

Space19

The key to
space's future



INTERVIEW
Pedro Duque
Minister of Science and Innovation
Government of Spain



SATELLITE 2020

Washington D.C (USA) March 10-12

For yet another year GMV is attending SATELLITE, the world's leading telecommunications-satellite event, held each year in Washington DC and bringing together the sector's main stakeholders.

This tradefair will be showcasing viable space-communication solutions for the current changes faced by governments, the military and civil authorities. The event also boasts a wide range of government and military content to share with conference-goers the experience, lessons learned and consultancy of leading politicians and top government officials.

GMV's stand will be giving demos of its complete line of satellite control systems.

Drop in and see us at stand 431

To find out more:
www.satshow.com



Letter from the president

As the twenties of the twenty-first century kick off, the business magazine Forbes has identified the 7 main technological trends we all need to get ready for: artificial intelligence, 5G data networks and IoT, blockchain, autonomous driving, personalized and predictive medicine, computer vision and extended reality. We at GMV are not only ready for them; we're already participating in major international R&D projects for developing all these technologies and in many cases we're implementing them in client solutions.

Artificial intelligence is now making a crucial input to all the following: earth observation, banking-fraud prevention, epidemic control, air-traffic control, future robotic missions to the Moon or Mars and satellite-collision avoidance. Our clients are already using IoT-connected sensors to monitor water quality, optimize the grape

harvest or to improve their production and maintenance processes under the aegis of Industry 4.0, always with due application of the necessary cybersecurity measures. Blockchain could help us to guarantee data quality. GMV is working with BMW on the development of autonomous driving. **Antari Home Care** is one of GMV's inhouse personalized medicine products. Artificial vision plays an essential role in our guidance, navigation and control systems for space-debris removal or for interplanetary missions. Our surgical navigator is based on extended-reality techniques, just like the new aerospace-manufacturing tools we are now developing with Airbus under the PASSARO project.

GMV's leadership in these and other cutting-edge technologies fueled sharp growth in 2019, enabling us to generate hundreds of new highly-skilled jobs.

Mónica Martínez

Nº 72

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GMV

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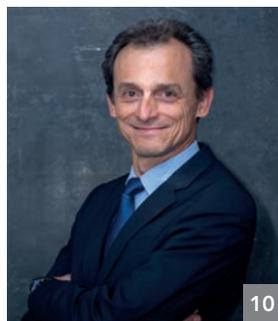
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Space19 

The key to space's future

Ministerial Level

November 2019



From 27 to 28 November Seville hosted Space19+, the Conference at Ministerial Level of the European Space Agency (ESA), which can only be qualified as a resounding success. ESA's member states have signed up to a total program worth 14.4 billion euros, an all-time high subscription. This takes in many different programs in the fields of science, space exploration, launchers, earth observation, satellite navigation, telecommunications, planetary defense and space surveillance. The decisions taken represent a huge boost to Europe's space industry.

The countries GMV does business in signed up for the following subscriptions: Germany, 3.359 billion euros; France, 2.798 billion; UK, 1.643

billion; Spain, 858 million; Poland, 172 million; and Portugal, 104. Romania, for its part, weighed in at first with 49 million, then announcing a post-conference increase to 170 million.

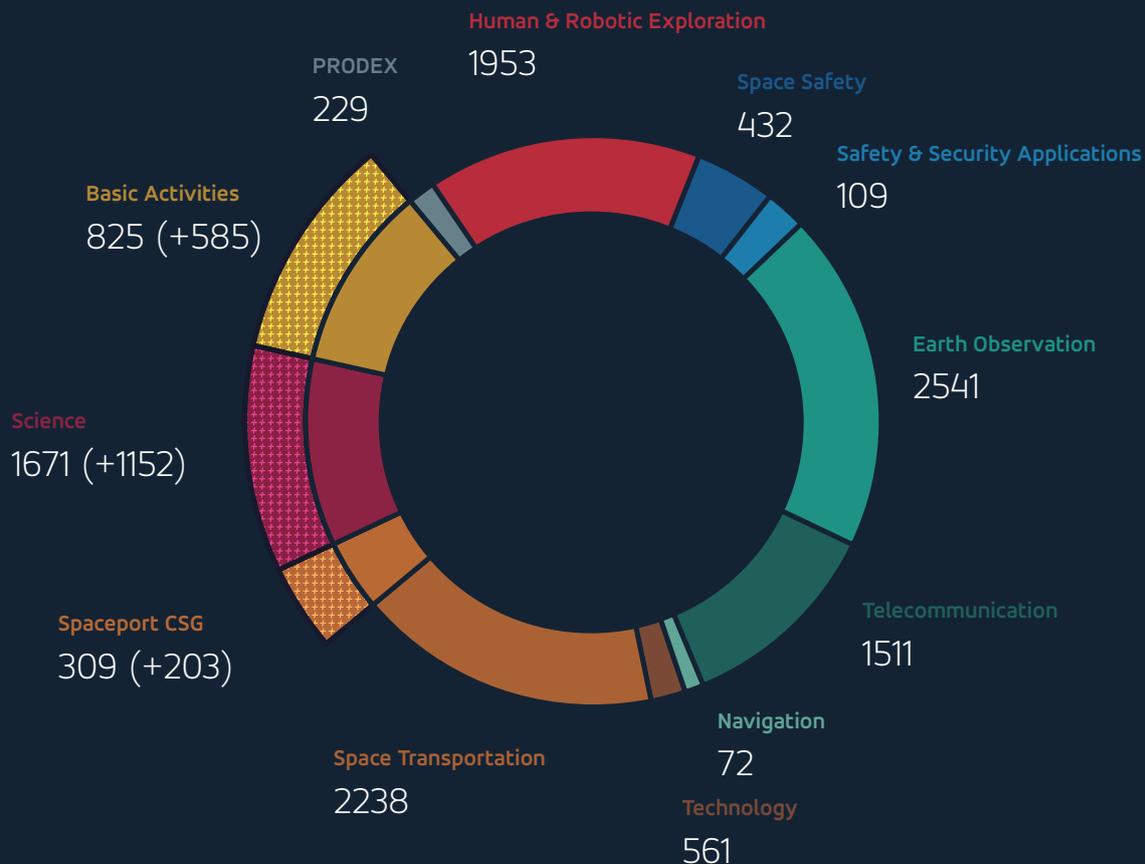
The mandatory program, taking in the scientific program, grows by 10 %, with funding for the next five years. This accounts for a total of 4.2 billion euros, which ESA member states finance in proportion to their particular GDPs.

The space-exploration program, including the International Space Station (ISS), the Gateway lunar station, lunar robotic exploration and the technology program, represent between them a total funding of 1.97 billion euros. All the programs have received big commitments from Germany, Spain and the UK, while

Poland, Portugal and Romania all chip in too. This significant budget commitment will enable GMV to play a key role in these programs, with the ISS and the Mars Sample Return mission to the fore.

The space security and safety budget is worth 455 million euros, a huge increase on the previous Ministerial Conference. Featuring large in this program are the core activities, plus the planetary defense mission HERA and the space-debris removal mission ADRIOS, all of which are fully funded. The lower-budgeted programs of the L5 and CREAM mission will be kept on the back boiler until future conferences. The biggest contributors to these programs are Germany, Spain and the United Kingdom, with lower but still significant inputs from Portugal, Poland and Romania.

ESA TOTAL SUBSCRIPTIONS (14.4 B€)



This sets up the ideal scenario for GMV to consolidate its leadership of HERA's Guidance, Navigation and Control (GNC) while also playing an important part in ADRIOS. Spain has also further endorsed the Spanish Space Surveillance and Tracking (S3T) system, where GMV is already playing a key role; this reinforcement will therefore allow GMV to continue making headway in its space surveillance business.

Earth observation programs receive a 2.733 billion euro budget from ESA member states. Standout activities in this area are the Copernicus and Future EO programs, which have received healthy contributions from

all countries, especially Germany, France, the UK and Spain, with a tidy input too from Romania and Portugal. This backing will enable GMV to cement its leading position with earth observation activities.

The ARTES telecommunications programs, taking in the traditional ARTES partnership projects, as well as the new developments in 5G, safety/security and ScyLight, receive funding of 1.725 billion euros. The biggest contributors to these programs are Germany, the UK and Spain, with Romania Portugal and Poland just behind. Yet another area, therefore, where GMV can strengthen its worldwide benchmark position.

In satellite navigation, under which heading the EU funds both Galileo and EGNOS, there was a particularly eye-catching 72-million-euro budget for the new Navigation Innovation and Support Programme (NAVISP). The biggest backers here were the UK and Spain, again with Portugal and Romania making smaller contributions.

The space-transport block, taking in the Ariane 6, VEGA, FLPP and Space Rider programs, were budgeted with 2.250 billion euros. ESA's main countries, Germany, France and Italy, account for most of the contributions, with significant inputs too from Spain, Romania and, to a lesser extent, Portugal. This subscription level, albeit

lower than might have been expected, will still be enough for GMV to tackle its development plans and activities, especially in VEGA, FLPP and Space Rider.

Finally, the General Support Technology Programme (GSTP) has been earmarked for 581 million euros, with significant contributions from all countries GMV

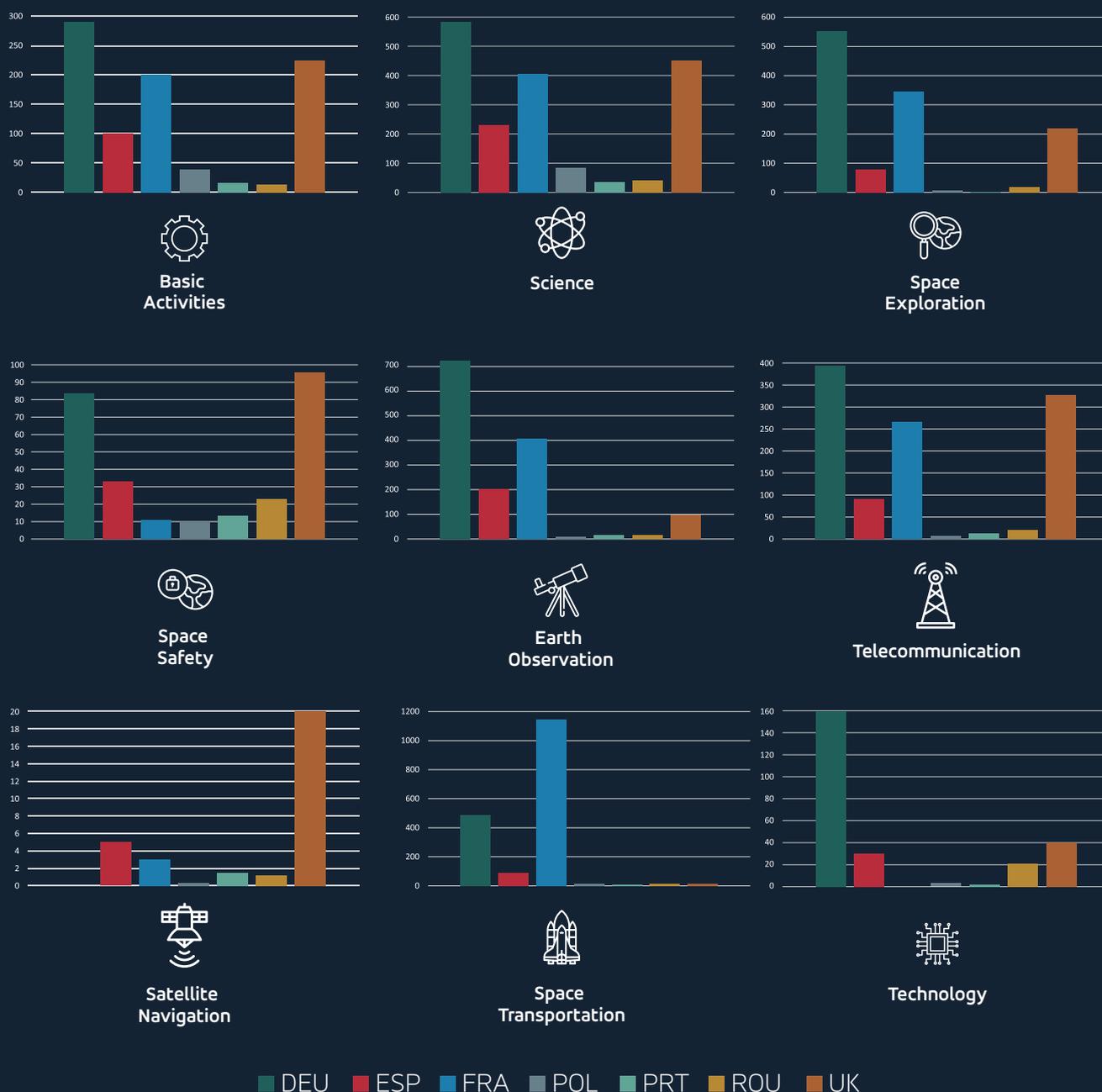
trades in, especially Germany, Spain and Romania. This should allow GMV to take on specific technology developments that bode well for the company's future.

In sum, the conference has turned out to be a huge success, holding out thrilling prospects for GMV's future and offering a host of programs that will doubtless

enable the company to continue to grow, generate jobs and boost the value chain.

Now it's up to GMV to invest and compete vigorously to turn this potential growth scenario into actual contracts and then carry out these contracts with our hallmark expertise. The future is looking bright for GMV!

ESA SUBSCRIPTIONS BY COUNTRIES





Pedro Duque

Minister of Science and Innovation
Government of Spain

Pedro Duque graduated in 1986 as an Aeronautical Engineer from the Higher Aeronautical Engineering School (Escuela Técnica Superior de Ingenieros Aeronáuticos) of the Polytechnic University of Madrid (Universidad Politécnica de Madrid). After graduating he joined GMV, where he was posted to the European Space Operations Center (ESOC) of the European Space Agency (ESA) in Darmstadt (Germany).

In 1992 Duque was selected to join ESA's Astronaut Corps based at the European Astronauts Centre (EAC) in Cologne, Germany; in August 1993 he began his preparation for the joint ESA-Russia mission EUROMIR 94.

In July 1996 he was chosen by ESA as flight engineer of NASA's space shuttle. He made his maiden space journey as crew member of space shuttle flight STS-95 in a joint scientific mission of NASA, ESA and Japan's National Space Development Agency (NASDA).

In 1999 he was awarded Spain's Príncipe de Asturias International Cooperation Prize together with the astronauts Chiaki Mukai, John Glenn and Valery Polyakov.

In 2002 and 2003 he trained as co-pilot (flight engineer) for Saiús-TMA, obtaining this qualification in April 2003. In October 2003 he took part in the ten-day Cervantes mission to the International Space Station, serving as flight engineer of the Saiús-TMA spacecraft and taking on responsibility for approach (together with the eighth permanent crew) and landing (together with the seventh).

After his last spaceflight Duque was seconded by ESA as Operations Manager of the Operations Centre and International Space Station User Support, under the Ignacio da Riva Microgravity Unit of the Universidad Politécnica de Madrid.

From 2006 to 2009 he worked as Executive President of the earth-observation satellite-data company Deimos Imaging, S.L. In October 2011 Duque went back to ESA after his leave of absence, taking up again his astronaut post.

In June 2018 the Spanish President, Pedro Sánchez, appointed Pedro Duque Minister of Science, Innovation and Universities. In January 2020, under Pedro Sánchez's incoming government, Pedro Duque took on the portfolio of science and innovation.



Under the name of “Space19+” ESA’s Council at Ministerial Level, with Spain in the chair, met up on 27 and 28 November in Seville. Every three years ESA’s Ministerial Councils bring together all Member States plus EU observers to decide on the new funding proposals and national subscriptions over the upcoming years. As well as the ESA Director General, and other ESA high-ups, the meeting assembles Europe’s space ministers. Spain’s representative was the acting holder of the Science, Innovation and Universities portfolio, Pedro Duque.

What has the presidency of ESA’s Council at Ministerial Level meant for Spain?

ESA’s ministerial presidency has come at a particularly busy period. During the three years of the presidency our main aim has been to encourage cooperation between Europe’s top two space players: the European Space Agency (ESA) and the European Union.

In 2018 Spain for the first time hosted an intermediate ESA ministerial council in cooperation with Austria’s EU

presidency. The idea back then was to start the spadework for Space19+ in good time, laying down the bases for Seville’s success and forging EU/ESA cooperation, which had been weakened during the previous period. This reinforcement has been formalized in an agreement to bring back EU-ESA Space Councils.

