allowed me to feel supported by other women who are in my same work situation, or in a similar one. I have found it to be an excellent initiative, because I have learned from it while also enhancing my personal and professional abilities.

DEFENCE

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