In 2019, together with Romania’s EU Presidency, Spain co-organized the ninth EU-ESA Space Council, which brought back Europe’s highest-level space forum after an eight-year break.

These two milestone events have coincided with negotiations for the EU’s new multiannual financial framework (MFF) for 2021-2027, with negotiations for the EU’s new Space Programme Regulation and ESA’s successful Space19+. All this means Spain has played a leading role in the reorganization of Europe’s space management procedures.

Spain’s presidency has hence been a fine showcase for the Spain brand and for Spain’s ongoing space activity.

The unanimous verdict of the space sector after Space19+ is that Europe’s space program is full steam ahead. What’s your take on the Space19+ agreements?

Let’s start by taking a look at the hard figures: 14.4 billion euros is an all-time high contribution of any ESA Ministerial Council. Secondly, Seville’s ministerial council represented the first time ever that member states have earmarked an even bigger budget than the one initially proposed by ESA’s Director General; it was likewise the first council in which no program or mission had to be dropped due to lack of support. Space19+ has therefore achieved an unprecedented feat and we should all feel satisfied about our part in that.

As announced in the Space19+ press conference, the meeting was extraordinarily positive, thanks to the excellent spadework under Spain’s presidency and the existence of common goals and a shared vision of Europe’s space future.

If I had to highlight one particular decision I would take the increased

budget of the Science Programme and the Basic Activities (the spine of ESA) as well as recognition of the importance of ESA's industrial policy in its aim of knitting together a sustainable European industrial fabric and supporting SMEs. Equally significant is the determination to avoid monopolistic situations by the major groups in value-added activities. All these aspects guarantee the health of the space ecosystem in the mid- and long-term.

Would you say these agreements have helped to strengthen international cooperation with other space powers? How would you expect Europe's space industry to prosper from this in the coming years?

I would argue that cooperation has been one of the keynote themes that have come out of this ministerial council.

The budget increase for the Science Programme, after losing spending power in several previous councils, is a telltale sign of this. The science programme, as well as being an ESA bulwark, is based on cooperation with member states themselves, who input the instruments, and on cooperation with other space agencies, who also either contribute instruments or participate in their operation.

A second program with cooperation as its core is Copernicus, a joint EU-ESA venture. Copernicus represents Europe's main GEO initiative and has spawned many bilateral agreements for use of its data, products and services, also promoting free access to the information.

Finally, I believe that the international cooperation space program par excellence, weathering all the storms that have wreaked such havoc elsewhere, is the European Exploration Envelope Programme (E3P). E3P has mustered a rock-solid level of support for all its components (International Space Station, the Moon and Mars) chalking up a subscription level of almost 100 %.

Spain has upped its ESA contribution to an all-time high for the 2020-2026 period. Why has Spain's increased contribution been deemed so important and where does it position the country in the ESA ranking?

Not only Spain but most of ESA's member states have upped their ESA contribution considerably, leading to a record budget for the coming years.

Space19+ has therefore represented a huge thumbs-up not only for space as a strategic activity but also for ESA as the central fulcrum of Europe's space activities.

Spain's increased contribution has enabled us to maintain our 6 % contribution to ESA's overall budget, despite the sharp increase in global funding, bringing us closer to the goal of reaching our pro rata GDP contribution.

We have also held onto fifth place among ESA countries, ahead of Belgium and way ahead of Switzerland and the Netherlands, with only Germany (top contributor with 23 %), France, Italy and UK ahead of us.

Spain has also reiterated its support for ESA as a space agency, contributing to the third-party programmes as a way of boosting the industry's skillsets and carrying out national activities in keeping with our rightful position within the commercial market and EU programmes.

Which of the Space19+ approved programs do you expect to record the highest participation by Spain's space industry?

Industrially speaking, Spain is recognized as a very attractive partner and I would even dare to call it irreplaceable nowadays in nearly any ESA program. This cast-iron reputation rests on the technical quality of its ideas, its fleet-footedness in adapting to project changes and its highly competitive cost scale.

For this reason Spain's industrial participation will effortlessly respond

to the country's Space19+ contribution, allowing us to forget the quantitative side and focus instead on the qualitative aspect of which program and missions will be most profitable.

The increase in the science budget should allow us to overcome the competition-fed over-return situation of recent years (contracts won worth more than country's contribution) and obviate the risk of being excluded from one or even two missions.

In earth observation, especially in Copernicus, we now expect to achieve leadership in instruments or missions, thus ensuring a high level of participation in the EU-funded part of the program.

Exploration has been one of Spain's trump suits in this ministerial council, especially Martian exploration, and we confidently expect industry to turn this opportunity to good account. Bear in mind here that Spain already has instrumentation on Mars thanks to its bilateral cooperation with NASA.

It's also important to refer to the initiatives with a strong national component. In particular, in the security field, we are now awaiting the start of studies for development of a Spanish-promoted infrared telescope for meteorite detection and the national S3T program, thanks to which Spain is now leading the consortium of EU countries providing space-debris tracking.

On the basis of the agreements reached and bearing in mind the

Spain's increased contribution has enabled us to maintain our 6 % contribution to ESA's overall budget



technological capability of Spain's space industry, in which areas do you now expect Spain to step up and increase its role? Is there any unfinished business for Spain's space industry, a role it hasn't picked up yet?

Spain has already led major space missions like Paz and Ingenio; it has developed the main instruments of international missions like SMOS or Solar Orbiter; it has contributed towards missions in cooperation with NASA or Roscosmos; it has led small international missions like CHEOPS or PROBA-3; and in the ground-segment area Spain's industry now boasts a wealth of experience in complete control centers and datacenters. Spain also has two major operators. In light of all the above, the biggest step still to be taken by Spain would be the leadership of a big international mission, allowing

Spain's space sector is a mature and consolidated sector that has been growing quantitatively and qualitatively for the last 25 years until building up a recognized position of leadership

it to join the exclusive club of countries who can claim to be Lead System Integrators (LSI).

Another area with a strong growth potential is known as "downstream", where most of the space-based business is now expected to congregate, especially in the areas of navigation and earth observation. This would call for and enable synergies to be sought with other areas like ICT, artificial intelligence or Big Data.

Finally, there are certain critical areas, for example navigation and control, avionics or instrumentation, where greater national capability ensures an essential level of independence when tackling certain ambitious programs.

Last but not least, I'd like also to mention the importance of backing companies and initiatives associated with what has come to be known as "new space", an opportunity that Spain just cannot afford to pass up. In this new scenario the more traditional and established industry needs to build up a growth- and opportunity-maximizing cooperation ecosystem.

And now that this council is over, what does the space sector need to do from here on?

Spain's space sector is a mature and

consolidated sector that has been growing quantitatively and qualitatively for the last 25 years until building up a recognized position of leadership. There do still remain certain steps to take, however, in order to achieve some of our outstanding goals.

First and foremost, on the initial assumption of strong, steady public investment in a strategically important sector backed up by robust protectionist measures in many of the biggest potential markets, Spain's industry has to achieve a higher level of independence in this investment, increasing its turnover in the commercial market and in the European Union's major programs.

In pursuit of this goal it is crucial to be able to work with large companies capable of competing with the major international groupings and serving as a driving force behind the many SMEs, start-ups and the so-called "midcaps", which have to complement and contribute to an innovation spearhead. This process, which has already occurred in the past, will be essential for future competitiveness in a market tending towards vertical integration and hefty tenders, many of them turnkey in type, which only the most powerful firms can take on with good chances of success.

GMV develops *Dronelocus*[®] for U-Space management and security

Dronelocus[®] aims to come up with an answer for the growing number of civil unmanned aircraft that will be making use of the airspace in the near future

In 2018 GMV was chosen by Spain's air-navigation services provider, ENAIRE, to provide tracking, emergency-management and GNSS-performance-forecasting services for navigation and surveillance within the DOMUS project.

DOMUS is one of the six European projects selected by the Single European Sky ATM Research (SESAR) program for demonstration of U-Space services for Unmanned Traffic Management (UTM).

Growing from GMV's participation in this project, as well as its increasing involvement in drone-use and -management programs, GMV has developed the U-Space product family, *Dronelocus*[®], aiming to come up with a response to the problem posed by the growing number of civil unmanned aircraft likely to be sharing the airspace in the near future.

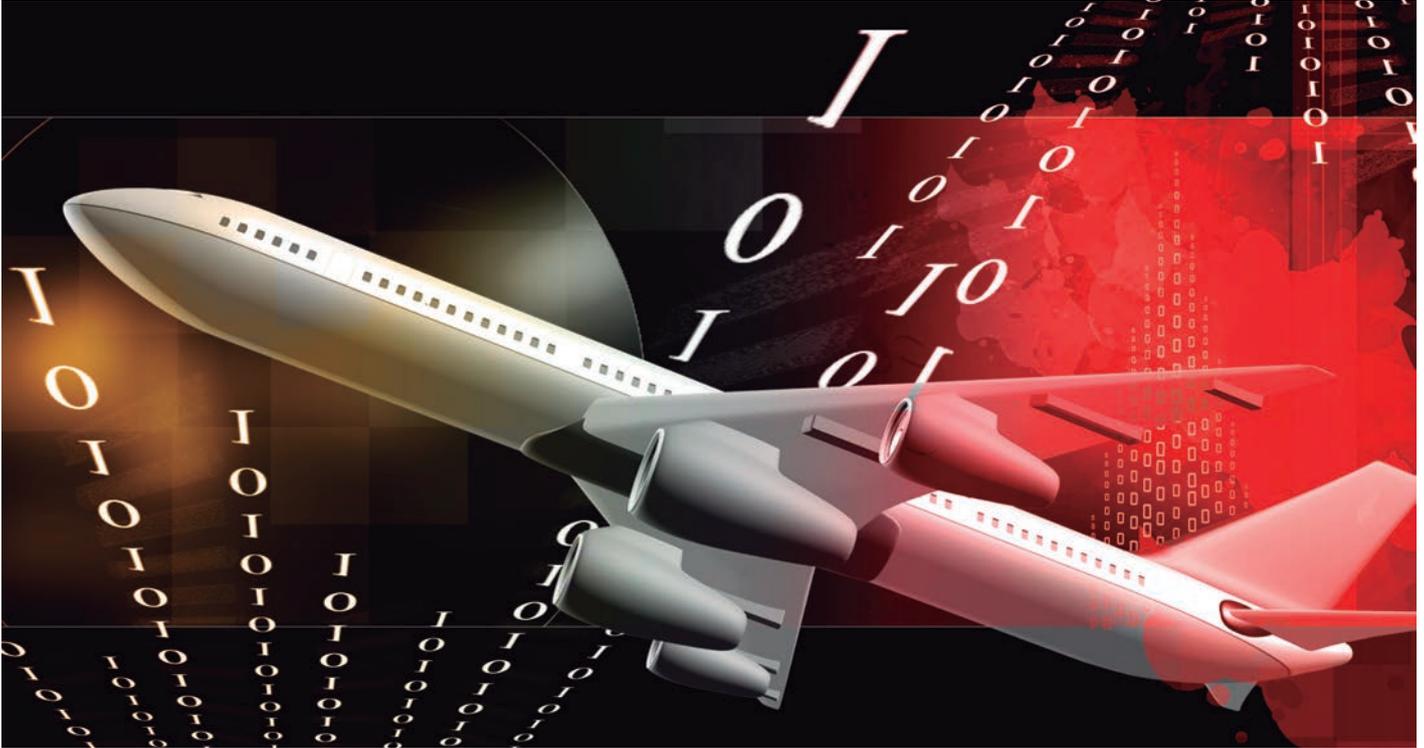
U-Space focuses on the management of low-level flights at an altitude of less than 150 m in both built-up and open-country environments. Under this overall remit the *Dronelocus*[®] tracking service taps into various sensors fitted on the drones for positioning-data processing and then records this data. It thus becomes a powerful support tool for looking into any type of accident or incident, by analyzing the flightpaths previously recorded in the system.

The *Dronelocus*[®] Emergency-Management Service, for its part, in combination with the tracking service, then takes on responsibility for drone operation alerts, automatically sending notifications to the authorities that be. This service also allows for setting up ad-hoc airspace drone restrictions around the emergency-affected area (e.g. a road accident, fire, safety zones, etc.).

These performance features help drone operators to abide by established restrictions, including special operators cleared to carry out missions in restricted zones.



GMV brings cybersecurity and digital-transformation technology to aeronautical security



■ In October GMV was appointed as coordinator of the vACCINE project. Falling under the Clean Sky 2 aeronautics research program, vACCINE's aim is to design an onboard aircraft security filter to detect intrusions in communications between the aircraft and air traffic control (ATC) systems. vACCINE aims to design an aircraft onboard security filter with an accuracy level of intrusion detection compatible with cyber-protection objectives. The goal is to check/control data from the ground domain before avionics clearance without thereby compromising safety.



Based on modern digital-transformation concepts and cyber-security technologies, the vACCINE project will employ an innovative approach to catalyze the resilience of existing aeronautical communication systems against cyberthreats. The Machine-Learning-based filter to be designed in the project will make it possible to detect communication anomalies. The filter will be tested in a near-real aeronautical embedded test bench.

ATC use of datalink has been spreading widely in recent years. Data communications are a key enabler sustaining SESAR/NextGen services, scheduled for deployment in 2020+.

Legacy data transmission is not always datalink-encrypted. This makes it very hard to decide if a failure stems from a malfunction or an attack. Civil aviation, however, is an increasingly attractive target for cyber-attacks. New technologies such

as e-enabled aircraft and modern CNS/ATM systems, together with the trend towards greater connectivity, technology-dependence, common infrastructure underpinned by the same technology and standards, etc. are changing the risk landscape of the aviation system. The consequences of a potential cyber-attack in civil aviation are wide-ranging and may bring about a loss of trust in new systems & concepts, limiting their successful deployment, or even the closure of the air traffic management system for unforeseeable periods.

There is no 'silver bullet' technology that will secure the aeronautical domain. It is therefore essential to investigate measures to make the current systems more resilient against cyber-threats while establishing effective and automated solutions for intrusion detection or promoting its implementation worldwide and building up stakeholder trust.

GMV supplies the Spanish Ministry of Defense with RPAS SEEKER systems

The systems will be integrated into the intelligence units of the Paratrooper Brigade and the Tercio de Armada de Infantería de Marina (Marine Infantry Protection Force)

In October, under the RAPAZ program, the Spanish MoD opened tendering proceedings for supply of RPAS Class I systems. GMV eventually won the contract for supply of four RPAS Class I SEEKER systems to be integrated into the intelligence units of the Paratrooper Brigade and the Tercio de Armada de Infantería de Marina (Marine Infantry Protection Force).

The SEEKER Unmanned Aerial System (UAS), developed by Aurea Avionics and supplied by GMV, is the core of a situational awareness system providing real-time intelligence. It has been designed for rapid-deployment and high-mobility military applications carrying out low-level, 15-k-radius intelligence, surveillance and reconnaissance tasks.

The system components can be broken down into two main groups: air segment and ground segment.

The air segment comprises the Unmanned Aerial System (UAV), with a 90-minute autonomy and 15-km range. This aircraft caters for daytime and



Unmanned Aerial Vehicle SEEKER

nighttime operations and completely automatic flights.

SEEKERS' ground segment comprises a ground control station (GCS), a ground data terminal (GDT) and a remote handheld control (RHC). These systems between them monitor the UAV's operation and process its real-time video data.

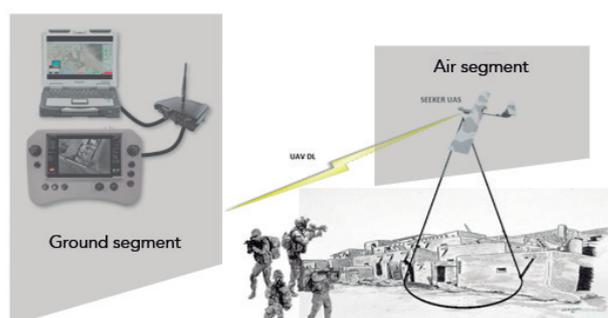
Within this project GMV will be running the design and manufacturing activities

and also the various flight campaigns scheduled to check that the systems work properly before delivery to the MoD. The project kicks off in late 2019 and system delivery is scheduled for October 2020.

GMV developments for unmanned aircraft

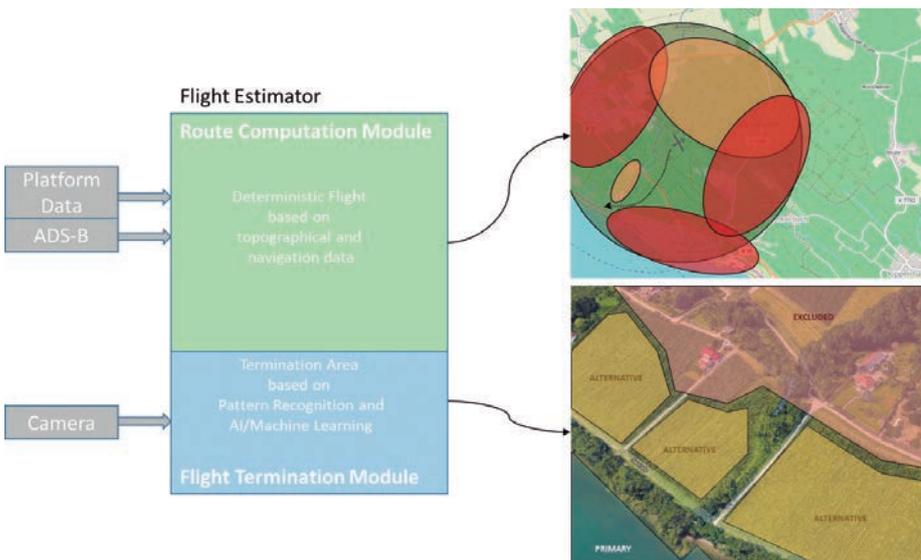
GMV boasts great expertise and experience in Unmanned Aerial Systems (UAS), built up on the strength of many previous projects such as ATLANTE, where it developed the aircraft's flight control computer (FCC); EGNSS4RPAS, where it weighed up EGNOS performance for RPAS operations; and DOMUS, where it developed emergency-management and -monitoring system demos for drone traffic control under the U-Space system.

This Spanish MoD SEEKER system supply contract boosts GMV's growing renown as developer and supplier of UAV systems and services.



SEEKER system segments

GMV helps to improve RPAS autonomy



GMV, in consortium with AERTEC, has been awarded of an important contract to assess the safe autonomous flight termination of Remote Piloted Aircraft Systems (RPAS). SAFETERM, a European Defence Agency (EDA) framework project, is due to run for an initial definition term of six months.

Operating in non-segregated airspace is an important need of military RPAS for both training and operational purposes, and EDA is one of the major European stakeholders in this domain. Autonomous decision-making is an important enabling factor for the aerospace integration of RPAS, particularly for emergency situations in which the intervention of the Remote Pilot is no longer possible.

SAFETERM's purpose is to weigh up the various technological and certification approaches for the development of autonomous solutions to ensure predictable yet adaptive aircraft behaviour in case of any emergency leading to a Flight Termination. In particular SAFETERM

aims to close the gaps in the current Emergency Recovery and Automation (ERA) concept. The project will focus on emergencies that balk the aircraft from reaching the predetermined Flight Termination Areas.

Although this capability cover a wide range of RPAS, the target platform will be a fixed-wing large tactical or Medium Altitude Long Endurance (MALE)-type RPAS with a Minimum Take Off Weight (MTOW) larger than 500 Kg operating fully integrated into the European Air Traffic Management System (ATM).

This functionality is expected to use autonomous detection- and classification-algorithms to find safe emergency termination areas. This will involve heavy use of machine-learning techniques to extract the environment features provided by the sensor data, in order to adapt the behavior to the different flight conditions of a large RPAS.



GMV presents *Dronelocus*[®] at SecuDrone

On 11 and 12 November the Strategic-Industry and Technology Promotion Association (*Asociación para la Promoción de las Tecnologías e Industrias Estratégicas: APTIE*) put on SecuDrone, a conference to look at drone and anti-drone needs and responses and security applications, bringing together manufacturers, developers and public institutions to

discuss current needs and float various technical ideas.

In the exhibition area GMV showcased its inhouse solutions in this sector. As part of the conference GMV also presented the *Dronelocus*[®] family of U-Space products, comprising a U-Space monitoring service and emergency management service developed under the DOMUS project.

The remit of the *Dronelocus*[®] family of products is to provide various support tools and functions within the U-Space system. By upgrading the services of this suite, GMV aims to become a benchmark firm in the development of the future U-Space ecosystem in Spain, coordinated by Spain's air-navigation services provider ENAIRE.

GMV helps to set up EUROCAE's artificial intelligence working group



■ GMV recently attended the kickoff meeting of EUROCAE's artificial intelligence WG-114 working group, held on EUROCAE's Paris site. The primary scope of this group is to prepare technical standards, guides and any other material required to support the development and certification of AI-implementing aeronautical systems.

EUROCAE (European Organization for Civil Aviation Equipment) is a non-profit organization set up in 1963 in Switzerland; its remit is to create aviation electronics standards. Its members come from international aeronautics authorities, aircraft manufacturers, air-safety service providers, airlines, airport operators and other stakeholder organizations. EUROCAE acts as a framework in which the various expert working groups of the aeronautics sector swap notes on standardization.

WG-114 will be tackling aeronautics systems certification involving AI technology. Current aeronautics software certification standards (DO-178/ED-12) do not cater for the non-deterministic

characteristics inherent to artificial intelligence. This makes it necessary for the aeronautics industry and regulatory agencies to reach an agreement on the required approach to the certification of AI-implementing aeronautics certification.

GMV is now using artificial intelligence algorithms on various R&D projects, in particular in the SAFETERM project. SAFETERM's aim is to design, develop and validate a proof-of-concept of an AI-based system that would allow an RPAS to operate with a high degree of autonomy in the event of any emergency. An example would be to bring off an automatic landing in the event of datalink loss. SAFETERM will also provide a system certification procedure to gauge any problems that may be posed by the use of artificial intelligence.

GMV is also participating in other EUROCAE working groups. In particular it is working with WG-105, for standardization of UAV operations, and also with WG-62, which deals with deployment of the GALILEO system and GPS modernization plans.

AED Days new edition

The 6th AED Days was held from 28 to 30 October in Taguspark (Oeiras, Lisbon), attracting a turnout of over 400 from more than 15 different countries.

This national event, promoted by the Portuguese Cluster of the Aeronautics, Space and Defense Industries, brought to Portugal representatives of the main national and international stakeholders of the Aeronautics, Space and Defense industries, including leading companies such as Airbus, Boeing, Embraer or as agencies like ESA.

The opening session was led by Mr. João Neves, Secretary of State of Economy of the Portuguese Government and José Neves, President of AED Cluster Portugal and GMV's Director of Security and Defense in Portugal. During his speech José Neves highlighted the importance of having such great players investing in Portugal and the outstanding growth perspectives of these industries in the near future. The Portuguese Minister of Defense, Dr. João Cravinho, and Secretary of State for Internationalization, Eurique Brilhante Dias, also stressed the importance of the Portuguese Aeronautics, Space and Defense ecosystem to the Portuguese economy.

Teresa Ferreira, Space Director of GMV in Portugal, was moderator of a technical panel dealing with the Space sector, with the presence of the European Space Agency.

At AED Days, participants had the unique chance to meet up and get to know the Portuguese Aeronautics, Space and Defense communities, find new business opportunities, improve participation in collaboration networks/ partnerships as well as debating the upcoming challenges for the ASD industries.

2019, a record

2019 has been a red-letter year for GMV's space business. Our turnover, reaching a total of 140 million euros, is nearly 30 % up on the previous year. Business is still booming therefore; over the last five years the space sector has multiplied its turnover by a factor of 2.5, fueling a continual influx of new recruits into team GMV. Indeed, from the job-generation point of view, GMV is Europe's sixth best-performing industrial group behind only Airbus, Thales, Ariane, Leonardo and OHB.

This growth has also been across-the-board throughout the whole space business, with rates varying from 15 % to 40 %, and in most of the countries where we run space activities. Within this European group Spain leads the pack; Germany holds on to second place, and sharp-growth rates are also being recorded by our businesses in France, Portugal, Romania and the UK. All this shows that GMV's project is going from strength to strength.

These all-time high productivity rates, built up on the strength of the

excellent work of our whole staff, speak for the thoroughgoingness of our business approach in this area.

Given the sheer size of the sector it is hard to cherry pick particular projects without slighting those left out. Even so, mention must be made of GMV's biggest ever contract for Galileo's Ground Control Segment (GSC), now in full swing and proving we can rise to the very biggest challenges. Within the sphere of Galileo and EGNOS we are also carrying out many top-notch projects, such as Galileo's Ground Mission Segment, our leadership of Galileo's future ground segment and involvement too in many Galileo centers (Service Centre, Reference Centre, Search & Rescue, TGVF and Commercial Service). Worthy of note too are projects such as our PRS developments (Public Regulated Service), the operational SBAS demonstrator, installed in Australia and New Zealand, and the high-precision products with integrity, including those carried out for the new generation of BMW's autonomous vehicles.

GMV reinforces its worldwide leadership in control centers, both in the commercial and institutional markets, beginning work on operations of the OneWeb mega-constellation and taking on responsibility for Galileo's control center. 2019 saw the launch of 12 satellites controlled by GMV's flight dynamic systems or control centers and we have made great headway as ground segment primer in programs such as the next-generation EPS ground control segment, the third-generation Meteosat control center, the ExoMars control center and the ground control segments of CHEOPS, PAZ and Ingenio. In telecommunications we remain world leaders, with eye-catching developments for Eutelsat, OneWeb and Arabsat. In the area of flight dynamics and operations GMV is world leader too, with notable developments and operations engineering this year for ESOC, Eumetsat, CNES and DLR.

Turning to the space-surveillance area, GMV likewise holds a leadership

space year for GMV

position in operations centers within the European Union's Space Surveillance and Tracking (SST) consortium, and has carried out important activities in ESA's Space Situational Awareness (SSA) program.

Business is also brisk in the data-processing, simulation and applications area. Marquee moments here were the winning of the contract for development of the processor of the MicroCarb mission (Carbon Dioxide Monitoring Mission); it has also been a busy year in Instrument Quality Tools for the Meteosat Third Generation (MTG) program. The European Commission's emergency and security framework contracts, furthermore, have clearly made us one of Copernicus's European mainstays, with successful participation in WekEO's Data Information Access Services (DIAS). In the applications market we have successfully focused on international agencies and the provision of sustainable-development-favoring services, leading to a maiden framework contract with UNICEF.

In the flight-segment area GMV made huge strides in 2019 as supplier of complete avionics systems, including GNC/AOCS subsystems, flight software and integration with flight equipment. Worthy of particular note here is GMV's participation in missions such as HERA, Mars Sample Return, Space Rider, ADRIOS, OPS-SAT, Heracles, ExoMars, lunar missions or successful qualification of the complete avionics of the MIURA-1 microlauncher. GMV is also cementing its technology-developer leadership in key areas of Guidance, Navigation and Control (GNC), robotics, software engineering and microelectronics. Areas where growth prospects are especially bright include launch vehicles, planetary defense, orbital services and robotic exploration.

This remarkable year ended in grand style with ESA's Conference at Ministerial Level, chalking up a record subscription with the concomitant boost for the whole sector. This now ushers in for GMV a period of the highest expectations, further fueled



Jorge Potti
GMV's Aerospace General Manager

by the firm's solid track record and its ongoing growth.

First field tests of the project for enhanced GNSS positioning based on 5G networks

■ Positioning with state-of-the-art 5G cell technology ushers in unknown hitherto possibilities for satellite-based positioning services in fields such as intelligent traffic management, asset monitoring, emergency and rescue services or personalized cell-phone-based delivery.

In 2016 the Horizon 2020 (H2020) operational group GNSS 5G took the initiative of giving form to the support of high-precision positioning services in 4G and 5G networks as a contribution to the Third Generation Partnership Project, 3GPP, the worldwide standardization effort.

In 2018, as part of this initiative, the European Space Agency (ESA) awarded to a GMV-led consortium the GINTO5G project (GNSS Integration into 5G wireless Networks).

Recently, under this umbrella project, a series of field tests was held by GMV and the German Aerospace Center (DLR) with the collaboration of engineers from NovAtel, u-blox and Deutsche Telekom.

Data collection involved two vehicles fitted with GNSS and IMUs receivers of different degrees, correction services

for some of these GNSS receivers and plus wireless broadband Long-Term Evolution (LTE) 4G and Ultra Wideband (UWB) receivers. Both vehicles running in the trial took relative positioning data between them, performing a continuous vehicle-to-vehicle monitoring to simulate future operational 5G standards.

During this campaign GMV took on responsibility for processing data, analyzing and characterizing the behavior of the GNSS and IMU equipment in each scenario while the Universidad Autónoma de Barcelona (UAB) carried out this same analysis for LTE and UWB data.

The next stage of this project involves complete processing of data compiled during this testing campaign, leading on to experiments in additional areas. Furthermore, the data compiled from all campaigns will be used for developing a simulator for obtaining hybrid GNSS and 5G solutions for carrying out preliminary studies in other areas of the planet that might be of interest in other projects.



GMV presents at FAR the avionics system developed for the MIURA 1 launch vehicle

In response to the growing demand for innovation and competitiveness in the space sector, the international conference Flight vehicles, Aerothermodynamics and Re-entry Missions and Engineering (FAR) was held from 30 September to 3 October in Monipoli (Bari, Italy).

This conference is the natural outcome of the successful series of symposia on aerothermodynamics for space vehicles, the workshops on thermal protection

systems and other international events organized by ESA in recent years in the field of (re)-entry and new vehicles design and engineering.

Francesco Pace, GMV Project Manager, presented the paper Miura-1 Avionics System: An Affordable and Reliable Approach. MIURA 1 is a rocket developed by PLD Space with the aim of providing a payload microgravity environment. Equally important is its use as a flight testbed for the

technology to be flown in MIURA 5, PLD Space's microlauncher.

PLD Space and GMV began to develop MIURA 1 and MIURA 5 in January 2017, since when both companies have been working together in a technology partnership. GMV is responsible for development and qualification of the complete avionics, including not only the launcher's vital hardware subsystems but also the Guidance, Navigation and Control (GNC) system and the onboard software system.

Pseudo satellites, a world of solutions and applications

■ High Altitude Pseudo Satellites (HAPS) are aerial platforms that operate in the stratosphere, at an average altitude of 20 km, above commercial airlines, strong jet-stream currents and the humidity of the troposphere. The use of HAPS in combination with satellite missions is promising for telecommunications and Earth observation applications.

Enter HAPSVIEW, a study for the European Space Agency (ESA), which sets out to demonstrate the enhancements HAPS can bring to urban and regional air-quality models, deriving from local networks and satellite observations.

GMV is leading the HAPSVIEW project, in collaboration with the Royal Dutch

Meteorological Institute (KNMI), the Swiss company SCEYE, developer of the LTA navigator, and the Canadian firm ABB, specializing in air- and space-borne remote sensing instruments. Four Public Institutions responsible for the control, monitoring, management and reporting of air quality are taking part in the study as key end users: Authority of the Great Rotterdam region, and Rotterdam City Council as well as the Andalusian Government and Seville City Council.

In the course of the study, the consortium has identified top priority air-quality-data user requirements in Rotterdam and Seville, suitable HAPS platforms, the payload and the ground segment, while the HAPS mission requirements will be fleshed out in Q1 of 2020. An analysis will also be made of airspace regulation, the products associated with the observed data and the synergies with satellite missions. Any HAPS limitations or shortfalls will be studied for further system upgrade discussions.

HAPSVIEW was presented in September to the scientific community gathered at the ESA Phi-Week contest, an event that explores cutting-edge technologies for the benefit of future satellite missions and Earth observation services.



Northern Portugal debates robotics and vehicle technology applied to space

■ In October, GMV was invited to participate in two important events held in the north of Portugal

Under the banner theme “Robotics and vehicle technology” the second UBIsym, an IEEE symposium organized by Universidade da Beira Interior, was held on 11 and 13 October. The symposium included several seminars and presentations given by top speakers within the different engineering sections related to robotics and vehicle

technology. Daniel Silveira, GMV’s Portugal leader of the Space Avionics team, presented “ESROCOS: a robotic operating system for space and ground applications”.

Additionally, GMV participated in the World Congress on Formal Methods 2019 (FM’19) that took place in Porto from 7 to 11 October. FM 2019 was the 23rd in a series of symposia organized by Formal Methods Europe, an independent association whose aim is to stimulate

the use of, and research on, formal methods for software development. The theme for FM 2019 was a reflection on how far the community has come and the lessons we can learn for understanding and developing the best software for future technologies. GMV presented the solutions used in the space domain regarding the application of formal methods in ESTEC’s the European Space Research and Technology Centre model-based engineering tools.

CHEOPS and OP-SAT, dual launch with GMV technology



■ On Wednesday 18 December, the European Space Agency (ESA) successfully launched the missions, CHEOPS (CHaracterising ExOPlanet Satellite) and OPS-SAT, from the spaceport in Kourou (French Guiana).

Both missions use GMV technology and travelled on board the Soyuz-Fregat rocket, together with the first satellite of the second-generation Cosmo-SkyMed constellation of the Italian Space Agency (ASI).

CHEOPS mission focuses on the characterization of exoplanet, and it is part of the European scientific

programme Cosmic Vision 2015-2025. It will orbit 700 km above the earth and is the first mission dedicated to monitoring stars with exoplanets, particularly those with a size between that of the Earth (6,371 km) and Neptune (24,622 km).

CHEOPS, led by Airbus in Spain, is a partnership between the ESA and the Swiss Space Centre, being a consortium of research organisations, universities and private entities from Germany, Austria, Belgium, Spain, France, Hungary, Italy, Portugal, the UK and Sweden.

GMV has been involved in the mission since the beginning, being responsible for the mission analysis, which served to verify the viability and define the main characteristics of said mission. Subsequently GMV has been responsible for the integration of the MOC (Mission Operations Center), the development and integration of the FDS (Flight Dynamic System), the MCS (Mission Control System), the SCSIM (Spacecraft Simulator), and the operations automation system (flyplan).

In addition, GMV was entrusted with integrating these elements with the terrestrial stations for Monitoring, Telemetry and Tele-Command of the National Aerospace Techniques

Institute (INTA), located in Torrejón de Ardoz (CEIT) and Villafranca del Castillo (ESAC).

For its part, OPS-SAT, which is the ESA's first CubeSat mission, aimed towards carrying out various experiments in the field of mission control. The onboard processing platform is the main feature of this nanosatellite, including a flexible environment and a totally reconfigurable logic. This nanosatellite, that is only 30 centimeter high, contains an experimental computer that is ten times more powerful than that of any current ESA spacecraft.

OPS-SAT is open to public use and is controlled from the SMILE laboratory (Special Mission Infrastructure Lab Environment), a new mission control and validation environment, located in the ESA's operations center in Darmstadt (Germany).

In this mission, GMV has been in charge of development and implementation of the full on-board software as well as various system components crucial for control and communication with the satellite. Those components include Attitude Determination and Control System (ADCS), Failure Detection Identification and Recovery (FDIR) and the Mission Operation Services (MOS), which is an information exchange protocol standard.

Space Surveillance from Hawaii

From 17 to 20 September the island of Maui in the US State of Hawaii hosted one of the world's most important space debris conferences, AMOS 2019. AMOS stands for Advanced Maui Optical and Space Surveillance Technologies Conference, hold this year for the twentieth time.

Governmental organizations, non-governmental organizations, the

private industrial sector and the academic sector came together during the four days of this conference, in which various technical sessions dealt with space debris and Space Situational Awareness (SSA), focusing on space objects optical characterization technology.

GMV is now working on research into advanced correlation and

orbit determination methods in order to enhance the necessary tools for building and keeping these space-debris catalogues. Part of this research focuses on the development of the industrial PhD in collaboration with the Madrid Universidad Carlos III, a three-year course that kicked off in 2018. In this conference it presented its latest breakthroughs in the paper "Object Detection Methods for Optical Survey Measurements".

GMV contributes towards successful validation of remote beacon activation using Galileo's RLSP

GMV, as leader of the framework contract for supply of the Return Link Service Provider (RLSP) of Galileo's Search and Rescue Service (SAR), took charge of the Galileo return-link integration tests

On 16 and 19 September the European GNSS Agency (GSA), together with Orolia, CNES, ENAIRE, the Spanish Mission Control Centre (MCC), the Spanish Rescue Coordination Centre (RCC) and the French MCC successfully conducted end-to-end tests of Galileo's Return Link Service (RLS) with the airline companies Iberia and Air France. These tests consisted of remote aviation-beacon activation.

The Return Link Service Provider (RLSP), as its name suggests, is the system responsible for generating Galileo's return messages. This system acts as an interface between the French Mission Control Centre (MCC), which forms part of the Cospas-Sarsat network, and the Galileo Ground Mission Segment (GMS). This service allows users in possession of a Galileo-compatible beacon to receive the confirmation message whenever this beacon is activated in any rescue operation. No other satellite-based rescue system is capable of sending this message; as such, it is Galileo's most valuable input to the Cospas-Sarsat program. The system can also send remote activation messages to the beacons themselves.



Under the aegis of the European Commission, GMV is leading the framework contract for supplying the RLSP infrastructure of Galileo's Search and Rescue Service (SAR); this project includes RLSP design and development, its validation and installation in the SAR/Galileo Service Centre plus its maintenance and support for system-integrating tests.

The tests, simulating a real aircraft-distress scenario, involved remote activation and deactivation of the beacons installed on the Iberia and Air France aircraft, using the GMV-developed return link to do so. User interfaces were also successfully put through their paces,

obtaining information on additional needs and also the airline's opinion as final user of the service.

CNES was in charge of the test operations, while GMV was responsible for providing support, installing the man-machine interfaces (MMIs) in a server located on GMV's site, making these interfaces available to external users, in this case CNES and the Spanish and French Mission Coordination Centres.

The tests were a resounding success. The operational concept was assessed and validated for Galileo-enabled response in aircraft emergency situations.



GMV helps ESOC design operations around small celestial bodies

■ A consortium led by GMV has been recently awarded a contract by ESA to facilitate the design of operations of future missions near small bodies, like asteroids, comets, Martian moons or non-cooperating spacecraft, by identifying and analyzing potential solutions and upgrading ESA's Orbit Software Facility.

Navigation around small bodies poses specific challenges: the environment is not well-known in advance and motion is difficult to predict, but accurate knowledge of the orbital state of the spacecraft relative to the target body is required for activities like the pointing of instruments or the delivery of a lander. The reaction time, which is determined by the signal propagation times and the duration of ground processing, is often short compared to the turn-around times typical for planet exploration missions.

QUADRANT - Future Navigation Concepts at Small Bodies - will carefully address the use of novel on-board autonomy concepts and streamlining ground processing

procedures to develop sound navigation strategies - building on the knowledge and tools that reconcile the concurrent limitations and needs that drive the design of proximity operations for such missions.

QUADRANT is the next step in a line of activities lead by a multi-disciplinary GMV team: FASTMOPS took place from 2014 to 2016 and

was overseen by ESA's Operations Centre (ESOC), while FCS-ATOMIC ran from 2016 to 2018 under ESTEC, the European Space Research and Technology Centre. As well as GMV's Spanish and Portuguese companies, the QUADRANT consortium is made up by Thales Alenia Space France as Platform Experts and German Aerospace Centre (DLR) as Science Experts.



The Portuguese education sector debates about Space

"The Moon: Gateway to the Stars" was the theme of the 2019 World Space Week, held all over the world between 4 and 10 October, representing the largest space event on Earth.

During the World Space Week, ESERO Portugal and Ciência Viva organized several initiatives including an astronomy exhibit with students' projects on the moon, scientists' lectures, a film session, storytelling, thematic classes and workshops where students had the opportunity to train like astronauts, analyze satellite images, program mini robots

to simulate lunar rovers and launch rockets.

GMV set up the initiative "O Espaço vai à escola" (Space goes to School) where several companies talked to students about different subjects within an ESERO initiative. Teresa Ferreira, Space director of GMV in Portugal, spoke about satellite navigation and the proliferation of new systems such as GPS, Galileo, GLONASS, and BEIDOU. GMV, made a presentation about space probes enhancing some ESA missions such as Rosetta, Gaia or Exomars.

Given the importance that the company gives to the future of Space, GMV also participated in the 6th Conference of Spatial Teachers held in Lisbon on 15 and 16 November dedicated to the "Space Exploration: Mars or Moon?". This conference organized by ESERO was opened by Ricardo Conde from the Portugal Space Agency with a presentation focusing on the importance of Space in school syllabi. Teresa focused her presentation on the "Technological Challenges: from global defense to space debris removal".

New framework contract for Copernicus Emergency Management Service

■ GMV is part of the consortium that recently won the framework contract for the Rapid Mapping component of the Copernicus Emergency Management Service (EMS).

The Copernicus Emergency Management Service uses satellite imagery and other geospatial data to provide a free-of-charge mapping service in cases of natural disasters, human-made emergency situations and humanitarian crises throughout the world.

The Rapid Mapping consists of the provision of geospatial information within hours or days from the activation in support of 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.

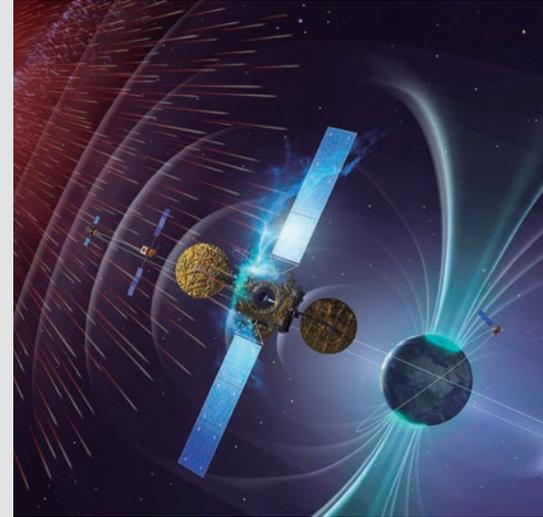
as digital or printed map outputs), or it may be further combined with other data sources (e.g. as digital feature sets in a geographic information system). In both cases it supports geospatial analysis and decision-making processes of emergency managers.

The service provides data to entities and emergency-management organizations at regional, national, European and international level. 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 programme, as well as European Commission services and the European External Action Service (EEAS).

Entities of the EU Member States that are not Authorized Users and wish to activate the EMS Mapping service must identify their National Contact Point; the Emergency Response Coordination Centre maintains a list of such Authorized Users.

GMV is in charge of one of the Production Sites, providing Rapid Mapping services in support of disaster-crisis management.

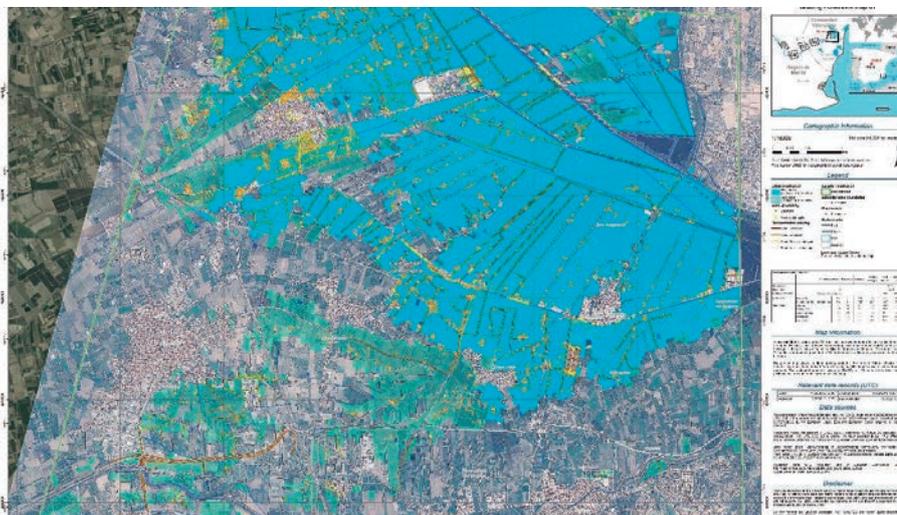
Research and innovation in support of space meteorology



As part of the activities to raise awareness of the effects of space weather, GMV took part in the SWE-MED Spain workshop, held on 3 October in the Universidad de Alcalá de Henares (UAH), as well as in the Portuguese counterpart held in Coimbra on the 24th October.

The community of Space Weather (SWE) users operating in the Mediterranean region is very widespread and diverse, and it needs punctual and precise information on space weather conditions. The UAH-led SWE-MED project, with GMV as partner, aims to identify which user requirements of the European Space Agency (ESA)'s Space Weather segment have to be improved or adapted to meet the needs of the end users operating in the Mediterranean region. To this end, a user consultation is planned, with congresses to be held in Spain plus four other Mediterranean countries (France, Greece, Italy and Portugal).

The target sectors of this consultation include navigation and communication systems, marine-resource exploration/exploitation, power-supply system operation, railway transport, long gas- or oil-lines, aviation, logistics, space surveillance and insurance.



Grading Map: Floods in Dolores - Alicante, Spain. Produced on 18/09/2019 © European Union

GMV features prominently at the Space Congress



■ On 9 and 10 October Madrid hosted the Space Congress, the must-attend event for finding out about the current situation of Spain's space sector and its future prospects. The venue was the conference center called Complejo Duques de Pastrana, attracting a total turnout of about 450.

Promoted by the Spanish Association of Space, Aeronautics and Defense Technology Companies (*Asociación Española de Empresas Tecnológicas de Defensa, Aeronáutica y Espacio: TEDAE*), with the organizational collaboration of the National Aerospace Technology Institute (*Instituto Nacional de Técnica Aeroespacial: INTA*), the Higher Scientific Research Center (*Consejo Superior de Investigaciones*

Científicas: CSIC), the Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial: CDTI*) and Spain's Ministry of Defense and Ministry of Public Works, the Space Congress brought together for the first time ever in Spain the most renowned professionals from industry, universities, public organizations and other institutions to set up a common dialogue forum for discussing sector capabilities, current challenges, goals and the opportunities of the upcoming years.

The congress, geared towards the national and European space community, aimed to «push back the limits» of technology, innovation, science and knowledge. The program comprised several discussion panels

and featured top speakers, tackling such issues as space exploration, satellite navigation, earth observation, the role of the space industry in the digital and communications society, space technologies and uses in defense and security, space's likely role in society within a 2030-2040 timeframe and Spain's leadership role at European and world level, plus the necessary technological advances to achieve all these goals. All these matters are bound up with the European Union's space strategy and the specific outlook of the European Space Agency (ESA) ahead of its November Council at Ministerial Level (Space19+) to be held in Seville.

GMV's Aerospace General Manager, Jorge Potti, took part in the discussion panel "Satellite Navigation: The Great Revolution", chaired by the Secretary General of Transport of Spain's Ministry of Public Works, María José Rallo del Olmo and with the participation of leading figures from the European Commission, ESA, GSA, the Spanish Ministry of Defense, INTA and Spain's air navigation services provider, ENAIRE.

The opening address was given by the Presidency Councilor of Madrid Region, María Eugenia Carballado, while the closing address was given by the acting Minister of Science and Innovation and Universities, Pedro Duque.

Portugal stages the Women in Engineering Forum 2019

Lisbon was the Portuguese city selected to host IECON 2019, the 45th Annual Conference of the IEEE Industrial Electronics Society (IES), which included the Women in Engineering Forum (WiE'2019). The event took place on 16 October.

The Women in Engineering Forum, which is supported by the Industrial

Electronics Society, has the main goal of fostering women's involvement in scientific and technical activities. The event was open to all professionals and students, from industry and academia, regardless of the gender, representing a great opportunity for networking between the speakers and all the attendees.

The Forum's activity-packed agenda included a series of keynote speeches by various female scientists and professionals, including Teresa Ferreira, Space Director of GMV in Portugal. During her speech, Teresa highlighted the "Challenges on Space Technologies and Applications".

GMV's avionics system greenlighted for microlauncher use

After a thoroughgoing test campaign the avionics system developed by GMV for MIURA 1 passes the system qualification test

Since 2017 GMV has been working on the design, development and qualification of a complete avionics system for the PLD's space probe MIURA 1. This system takes in all vital avionics items for a classic launcher, such as the power subsystem; data management subsystem; guidance, navigation and control (GNC) system; onboard software; payload management; telemetry plus the autonomous tracking technology and the termination system.

After a long field-testing campaign the GMV-developed avionics system for PLD Spaces' MIURA 1 launch vehicle has successfully passed its Qualification Acceptance Review (QAR), clearing it for fitting in this suborbital launch vehicle, one of the essential prelaunch conditions. In October, after the system had successfully passed its design review, work began on functional verification with thoroughgoing validation activity carried out on GMV's Tres Cantos avionics testbed. Next step

was its environmental qualification tests (vibration and thermal tests) on ALTER's site. In mid-December, after all recorded data had been analyzed in depth, the system's full functionality was duly confirmed.

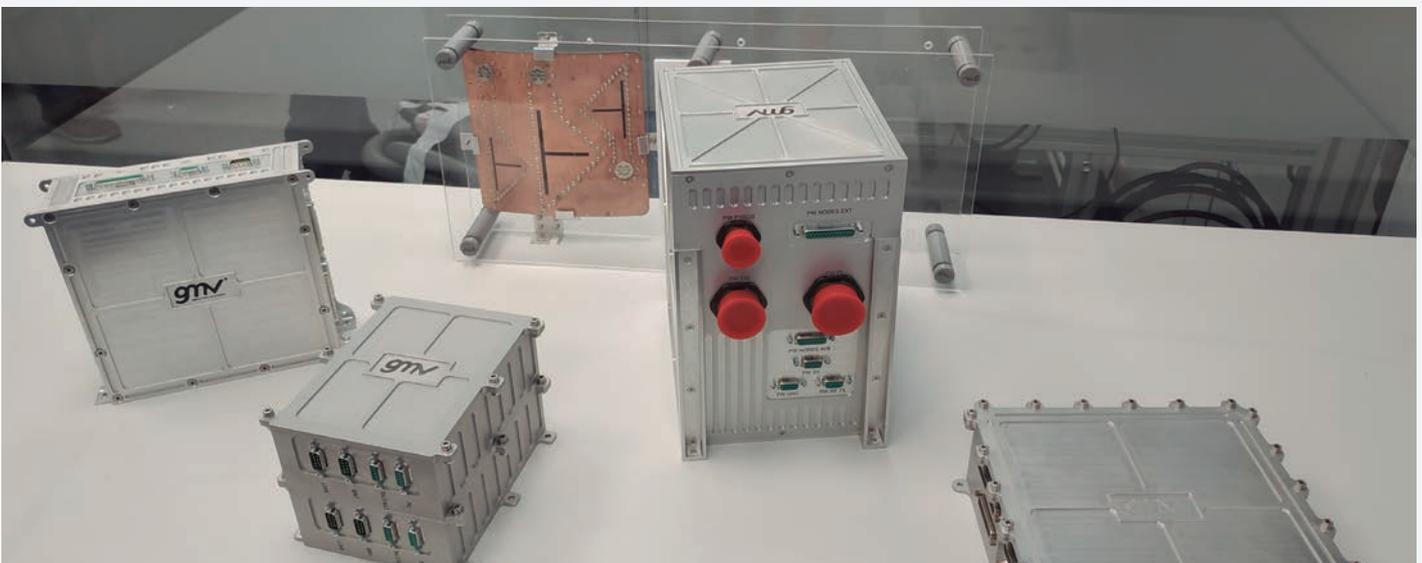
The avionics system is one of the most critical parts of any launcher. It collects and works up information from the sensors and takes due and timely decisions accordingly for the actuators to carry out the launcher's required maneuvers. Design and development of these avionics systems are also especially complex in such a fiercely competitive market involving the participation of a host of very different types of organizations, from the well-known launch service providers to the newcomers to the microlauncher world.

Key features of the avionics system designed and developed by GMV in collaboration with PLD are its modularity and scalability. Other

fundamental aspects are its use of COTS parts and the availability of advanced technology that guarantees the required performance at an affordable cost.

GMV has managed to maintain the functions of a classic launcher (Ariane, Vega, etc) while duly adapting them to a smaller vehicle with different performance features. GMV has risen to this challenge by applying new technology and design processes, thereby not only cutting costs but also shortening development times. In less than three years development has moved on from definition of requirements to qualification and complete system acceptance by the European Space Agency (ESA).

This development represents another stride forward in GMV's avionics business, as the first time the company has made, integrated and qualified a complete system.



GMV's participation in IAC 2019 reinforces its space leadership

■ From 21 to 25 October Washington D.C. hosted the 70th International Astronautical Congress (IAC), an annual event organized by the International Astronautical Federation (IAF) in collaboration with the International Academy of Astronautics (IAA), the International Institute of Space Law (IISL) and the NGO Space Generation Advisory Council (SGAC).

GMV featured prominently in the congress, which has by now become the essential worldwide meeting point for all space players, including scientists, researchers, engineers, agencies, companies, astronauts and members of the public who take an interest in the space sector.

In the Spanish pavilion of the exhibition area GMV showcased its space capabilities. Spain's pavilion this year was

organized for the first time by Spain's Foreign Trade and Overseas Investment Institute (ICEX) and Spain's Economic and Commercial Office in Los Angeles, in collaboration with the Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial: CDTI*) and the Spanish Association of Space, Aeronautics and Defense Technology Companies (*Asociación Española de Empresas Tecnológicas de Defensa, Aeronáutica y Espacio: TEDAE*). The pavilion companies were accompanied and supported throughout the event by Pedro Duque, acting Minister of Science, Innovation and Universities.

Under the banner title "SPACE: The Power of the Past, the Promise of the Future", IAC 2019 offered a busy, multidisciplinary program of plenaries and lectures addressing a great diversity of space disciplines.

Mariella Graziano, Director of Space Segment and Robotics of GMV's Aerospace sector and active member of the International Astronautical Federation's Space Exploration Committee, once more co-chaired the solar-system session, this year under the title "Solar System Exploration Including Ocean Worlds". She also took part in a special session entitled "Get Ready to Protect Earth from Asteroids – Planetary Defense in Your Hands". Her speech ran through the various asteroid deflection techniques, highlighting the fact that GMV has been playing an upfront role in planetary defense for over 15 years now.

GMV's leadership in such areas as guidance, navigation and control (GNC); planetary defense; the study, tracking and removal of space debris; and avionics for microlaunchers manifested itself here in the presentation of nearly a dozen papers in various congress sessions.

Further GMV involvement came when João Lousada, GMV employee in Germany and analog astronaut, picked up his award under the "IAF Young Space Leaders Recognition Programme", a yearly program that heralds the work of students and professionals whose academic or professional work has most helped to bring astronautics to wider notice.



GMV ups its profile in the United Kingdom's space sector in the latest Space Conference

■ GMV was present at the UK Space Conference 2019, held from 24 to 26 September in the recently constructed International Convention Centre (ICC) Wales. Held every two years, this is a must-attend event for the country's whole space industry.

GMV's stand featured was the variety of projects currently being carried out by the company's UK subsidiary, including earth observation, guidance navigation and control (GNC), GNSS, mission-planning and robotics projects.

Additional GMV showcased the new rover to be used for validation and verification of the company's autonomy software.

During the event researchers, decision-makers and representatives of institutions were able to attend an array of sessions dealing with research, technology, space environments and biomedicine.

The UK Space Conference is designed to allow the main space players to meet up and discuss future space possibilities

and thus boost their chances of fruitful exchanges and debates.

At the same time GMV is also taking part in the 14th UK-China Space Conference, exploring how the UK company might promote the trading link with China.

GMV's participation in this event strengthens its existing bonds within the industry while also favouring new connections to boost its UK growth prospects in coming years.

GMV is awarded a contract for enabling autonomous far-range orbital rendezvous

■ A GMV-led consortium has won the contract for extending applicability of vision-based-autonomous orbital approaches to far-range distances, in an activity contracted by the European Space Agency and overseen by its Space Research and Technology Centre, ESTEC.

Autonomous command of servicing spacecraft through on-board Guidance Navigation and Control is a fundamental enabling technology for rendezvous, in-orbit servicing and active debris removal - a baseline for the planned close-range phases of current and future orbital encounter missions.

In the GUIBEAR activity, which kicked-off in November, GMV will seek to extend the applicability range of this technology to distances up to 2000 km, where the

target is a faint beacon in the servicing spacecraft navigation camera's field of view.

Cosine (a Dutch camera manufacturer) and Odys (Italian specialists in model-based control) will augment GMV's team from Portugal and Spain.

Bearings-Only rendezvous consists in navigating using only angular measurements, planning and using knowledge of the range-estimating maneuvers, and calls for a groundbreaking family of model-based computational Autonomous Control techniques, where synergies between software architecture and algorithm design play a major role.

These techniques have the potential to cut mission costs by increasing

autonomy and reducing the requirements for the rendezvous in exploration missions such as HERACLES - where a European Lunar Ascent Element (LAE) will ascend from the Moon's surface and rendezvous with a Lunar Orbital Platform - Gateway (LOP-G) - an international crew-tended cis-lunar space station.

This activity will show the feasibility of bearings-only rendezvous in the Near-Rectilinear Orbits of the cis-lunar space by developing, prototyping and testing the required estimation, trajectory optimization and guidance functions, implementing Model-in-the-Loop validation and bridging towards a future study demonstration, which will use representative flight processors and GMV's Hardware-in-the-Loop testing facilities to mature the technology.

GMV attends the latest ION GNSS in Miami

■ GMV has attended the 32nd ION-GNSS symposium, organized by the Institute of Navigation of the United States and held in Miami (Florida, USA) from 16 to 20 September.

ION GNSS is the world's largest technical meeting and showcase of GNSS technology, products and services. International GNSS leaders and experts in other positioning-, navigation- and timing-related fields come together each year to present the latest research, introduce new technology, debate current policies, demonstrate products and swap ideas.

As usual, GMV played an upfront role in keeping with its leadership position in the satellite-navigation market. Eight GMV experts took part in six discussion panels to talk about the projects the company is currently carrying out.

This year GMV presented 11 papers as main author and contributed to another eight as co-author. These papers took in a wide range of issues such as technologies to be applied to the next generation of autonomous vehicles, correction and integrity systems, remote

sensing, synchronization and timing technology, among others.

The company also ran a stand to display its inhouse **magicGNSS** products plus other satellite-navigation applications and developments.



GMV officially endorsed as full partner of SpaceOps

■ The Committee-at-Large (CAL) meeting held in DLR's GSOC (German Space Operations Center) from 11 to 15 November officially announced GMV as full membership of SpaceOps.

SpaceOps (International Committee on Technical Interchange for Space Missions Operations and Ground Data Systems) is an organization created in 1992 to "promote and maintain an international community of space operations experts". SpaceOps is managed through two committees: an Executive Committee and a Committee-at-Large and it is currently made up by space-agency members plus non-space agency members from academia and industry.

Prime among its activities feature the following three mainstays: firstly, its biennial SpaceOps conferences, serving as a forum for swapping notes on methods, trends and tools in the field of space operations; secondly, its "Journal of Space Operations & Communications" and, thirdly, its award program to recognize outstanding achievement by individuals and teams in the space operations field.

With the overall aim of inputting its 35+-year experience and expertise in space operations, GMV has long been involved in SpaceOps by means of various sponsorship activities and



presiding over sessions of its biennial conferences. From now on GMV will be taking an even more active role as full membership by joining the Committee-at-Large and supporting the Communications, Outreach and Publications Group (COPG).

GMV participates in ESA's earth observation week

■ From 9 to 13 September GMV took part in the European Space Agency (ESA)'s international five-day Φ -week, held in the earth-observation center in Frascati (Italy) to look at the latest developments in Open Science trends.

Although earth observation was the central concern of the event, Φ -week in fact cast its net much wider, taking in new trends such as the future of earth observation in the so-called New Space, as well as applications of new technologies like artificial intelligence or

blockchain to the space sector in general and earth observation in particular. The event involved inspiring talks, workshops, roundtables, startup pitches, alternative events and hackathons to gain an overview of the new technologies and elements shaping the future of earth observation and space.

GMV is busy working on ground segments of missions in the area of earth-observation data, adding value to satellite images, earning it a high-profile appearance at the event.

GMV ran a stand and presented 2 papers and 4 posters related to its current activities in various projects such as EO_MAMMALS, which aims to analyze whale behavior using models feeding off satellite products, and HAPSIEW, which is studying the use of HAPS pseudo satellites to analyze air quality and greenhouse gases. During the event GMV co-chaired with ESA one of the sessions looking at the application of artificial intelligence to space and earth observation, as part of ESA's future AI4EO program.



Eutelsat 5 West B successfully launched

■ On 9 October Eutelsat 5 West B satellite successfully blasted off from the Baikonur Cosmodrome in Kazakhstan atop a Russian Proton-M launch vehicle.

Eutelsat 5 West B has been built by the US company Northrop Grumman Innovation Systems on a GEOSTar-2e platform. The satellite has a launch mass of 2740 kg and a payload of 35 Ku Band repeaters supplied by Airbus Defence and Space.

This satellite, replacing Eutelsat 5

West A, will be slotted into the orbital position 5 degrees west, from where, over the next 15 years, it will be providing video services to Europe and North Africa. It is also carrying an EGNOS GPS-augmenting system.

EUTELSAT, one of GMV's prime clients, is now working with GMV-developed systems for controlling its whole satellite fleet, pride of place going to the **Hifly**[®]-based multi-satellite control system for NEO satellites and the flight dynamics system **Focussuite**.



Seville New Space Forum

■ On 29 and 29 October, just a few weeks before hosting the European Space Agency's Council at Ministerial Level (Space 19+), Seville also served as venue for the "Seville New Space Forum".

This event, which brought together Europe's industrial space sector, was organized by the Community of Ariane Cities (CVA) and Seville City Council as president of CVA, in collaboration with the Industrial Technology Development Center (CDTI in Spanish initials) and other organizations like the Agency of Innovation and Development of the Andalusian government (*Agencia de Innovación y Desarrollo de la Junta de Andalucía: IDEA*)

Prelude to Space19+, the European Space Agency's Ministerial Council, this

forum's discussion panels and lectures were focused on Europe's space sector, its industry and the new business opportunities being opened up by New Space.

Miguel Ángel Molina, Business Development Manager of GMV's Aerospace sector, took part in the discussion panel dealing with the European industry's response to the challenge posed by such an important sector in the country's economy as the space sector. For his part, Jorge Potti, GMV's Aerospace General Manager and Space Vice President of the Spanish Association of Space, Aeronautics and Defense Technology Companies (*Asociación Española de Empresas Tecnológicas de Defensa, Aeronáutica y Espacio: TEDAE*) took part in the discussion panel "Spain in Space. Present and Future".

GMV, a key stakeholder in the Hera mission, attends the AIDA workshop held in Rome

From 11 to 13 September the *Aula Ottagona* of the *Terme di Diocleziano* in Rome hosted an AIDA (Asteroid Impact Deflection Assessment) workshop. The main objective of the event was to take stock of the current state of the ongoing analyses in support and preparation of DART (Double Asteroid Redirection Test) for NASA.

DART is a NASA mission that sets out to flight test necessary planetary-defense technology for heading off possible asteroid impact with the Earth. This mission, together with ESA's Hera mission and the LICIA CubeSat of the *Agenzia Spaziale Italiana* (Italian Space Agency), make up the umbrella mission of international collaboration AIDA.

GMV is head of the international consortium that is seeing to the design and development of the guidance, navigation and control (GNC) system of Hera, Europe's first ever planetary defense mission. Additionally, GMV Romania is responsible for the GNC system analysis and mission of Juventas, one of the two cubesats to be brought back onboard Hera.

A group of engineers from GMV in Spain and GMV in Romania took part in the AIDA workshop. Particularly noteworthy was the paper given by Andrea Pellacani, Head of Project of Hera's GNC at GMV, on the Hera phases of Close Proximity, Trajectories and Constraints in the framework of the activities of Working Group 5 of Operations and Data Analysis.





GMV improves autonomy and navigation for extreme environments

Under the ARISE project (Autonomous Robotic InSpEction), which aims to develop a robotic system for mining operations, GMV will be supplying the robotics platform and ensuring robot autonomy

The modern world is dependent on the supply of mineral resources to provide the raw materials to meet current and future energy-, manufacturing- and construction- needs. At the same time demand is soaring due to population growth, lengthening life expectancy and a more technologically-focused digital world that needs sophisticated mineral products.

The mining industry is highly safety conscious and is determined to cut accident rates at a time when operations are increasingly migrating underground as close-to-the-surface deposits run out. The underground environment is particularly challenging due to such factors as high rock stress, high temperatures, poor communications with the surface, access constraints and inoperable conditions for satellite-positioning systems.

In this overall context and in the particular framework of the Innovate UK R&D program, GMV is now working on the Autonomous Robotic InSpEction (ARISE) project, which aims to implement autonomous surveys of geotechnical conditions during

the normally unproductive period immediately after the blast when workers vacate the mine due to post-blasting fumes and seismic risk.

ARISE is based on the development of several key technologies, such as sensing for autonomy based on cameras and light array; groundbreaking onboard-computer electronics based on FPGA and rugged components; integration of LIDAR for Validation and Verification, and analysis of data products.

Drawing on its proven expertise in robust, autonomous navigation for extreme environments, Guidance, Navigation and Control (GNC) and space-robotics platforms in general, GMV will be supplying ARISE's robotics platform and ensuring robot autonomy.

ARISE sets out to provide safety and financial benefits without affecting the production cycle (operating in the shift-change periods); as such it comes across as highly attractive for industrial roll-out.

The project demo has been penciled in for late 2020 in a working mine in Chile.

EROSS OG7 successfully passes its Preliminary Design Review



■ On 26 and 27 November Space Applications' Brussels head office hosted the Preliminary Design Review (PDR) of the European Robotic Orbital Support Services project (EROSS) – OG7. EROSS OG7 successfully passed its PDR milestone, which sets out to consolidate the system's requirements and present its preliminary design, thus greenlighting the start of the detailed design and implementation phase.

EROSS OG7 is one of the 5 projects funded by the European Commission (EC)

in the second phase of the space-robotics Strategic Research Cluster (SRC), the EC's biggest H2020 robotics program.

The activity, led by Thales Alenia Space France, involves 11 partners from 8 European countries, including GMV. EROSS OG7 aims to develop a complete engineering solution for autonomous, efficient and safe performance of on-orbit satellite servicing. It also seeks to showcase European on-orbit solutions for both service providers and potential client satellites.

The project will assess and demonstrate the capability of the on-orbit servicing spacecraft (chaser) to perform rendezvous, capturing, grasping, berthing and manipulating of a collaborative client satellite (target) provisioned for servicing operations including refueling and payload transfer/replacement.

EROSS will also see to maintaining the building blocks of the call I3DS OG4: Integrated 3D Sensors.

GMV has taken on responsibility for supporting integration of two of the blocks led by the company in the previous phase, i.e., ESROCOS (OG1) and ERGO (OG2). It is also contributing to the design and implementation of the guidance function during the rendezvous and capture phases, as well as offering support for inclusion of ESA's ASSIST device as berthing and refueling interface in the final EROSS demonstration. Validation tests will be conducted on GMV's inhouse **Platform-art**® testbed.

GMV supports the 5th ERC, held in Poland

The European Rover Challenge (ERC), one of the biggest worldwide space robotics competitions, has been held since 2014. From 13 to 15 September the Kielce University of Technology (Poland) hosted the fifth competition in the series, focusing on technological development for space exploration.

The core of this event is the international ERC-Student competition. The university students vie with each other to build a rover of similar characteristics to those used for Martian exploration and pass a series of tests comparable to those they would come across in a real case. Forty teams from 15 different countries were assessed by a jury of independent experts including a GMV representative.

In this edition, the competition was accompanied by the industry and

business conference. The subjects discussed in the presentations and talks included the opportunities in Space domain for Poland companies as well as next steps in Space exploration. Paweł Wojtkiewicz, GMV Director of GMV in Poland and President of the Board of the Polish Space Industry Association (ZPSK), moderated the panel discussion on the benefits of working on international projects for space agencies, with participation by representatives from NASA, OHB, TAS Italia and Astronika.

Mariella Graziano, Director of Space Segment and Robotics of GMV's Aerospace sector, took part as speaker in the two discussion panels "Next giant leap" and "Strategic Research Cluster in space robotics PERASPERA

– opportunities and challenges", talking about GMV's experience in Martian and lunar exploration and as leading company of various robotic technology building blocks of the European Commission's Space Robotics Strategic Research Cluster (SRC).

The event was addressed to experts in planetary robotics, scientists, industry representatives, the new technology sector and the public at large. The European Space Foundation is the main organizer of this event, which forms part of an annual program serving as reference point for planetary robotics activities. With initiatives like ERC-Student, the foundation aims to encourage innovative research and a passion for STEM skills (science, technology, engineering and mathematics).

The PRO-ACT robotic project passes another milestone



■ On 8 November the H2020 PRO-ACT project successfully passed its Preliminary Design Review (PDR) on the site of the German Research Center for Artificial Intelligence (DFKI) in Bremen (Germany).

The PDR's purpose is to consolidate the software design requirements and also to green-light the design and implementation phase.

PRO-ACT is one of the 5 projects selected for European-Commission funding in the second phase of the space robotics Strategic Research Cluster (SRC), the European Commission's biggest robotics program.

Primed by Space Applications Services (SAS), with the involvement of GMV, the project's main remit is to design,

develop and validate a multi-robot and cooperative system to be used on future exploration missions (e.g. the Moon or Mars) for the establishment of a human settlement.

GMV's main role within PRO-ACT (OG 11) is to help to pinpoint the technical requirements, support identification and definition of ESROCOS (OG1) and ERGO (OG 2) results for subsequent adaptation to this project. The company will also be taking part in preliminary design and main detailed design, specifically in multi-agent cooperative mission planning.

In this context PRO-ACT's main goal is to develop and demonstrate manipulation and cooperation capabilities between three robots for assembling an in-situ resource utilization (ISRU) system.

GMV hosts the meeting to present the results of the ADE project's PDR

■ On November 12 the company's Tres Cantos (Madrid) head office hosted the presentation of the results of the preliminary design review (PDR) of the H2020, OG10-ADE project (Autonomous Decision Making in very long traverses).

This milestone event marks the end of ADE's preliminary design and modeling phase, in which ADE's common architecture features have been defined. The team also presented the scenario for the ADE demonstrator and identified the necessary equipment and testing components.

The ADE OG10 project, together with PRO-ACT, is one of the 5 projects selected for European-Commission funding in the second phase of the space robotics Strategic Research Cluster (SRC), the European Commission's biggest H2020 robotics program.

The main purpose of this second SRC phase is to integrate the common

technology building blocks previously developed in on-ground demonstrators in the first phase. This will help to drive the development of future space robotics applications for orbital and planetary use (phase 0/A studies) to meet not only the future needs of space exploration and exploitation but also potential spin-off and spill-over effects to other areas of robotics activity on Earth, such as agriculture, the automotive sector, the nuclear or underwater sector.

GMV is priming the 12-partner, Europe-wide ADE project (OG10). This project, building on the autonomy framework developed within ERGO (OG2), aims to develop and test a rover capable of obtaining opportunistic scientific data and performing long-range journeys (building up to 1 km in under 6 hours). In planetary exploration missions ADE will guarantee a quick response and optimum use of onboard resources, combining the capabilities of PERASPERA's first call building blocks:

OG1-ESROCOS (European Space Robot Control Operating System) OG2-ERGO (European Robotics Goal-Oriented Autonomous Controller), OG3-InFuse (data fusion) and OG4-I3DS (sensors).

GMV coordinated the meeting, attended by members of PSA, the consortium and the European Commission.





Kickoff of MEDMCSW, a project to improve the management of medical support capabilities in European operations

Under the project a platform will be developed, accessible to all member states, to facilitate the resource-sharing and grouping strategy for healthcare support in EU-coordinated crisis management operations



The European Defence Agency (EDA) has awarded GMV a two-year, 600,000-euro framework contract for running medical support capabilities in European operations.

A necessary condition of the use of military medical capabilities in European operations is for member states' armies to be able to integrate different healthcare modules for setting up the Special Multinational Medical Force.

The EDA's various member states "speak" different technological languages nowadays and one of the main stumbling blocks is the lack of any common platform that would enable them to act in a coordinated way.

The platform developed under this project; accessible to all member states, must facilitate the healthcare resource pooling and sharing strategy

for coordinated EU crisis management operations. This will involve setting up a catalogue of member states' medical capabilities to give a clear overview of the current situation. It will also provide additional tools to facilitate decision-making and the planning of a rapid integration of national resources. The tools will have to be modular and capable of offering logistic support to help commanders calculate needs and oversee the whole healthcare support generation process for operation in a multinational context.

The first contract, up and running since October, aims to define user-community requirements and design a modern, powerful system to improve user friendliness on the strength of state-of-the-art technology. To carry out this activity GMV is working with the external consultancy of the reserve medical general Manuel J. Guiote and holding workshops with think tanks of EDA's Project Medical Team and the European Union Military Staff (EUMS).

Future contracts will deal with system implementation. GMV will also be providing training and instruction services for system users, plus support and maintenance after system rollout.

GMV's experience in communications and information systems (CIS) for command and control stood it in good stead for taking on the definition and development of this new system.

This initiative represents further headway for GMV in setting up medical command and control systems and crisis management systems, building on its previous work in projects like EDA's Command, Control and Communication Applied to Multinational Medical Support (C3AM2S) and the DRIVER project (Driving Innovation in Crisis Management for European Resilience).

This project builds on GMV's fifteen-year-long tried-and-trusted track record as EDA supplier.

GMV's information systems support the Spanish army's first annual exercise

■ From 8 to 24 November, under the command of the Castillejos Division, the Spanish army held the latest Toro exercises, bringing together 6000 soldiers, 750 vehicles, 12 helicopters and several drones, plus a 400-soldier and 100-vehicle tactical grouping of the Italian army.

The TORO exercises, held simultaneously in several locations, represent the army's main training exercise for 2019. Services put through their paces included the intelligence capability of the SAPIIEM systems, the command and control capabilities of the TALOS system and integration of the sensors of the IRIS system, all developed by GMV for the Spanish MoD's Directorate General of Armaments (*Dirección General de Armamento: DGAM*).

GMV's support for this exercise fell under a system-deployment contract with the Headquarters of the Spanish Army's Terrestrial Force (*Cuartel General de la Fuerza Terrestre del Ejército de Tierra: FUTER*), an activity also including system-operator and -administrator training, plus in situ exercise support, both in the Castillejos Division (Madrid) and the San Gregorio Airbase (Zaragoza).

One of the main attractions of the exercise is integration of the drones provided by Intelligence Regiment 1. The drone products were then distributed by the IRIS system and displayed on the systems provided by GMV, an invaluable input to the operation of intelligence assets. A new feature this time is that Intelligence Regiment -1 deployed for the first time its drones together with other units

in the maneuver field of San Gregorio (CENAD), taking off from Garray aerodrome in Soria, 120 kilometers from San Gregorio.

Employment of the SAPIIEM systems (*Atenea, Seismo, CSD sierra*) makes **C2NEC/Talos** capable of executing the complete intelligence cycle and also coping with all Information Requirement Management & Collection Management (IRM&CM) needs, as well as sensor information processing capability, generation of intelligence and its distribution among the various participating nodes.

Use of the **Talos** information system, from the army corps to company level, has facilitated coordinated fire-support management in the maneuver and with the rest of the combat functions.



GMV participates in the EDA meeting for integration of drones in controlled airspace

On 8 November GMV took part in the third industrial encounter for integration of drones into controlled airspace, organized by the European Defence Agency (EDA) in Brussels.

After participating in all previous years, this year GMV presented

the results of the project "Standardization of Remote Pilot Stations of RPAS", an EDA project carried out by AIRBUS and GMV. Together with the results so far, this presentation also stressed the importance of a second project phase to facilitate integration into

controlled airspace of the future RPAS EuroMALE.

This participation is part and parcel of GMV's R&D activities in RPAS design and operation, an area considered to be strategically important by the company.

GMV coordinates the Iberian trial of the Maritime safety and security project MARISA

As trial coordinator GMV posted personnel to the two test sites (Madrid and Lisbon), giving the necessary operator training and end-user support to ensure the demo's success



From 30 September to 3 October the Iberian Sea Trial was held, one of the operational trials scheduled for the second phase of the Maritime Integrated Surveillance Awareness (MARISA) project.

The main aim of MARISA, which kicked off in May 2017, is the integration of Big Data with multi-sensor data-fusion; this groundbreaking technique involves the mining of data from different sources to glean useful, top-quality information, applied in this case with maritime safety and security in mind. This will be possible thanks to the development of a set of interoperable tools for easy access of the data generated by the various technological resources now up and running.

This Horizon-2020 project involves a consortium in which the Italian multinational Leonardo is leading another 21 companies from 9 EU member states. GMV is one of these partner companies, playing a standout role in the project. In particular it is responsible for system design, the development of anomaly-detecting and level-1 data-fusion algorithms, as well as carrying out the integration and operational trials.

This ambitious demo, coordinated by GMV, involved various assets of the Portuguese Navy and the Spanish Guardia Civil. It was a resounding success. The set of interoperable tools developed during the project all interacted with each other in a coordinated way. The trial also achieved the problem-free implementation of the infrastructure of the Common Information

Sharing Environment (CISE), present in both countries, guaranteeing the due exchange of information and favoring collaboration between both countries.

As trial coordinator GMV posted personnel to the two test sites (Madrid and Lisbon), giving the necessary operator training and end-user support to ensure the demo's success.

One month later, on 27 November, a new trial was held under the Ionian Sea Trial project, on this occasion with support of the Italian and Greek navies and coordinated by Leonardo and Satways Ltd. Under this new trial the set of interoperable tools developed during the project once more managed to interact in a coordinated manner, thus ensuring the exchange of information between both countries.

GMV helps to extend the capabilities of the Common Information Sharing Environment (CISE)



■ The length of the European Union's land and sea borders and the sheer diversity of terrain involved make its border surveillance a particularly complex problem.

Moreover, new threats are continually cropping up, calling for the coordination and collaboration of multidisciplinary and multinational agencies. The current practice in Europe, therefore, is to encourage the use of common information-exchange models to facilitate this task, such as the Common Information Sharing Environment (CISE).

Within this overall picture Athens hosted on 17 September the kickoff meeting of the ANDROMEDA project, in which 19 participants from 9 different countries are working together for 18 months with the main aim of boosting the takeup of the CISE data model, currently severely underused and only for maritime environments.

This EU-funded project will analyze final users' needs by extracting requirements and use cases, and the CISE model will be extended to cover all the gaps and loopholes

brought to light in the first phase of the project. A series of command and control systems will then be adapted, including GMV's Socrates system, to ensure total compatibility with the new model and maximize the use of all its capabilities.

ANDROMEDA will also be inputting data-fusion and decision-making tools that are compatible with the new model; this will favor the exchange of information with the aforementioned command and control systems.

The project scope will be demonstrated in a validation phase that will be carried out in three different scenarios: the Iberian Peninsula, Greece-Bulgaria and the Ionian-Adriatic Sea.

GMV is playing a standout role in the project, leading system architecture design, inputting the **Socrates** command and control tool and participating in one of the demo scenarios.

GMV's participation in this project further strengthens its border-surveillance business in support of the CISE initiative.

Artificial Intelligence and the Armed Forces of the Future

On 7 November, mindful of the challenges and trials posed by the digital transformation for the armed forces of the future, the Academy of Military Arts and Sciences put on the conference entitled "Artificial Intelligence and the Armed Forces of the Future".

Among a roster of top-level speakers from the military world and industry, GMV gave its take on the

digital transformation and artificial intelligence and their implications for the concept, design and running of future armed forces.

José Luis Delgado, Head of GMV's Homeland and Security section, together with representatives from Everis, Indra and Telefónica took part in the panel discussion "New technologies associated with the digital transformation, industry vision",

moderated by Doctor Félix Arteaga Martín, main researcher of the think tank called Real Instituto Elcano. The debate brought out the industry's view of information technologies and telecommunications in general and artificial intelligence in particular. After a reflection on the bases underpinning the digital transformation, the participants itemized the needs of national companies to be competitive in this field on a worldwide basis.

GMV works to enhance the interoperability of ISR systems

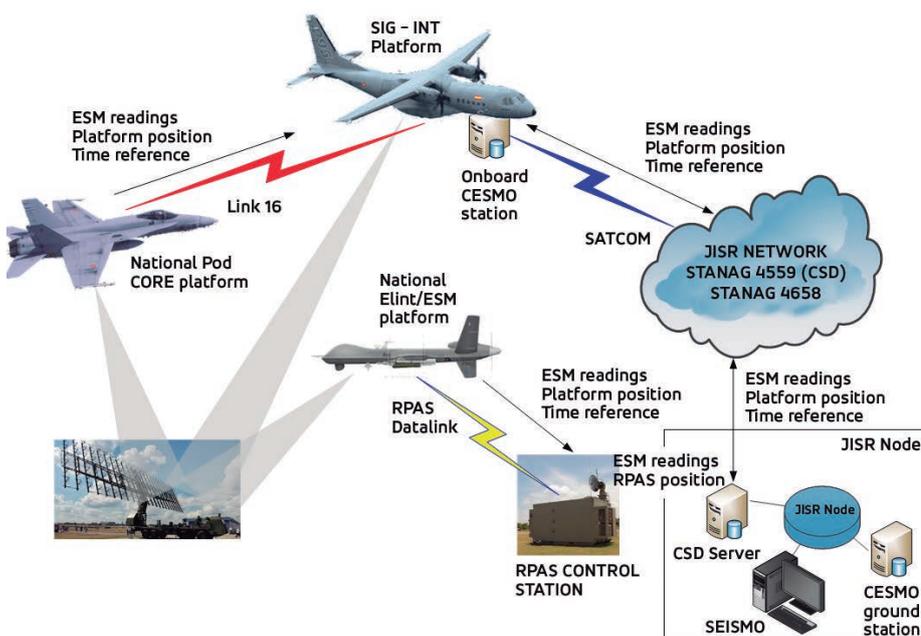
December saw the kickoff meeting of the project for development of a Core-type mountable computer interface for cooperative Electronic Support Measure (ESM) operations. The objective of this project is to supply a system for exploiting Link16 track information and information from the new electronic warfare pod of the Spanish airforce's F-18, dubbed CORE (short in Spanish for "Electronic Recognition Operational Capability"). The system will be able to operate both from land and onboard a new aerial platform for Signals Intelligence (SIGINT) mission, such as a C-295.

GMV's system will pick up ESM tracks from different sources, then performing fusion processes and generating messages for Cooperative ESM Operations (CESMO) under the interoperability standard STANAG 4658.

CESMO can pick up and geo-locate state-of-the-art aerial defense systems with LPI/LPD capabilities, the main threat to allied aircraft. LPI/LPD techniques combined with the high mobility of air defense radar forces e-warfare aerial platforms to cooperate with each other to ensure detection and geolocation of these threats.

Thanks to the use of NATO's interoperability standards like STANAG 4559, known as CSD or STANAG 4658, the MoD's systems can be integrated into multinational missions with sensors and processing nodes of allied countries.

This project adds to GMV's already impressive track record in the interoperability of intelligence, surveillance and reconnaissance (ISR) systems, where GMV is providing solutions for Spain's MoD, NATO and the defense ministries of other NATO countries.



Employment concept of GMV's CESMO mountable computer in a potential mission. The figure distinguishes between several different components: manned aircraft and unmanned aircraft fitted with ESM systems like the Spanish airforce's CORE pod, electronic warfare aircraft fitted with a mountable computer and ground systems.

GMV gives it take on the challenges and trends of C4ISR systems



On 18 and 19 September GMV took part in the conference entitled "Innovative Defence Technologies for the Virtual Battlefield", held in Kajaani, Finland and bringing together companies and regional organizations to discuss the opportunities offered by the European Defence Fund (EDF), and other programs that can support the development of defense technologies in the areas of communications, simulation and modelling, and virtual training.

GMV is now one of Europe's leading companies in the development of Intelligence, Surveillance and Reconnaissance (ISR) software; taking part in diverse programs for the Spanish MoD, NATO and the European Commission.

Drawing on GMV's experience and expertise in C4ISR (Command, Control, Communications, Computing, Intelligence, Surveillance and Reconnaissance systems), José Prieto, GMV's Manager of Defense and Security Institutional Relations and Business Development, presented a paper on the technology, challenges and trends of these systems in terms of their performance, capability and potential at European level.

The event was organized by the European Commission (EC), the regional development company Kainnunt Etu, the Association of Finnish Defence and Aerospace Industries (AFDA) and the European Association of Development Agencies (EURADA).

GMV presents its intelligence, security and defense solutions at DSEI



■ From 10 to 13 September London hosted the latest Defence and Security Equipment International (DSEI). Attracting a turnout this year of 1600 exhibitors and 35,000 visitors from all around the world, DSEI is one of Europe's most important defense and security events and a worldwide benchmark.

GMV showcased its command and control and JISR (Joint, Intelligence, Surveillance and Reconnaissance) solutions. This activity is part and parcel of Spain's participation in NATO's JISR initiative, where GMV is collaborating not only with diverse NATO organizations but also MoDs of NATO member countries from both sides of

the Atlantic, offering its inhouse Mobile ISTAR Operating system (called **Seismo** after its Spanish initials: Sistema de Explotación ISTAR Móvil), **CSD** (Coalition Shared Database), **Atenea** (IRM&CM Tool) and **Collector** (ISR sensor simulator), which pools information from many different sources in different formats to provide intelligence analysts with the necessary tools for exchanging ISR information.

The company's stand also displayed other groundbreaking defense and security solutions, such as the ISNAV system, which supplies navigation and timing data for the 8X8 DRAGON vehicle and the shot detector subsystem, the ruggedized and miniaturized LGB10/LGB11 mission computers and the results of the MARISA project (Maritime Integrated Surveillance Awareness).

In the simulation area GMV presented the WESCAM camera training simulator, developed for L3 Harris.

During the event GMV was visited by leading figures, authorities and various international delegations like EUMS, UK, Australia, Argentina, Colombia, Chile and South Korea.

The new security and defense capabilities debated by GMV

■ The European Defense Agency (EDA) spends time and money on security innovation and developing the security capabilities of its member states. Its technological research activities are carried out through a think tank called CapTechs (Capability Technology Group) involving over 4000 specialists on specific subjects from governmental organizations, industry and universities of the various member states and the EDA itself.

GMV is participating in several of these groups, especially the Information CapTech, focusing on communications, information systems and networks.

On 23 October GMV's head office hosted the 43rd Information CapTech meeting, broken down into two parallel sessions. The first, headed by the CapTech National Coordinators (CNC) in collaboration with the CapTech Governmental ExpertS (CGE), centered on an analysis on the best ways of promoting future European research projects, set to dominate the coming years. The second session, led by the CapTech non-Governmental Experts (CnGE), was made up by industry, research centers and academic institutions and focused on the projects currently underway, including ABIDE (artificial intelligence and Big Data for Decision

making in C4ISR), a project led by GMV in a consortium with the Information Processing and Telecommunications Center (IPTC) of the Universidad Politécnica de Madrid (UPM).

A day earlier GMV also hosted a workshop on this project, studying applications of Big Data and artificial intelligence to Command, Control, Communications, Computing, Intelligence, Surveillance and Reconnaissance systems (C4ISR) with the overall aim of improving their performance and boosting their capabilities. This meeting served not only to present progress to date but also to sketch out the future roadmap.

Success of the first OCEAN2020 exercise

■ OCEAN 2020, carried out under the European Union's Preparatory Action on Defense Research (PADR), is Europe's biggest maritime-surveillance technology development program. On 20 and 21 November one of OCEAN 2020's first two scheduled demos was carried out.

The OCEAN2020 consortium, coordinated by the Italian multinational LEONARDO, and working with a total of 42 partners from 15 European countries, includes a strong institutional participation from the MoDs of Spain, Italy, Portugal, Greece and Lithuania, with further support from the MoDs of Sweden, France, the UK, Estonia and the Netherlands. GMV has a twofold participation in the project, from its subsidiaries of Spain and Portugal.

GMV's particular contribution focuses on C2 (Command and Control) and JISR (Joint Intelligence, Surveillance and Reconnaissance), in keeping with the company's international track record in these areas. As part of Spain's participation in NATO's MAJIC (Multisensor Aerospace /Ground Joint ISR -Intelligence, Surveillance and Reconnaissance- Interoperability Coalition) project, GMV is responsible for the SAPIEM system (made up by several systems such as **Atenea**, **Collector**, **CSD sierra**, **Sierra tools** and **C2NEC**), which pools information from several sources in different formats, providing intelligence analysts with the necessary wherewithal for exchanging ISR information and workflows, thereby

ensuring interaction in all JISR phases. GMV's OCEAN2020 participation also includes the design and development of a Brussels-based European Centre of Maritime Operations, to be set up under the project.

Coordinated by the Italian Navy, this demonstration involved sending to the Cartagena-based Maritime Surveillance and Operations Center (*Centro de Operaciones y Vigilancia de Acción Marítima: COVAM*) information on moving targets detected by the radars of the frigate "Santa María" deployed in Italy, while also streaming a video from the Spanish drones Pelicano (UAV) and Seadrone (USV), controlled from the frigate. The information received in COVAM was then sent on to the experimental Maritime Operations Centre set up in Brussels. For this purpose a corporate network also had to be designed and set up in order to handle information from other Italian, Greek and French drones through their respective national operations centers.

From a technical point of view, tapping into COVAM's capabilities, the demonstration represented integration in the EU's maritime surveillance MARSUR network of the MoD's command and control systems, especially designed by GMV for the project.

This eight-day demonstration involved six operations centers, six ships and ten different types of drones, including UAVs, USVs and underwater vehicles.

GMV participates in the International Alfredo Kindelán Chair Seminar

As a leading military aeronautics company, GMV was invited to the 29th International Alfredo Kindelán Chair Seminar, held from 5 to 8 November in Madrid.

This airforce Chair, under the honorary presidency of King Felipe VI, was set up in 1980 as a forum to study and debate current thinking in the airborne military area.

This year's seminar, opened by the acting Minister of Defense, Margarita Robles, looked at "Air Forces and Space: a challenge of international cooperation".

The 3-day seminar included lectures, workshops and various working sessions that every year bring together recognized experts of the particular area dealt with, plus national organizations and organizations of friendly and allied countries. Jorge Potti, GMV's Aerospace General Manager and Space Vicepresident of the Spanish Association of Technological Defense, Aeronautics and Space Firms (TEDAE) gave one of the lectures on behalf of Spain's space industry. Furthermore, in recognition of his contribution to the working sessions, José Prieto, GMV's Manager of Defense and Security Institutional Relations and Business Development, received the Chair's award for outstanding performance in support of the Chair itself and the armed forces in general.

The 29th seminar was attended by 25 generals still on active service and 25 reserve generals, mustering between them a total of 120 stars from each branch of the armed forces and including representatives from Spain, Austria, Canada, Ireland, Portugal, Turkey, France, Greece, Germany, Italy, the UK and Belgium, the European Defense Agency.



Car Hacking at CyberCamp 2019



■ Today's world is continually evolving; new business models and disruptive technology are mushrooming all around us. The downside of this boon is that cyberthreats themselves are becoming increasingly sophisticated. No sector can afford to ignore this development and the automotive sector is certainly no exception to this rule. The current spate of cyberattacks and threats takes in not only connected vehicles but also all connected devices in our daily world; this makes it very hard to keep an up-to-date list of attacks and head them off beforehand.

This was the central concern of GMV's intervention in CyberCamp, held from an initiative of Spain's National Cybersecurity Institute (*Instituto Nacional de Ciberseguridad: INCIBE*), aiming to spread the cybersecurity culture wider among the country's citizens and companies.

Carlos Sahuquillo, technical leader of Cybersecurity in Onboard Systems of GMV's Secure e-Solutions sector, demonstrated some of the commonest connected-vehicle cyberattacks before explaining the workings of a device that analyzes all the packages running through any intravehicular network to pinpoint any untoward behavior and filter it out in real time.

Sahuquillo's speech ran through the whole gamut of cyberattacks on the first connected vehicles and showed how they have evolved to date. He stressed the sheer complexity of today's vehicles, containing more than 80 Electronic Control Units (ECUs), many of them representing cyberattack vulnerabilities due to the very age of the protocol.

He also presented some examples of GMV's lab simulations of vehicle

attacks, such as the CAN-BUS hack known as BUS-OFF. This bears many similarities to the better-known Denial of Service (DoS) attack. Yet another hack vector involves taking over the Parking Assistant Module (PAM) ECU to send commands and swivel the steering wheel at any moment. Then there is also the well-known GPS spoofing option for sending a misleading tracking signal and diverting an autonomous car from its intended path.

As new mobility procedures continue to make further headway, our vehicles will become increasingly connected to each other, to the roadside infrastructure and surrounding networks. To confront the threats posed by this hyper-connected world we have to bear in mind, first and foremost, all the safety risks; here is where manufacturers need to concentrate their greatest effort.

To meet these needs GMV has developed an "active CAN filter". Adapted to the vehicle network, this device keeps up a real-time inspection of all vehicle parameters, distinguishing licit vehicle traffic from any anomalous behavior. This is no easy task; over 60,000 messages per second pass through any CAN-BUS.

Cybersecurity, a top-priority investment for the logistics sector

Zaragoza University hosted the seventh meeting of the Carreras Chair of Sustainability and Logistical Innovation (*Cátedra Carreras de Sostenibilidad e Innovación Logística*). The day's speakers gave their various takes on the potential of data and the Internet of Things, the breakthroughs in artificial intelligence, GMV concentrating on its own experience of the value that cybersecurity can add to the supply chain.

In recent years the logistics industry has come in for several cyberattacks. These have not always depended wholly on technological factors

but rather human errors or capacity shortfalls.

In this scenario, interconnectivity and the sheer amount of data they handle make the supply chain particularly vulnerable. This makes it necessary to step up prevention-, detection-, reaction- and recovery-measures in order to be ready for anything an increasingly hostile environment might throw at any of the stakeholders: suppliers, manufacturers, distributors, agencies, customers, etc.

During his speech Javier Osuna, Cybersecurity Service and Consultancy

Manager of GMV's Secure e-Solutions sector, listed the actions to be taken into account, such as understanding of the environment and its threats, the earmarking of budgets in keeping with IT and R&D investments and the management of interconnected supply-chain risks to safeguard administrative and operational tasks, avoiding and mitigating any negative consequences for the company, its suppliers and customers. To confront these threats companies need first and foremost to assess and diagnose the risks, draw up a mitigation plan and build a cybersecurity-conscious culture.

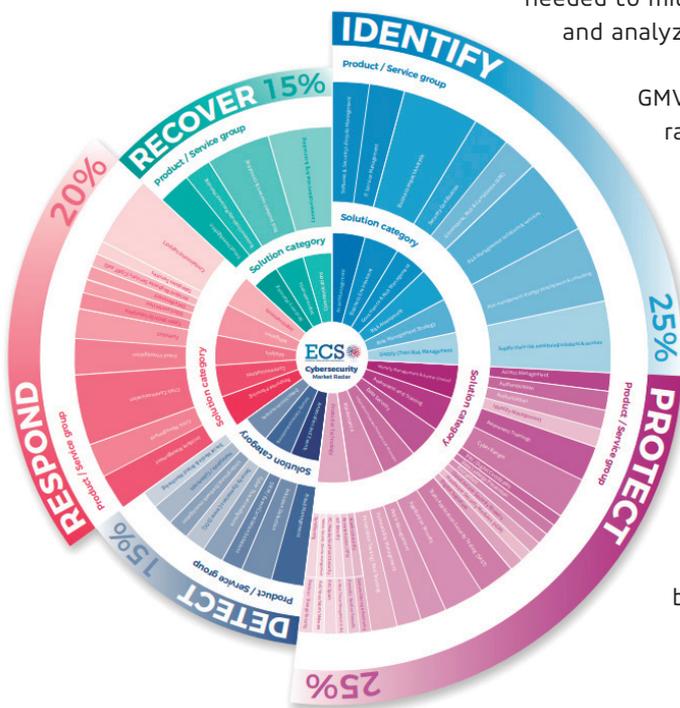
GMV on ECSO's Cybersecurity Market Radar

The European Cyber Security Organisation (ECSO) has just released the updated version of its Cybersecurity Market Radar, representing the European-based cybersecurity product vendors, service providers and consultancy firms

The Radar serves as a comprehensive visualization tool, marking a significant step towards ensuring the transparency of the European

cybersecurity market and boosting the visibility of its solutions. Each one of the 5 designated capabilities (Identify, Protect, Detect, Respond, Recover) provides a close-up view of the specific skills and resources needed to mitigate, resolve, monitor and analyze cyber-related threats.

As for protection capabilities GMV boasts the right security measures for shrinking the attack surface and guaranteeing the availability, integrity, confidentiality and performance of critical services. In this case the radar brings out GMV's experience in access management, data leaks, encryption, vulnerability management, pentesting and end-point security.



GMV features on the radar as a benchmark firm offering tools for identifying and detecting the nature and scope of cyberattacks, doing so by means of risk-management services and solutions, a security operations center (SOC), cyber threat intelligence and social media and brand monitoring.

GMV features on the radar as a benchmark firm offering tools for identifying and detecting the nature and scope of cyberattacks

GMV establishes a partnership with Checkmarx for the Portuguese market

■ GMV has recently established a partnership with Checkmarx, the global leader in software security solutions for DevOps. This partnership has the aim of supporting companies with internal DevOps teams through Checkmarx's Software Security Platform, which leverages static application security testing (SAST), interactive application security testing (IAST) and software composition analysis (SCA) solutions, as well as developer application training and awareness programs, to identify, screen and remediate vulnerabilities found

throughout the software and application development cycle.

For João Sequeira, Director of GMV Secure e-Solutions sector in Portugal, this partnership for the domestic market will reinforce GMV's offer for the Cyber Security sector based on a new service for all software development companies. Most organizations today have vulnerabilities in their software and application source code as well as infrastructure management, thus creating openings called vulnerabilities leaving them

exposed to potential cyber-attacks. "It is important for organizations to understand that when it comes to infrastructure protection and software development, prevention is crucial and can even mean considerable cost savings," adds João Sequeira.

GMV, which has a 35-year history of innovation, further strengthens its scope in the Cyber Security sector and develops new opportunities for business growth, complementing its offer with an innovative service that also promises to enhance IT credibility.



IDC Directions® promote the 22nd edition of Portugal's main IT event

GMV was once again present at the IDC Directions® conference that took place on October 17 at the Estoril Congress

Center. The 22nd edition of this key industry annual event focused on success in the scaled-up digital economy and attracted an all-time high turnout of 1600.

IDC predicts that by 2020 30 % of the world's two thousand largest companies will be spending 10 % of their total revenue on their digital transformation initiatives.



Digital Transformation (DX) means applying new technologies to radically change processes, customer experience, and value. DX allows organizations to become a Digital Native Enterprise that supports innovation and digital disruption rather than enhancing existing technologies and models.

GMV focuses its IDC Directions attendance on Cybersecurity, presenting the different solutions the company has to offer to the hundreds of people that visited GMV's stand. To promote its Cyber offer, the company also held a draw for a free diagnosis of companies' system vulnerabilities.

First study of industrial cybersecurity incidents in Spain's essential services

■ Spain's Industrial Cybersecurity Center (*Centro de Ciberseguridad Industrial: CCI*) is continually striving to hone the skills of all industrial cybersecurity professionals, doing so by means of publications, training, credentials, standard-based guides and conferences. CCI has recently published a study showing the degree of cybersecurity preparation of organizations running essential services and their ability to respond to any cybersecurity incidents. Javier Zubieta, Marketing and Communications Manager of GMV's Secure e-Solutions sector, has participated in CCI's study.

The provision of essential services in Spain depends increasingly on big-data processing, growing automation of internal production services and economic management.

This in turn entails a higher exposure to the inherent risks of running an open, worldwide system like internet, a vector that can equally be employed for spreading virus infections and malware that might then interfere with the provision of essential services, spring leaks of personal data, jeopardize commercially valuable confidential information and upset the workings of said internal market.

CCI's document stresses that nearly 75 % of interview respondents believe the vulnerability level of their essential services' OT infrastructure to be high.

As for attack consequences, nearly 30 % reported the loss of an essential service to be one of the main cyber-incidents they have to deal with. This is due mainly to the fact that essential-service-operating industrial technologies do not take cybersecurity requirements into

account properly. The document also shows which structure is adopted by essential service operators in the management of OT cybersecurity and what they expect of the future in terms of cybersecurity applied to physical infrastructure.

Javier Zubieta argues that significant progress has been detected in incorporating cybersecurity requirements into new industrial facilities. The facility owner, the engineer and manufacturer are now all assimilating good design-up cybersecurity practices. Conversely, in industrial facilities that have now clocked up some years of useful life, recovering from any cyber-incident is still painstaking and time-consuming.



GMV features in the National Cybersecurity Congress, 13ENISE

On 22 and 23 October, under the banner theme "Cybersecurity in connected industry: from threat to opportunity", the city of Leon attracted a 25,000+ turnout to the 13th International Information-Security Meeting (*Encuentro Internacional de Seguridad de la Información: ENISE*), an event organized by Spain's National Institute of Communication Technologies (*Instituto Nacional de Ciberseguridad de España: INCIBE*), an organization dependent on the Ministry of Economics and Enterprise.

For yet another year GMV has participated in and supported ENISE. Javier Zubieta, Marketing and Communications Manager of GMV's Secure e-Solutions sector, sat as a member of the Evaluation Committee of the International Acceleration Program, Cybersecurity Ventures, and also took part in the incubation program, Ciberemprende, an INCIBE initiative that seeks to attract and promote groundbreaking cybersecurity talent.

For his part, José María Legido, Manager of GMV's International Secure e-Solutions sector, represented the company in the International Business Forum, a chance for international purchasers to check out GMV's range of cybersecurity products and services.

After the success of last year's Connected-Vehicle Workshop, INCIBE decided to rerun it, with the participation of Carlos Sahuquillo, GMV's Technical Leader of Cybersecurity in Onboard Systems. His speech set out the company's cybersecurity challenges, opportunities and success stories in the automotive area.

Secure digital identity in the intelligent connected society



On 29 and 30 October Madrid hosted identiSIC, an annual event put on by the specialist cybersecurity trade review, SIC.

This year's two-day conference dealt with the challenge of secure digital identity in the intelligent connected society, zooming in on issues such as the role of identity in the new banking operations, Identity of Things (IDoT) management, SSI and decentralized digital identity, the new approaches to modernization of business IaM/CiaM systems, strengthening of the management of security risks in privileged access and the proposal of alternative state-of-the-art technology in support of IaM/ CiaM and their sub-processes.

Javier Hidalgo, Industry Solutions Architect of GMV's Secure e-Solutions sector, gave a paper on Identity of Things (IDoT) management, IDoT being understood as an ecosystem for managing relations between IoT devices, persons, services and applications. This system is also based on definition of the identity of each one of these elements and provides a technology platform for lifecycle-long management of these relations.

The automotive sector and cybersecurity: the perfect match to take on the present and future

■ Miguel Hormigo, Industry Manager of GMV's Secure e-Solutions sector, has taken part in the IoT Solutions World Congress (IoTSWC), organized in Spain by plataforma enerTIC. Its remit is to debate the automotive sector's problems, needs and solutions with the overall aim of driving Industry 4.0. In this scenario digitalization helps to streamline processes, supporting the procurement phase, getting to know customers better and giving them personalized services to meet their particular needs while also ensuring that production remains profitable, dynamic and flexible.

The current boom of smart factories and the advent of connected vehicles mean that technological integration and innovation have changed from an option into a sine qua non of survival. After some tricky years for carmakers, worldwide production is now expected

to grow 30 % by 2030, building up to a total output of 123 million vehicles, mainly as a result of the takeup of autonomous vehicles.

This modernization depends on some salient factors like the convergence between carmakers and technology firms plus academic cooperation with research centers and universities. We at GMV provide technological support for the automotive sector, involving all the following: automation solutions, such as advanced robotics or highly precise and safe GNSS solutions for autonomous driving; digitalization solutions for carrying out such aspects as predictive maintenance and process simulation; and, last but by no means least, design-up cybersecurity with the Smart Secure Key, taking in all aspects along the way right up to intrusion-detection and -prevention systems.



Cloud Security Alliance Congress 2019

■ For a decade now the Cloud Security Alliance (CSA) has been bringing together the top cloud computing professionals to define and raise awareness about the best cloud computing security and privacy practices, focusing in particular on cloud compliance.

In late November Berlin hosted the three-day CSA EMEA Congress, a mix of training courses, educational sessions and networking

opportunities for cloud-security professionals.

Mariano J. Benito, CISO of GMV's Secure e-Solutions sector and Coordinator of the Operational Technical Committee of the Spanish Chapter of CSA, gave a paper on "Secure Cloud Adoption by Spanish Organizations", in which he unveiled the most important aspects of the 7th State-of-the-Art Cloud Security Study, an initiative of ISMS Forum and CSA Spain.

The advantages and risks of the public cloud

A migration to the cloud brings many advantages in its wake. One is the possibility of cutting the service deployment time from months to hours. In any traditional system the time needed to increase any infrastructure's capacity are lengthening, mainly due to the various budget-approval and hardware-procurement procedures. In the cloud, on the contrary, this time can be cut to hours, with the additional advantage of a modest monthly usage rate instead of the heavy initial outlay of a traditional system.

Another advantage strikes the eye in current deployments of large public clouds like Amazon Web Services (AWS), namely the much higher availability than a traditional datacenter, rising from about 99.5 % in traditional infrastructure to 99.9 % in the public cloud.

Another point in favor of the cloud is its scalability. Any increase or decrease in the service load can be quickly and automatically catered for by up- or down-scaling, as in Xmas campaigns or sales periods: resources are adapted to needs and payment is made only for the strictly necessary.

The cloud provider can also provide managed services, which might spare the organization from routine tasks like monitoring, fault-detection and -repair, updates or backups and restorations; this may even go much further, as in a database management service.

But there are also some drawbacks to the cloud. It is sometimes thought that the cloud is securer, forgetting that the cloud in fact calls for more security measures than a traditional datacenter, since the infrastructure is shared with other clients.

One of the FAQs is How can we be sure the cloud administrator doesn't pry into a client's infrastructure without consent? We have seen real public cloud deployments (the design phase, where mistakes are usually made) where access has been mistakenly lost to the deployed infrastructure and the firewall protecting it. After opening a support case with the provider, technicians were able to solve the problem, accessing the firewall through a back door and wiping out the logs to eliminate evidence.

This is a telling example of what administrators are capable of. Bearing in mind that an appreciable number of security incidents stem from disaffected employees, how can we be sure that a disgruntled employee won't access and steal critical data of an organization in the cloud? Here is where measures like data encryption might come into their own or the blocking of suspicious actions.

Another cause of cloud security breaches is wrong configuration. AWS, for example, sometimes unwittingly shares S3 buckets with confidential data. This doesn't necessarily mean the cloud isn't safe, merely that we have to be more careful about



Raquel Paz Casteleiro
Section Head Cloud & Cloud Security
GMV's Secure e-Solutions sector

“If we weigh up the clouds pros and cons, the pros come out winning, but to mitigate security risks the security measures need to be better than in a traditional datacenter”

implementing the best configuration and security practices.

If we weigh up the clouds pros and cons, the pros come out winning, but to mitigate security risks the security measures need to be better than in a traditional datacenter.

Availability, integrity and identity as the main challenges for protecting Smart Cities

On 24 September the publisher Borrmarkt put on the Open Smart Security Day to talk about the working of intelligent and groundbreaking solutions and technologies for smart cities and for business management, placing special stress on the security layer and solvency that these new technologies provide.

We at GMV have always focused on the need of forestalling cyberattacks by integrated vulnerability management and prevention plans. Many of the threats faced by smart cities, after all, stem from the overlooking of this aspect in the initial phases.

Smart City initiatives all too often overlook the cybersecurity aspect, eclipsed by functionality and interoperability. The truth is that cities' attack surface is extensive and completely exposed to a real and immediate peril.

"The main threats involve availability, integrity and identity of these cities' component devices" argued Javier Zubieta, Marketing and Communications Manager of GMV's Secure e-Solutions sector during his intervention in the Smart Security Cities discussion panel. In this scenario it is vital to take cybersecurity and privacy into account from the Smart City design stage onwards and then incorporate these two factors as a strategic pillar into all services and systems across the board.

Channel Partner hails GMV's security work in critical aerospace environments

■ GMV has recently won one of the prizes with which Channel Partner, the specialist in information for technology distributors, distinguishes the best-performing partners of the previous year in various categories.

The prize was handed over by the technology partners Ireo and Sophos, recognizing the company's work in security in critical aerospace environments. In particular the prize-giving ceremony proclaimed GMV's role as leader of Galileo's Ground Control

Segment (GCS), featuring an important set of cybersecurity services. These services include security engineering, secure development, vulnerability management, accreditation and implementation of an auditing program, among other features.

The prize, picked up by Nathalie Dahan García, GMV's Business Development & Partner Manager, was given out by Soledad Manzanares Castro, Channel Account Manager at Sophos, and Belén Amer, Channel Account Manager at IREO.



EL/WLA Security and Integrity Seminar

■ On 10 October European Lotteries (EL) and the World Lottery Association (WLA) put on a seminar in Ljubljana (Slovenia) to address the current cybersecurity challenges and issues, including data use, privacy, governance, machine learning and threat intelligence. All of these were analyzed by sector experts.

Mariano J. Benito, CISO of GMV's Secure e-Solutions sector and Coordinator of the Operational Technical Committee of the Spanish Chapter of CSA, was invited to present CSA's view of cloud trustworthiness and security.

SecDevOps: the maturity of DevOps

Software is Eating the World". This attention-grabbing phrase was the central theme of an article by Marc Andreessen in the Wall Street Journal back in 2011. Its argument still rings true today: most of the world's most powerful firms bear some relationship to software. Not only that, but many traditional firms are rethinking their business to bring it more into line with a software firm (the banking sector, to go no further). The process that has been dubbed the digital transformation is driven by many factors such as the ubiquity of internet, but another fundamental factor is that many procedures that traditionally involved physical components can now be done virtually at a fraction of the cost.

One of the obstacles to this transformation is that real-world operations use standardized and tried-and-tested parts (whether a nut and bolt, an engine or an aircraft's rudder). In the software world, on the contrary, these parts are intangible and the process of bringing them on stream has always been closely bound up with the developers.

This separation between developers and operators is what the DevOps philosophy is meant to solve: to narrow the gap between these two worlds by means of a series of tools and practices that make it easier for developers to deploy their own products and operators to run them and maintain them in the least disruptive way possible. The goal is always to cut times and bring in

new functions more adroitly; "Agile" is precisely another of the methodologies pivoting around DevOps.

Just like development and operations, security has always worked its own patch, separated off from the former two: connecting a new system to the network behind a corporate firewall involves for many firms a nightmare more bureaucratic than technical. It is no longer viable to maintain this way of working if we want to have a continuous flow of deliveries as proposed by DevOps; but the aspect most overlooked by this approach is cybersecurity. The classic slogan of the developers of Facebook "move fast and break things" is an invitation to tag on new functions with the assurance that any faults will soon be corrected. The trouble is that cybercrime also moves fast and can ferret its way into these gaps as soon as they are detected.

It therefore becomes necessary to bring the same DevOps philosophy to security and move towards SecDevOps; a working philosophy that aims not for a production chain with start, end and strict borders between teams but rather an iterative process in which each team complements the functions of the other. The inclusion of cybersecurity, which thereby turns DevOps into SecDevOps, can hence be used as a gauge of these processes' maturity. Indeed, to make sure our DevOps scheme does not leave out of account risk- and vulnerability-management we need to ensure all the following: Phase the best security practices into the DevOps cycle from the design phase (Secure by Design);



José Pedro Mayo Mendo Section Head Consultancy, Architecture and Systems Design GMV's Secure e-Solutions sector

«It therefore becomes necessary to bring the same DevOps philosophy to security and move towards SecDevOps; a working philosophy that aims not for a production chain with start, end and strict borders between teams but rather an iterative process in which each team complements the functions of the other»

incorporate security-automating tools into operations; bear in mind, in short, that security is a process whose lifecycle can (and must) be managed in an integrated way with development and operations.

GMV's contribution to diversity: #mujeresciber



■ Women's take-up of technical and technological careers remains very low, accounting for only 25 % in the ICT sector. In the particular case of cybersecurity the worldwide mean stands even lower at 11 %, according to the Global Information Security Workforce: Women in Cybersecurity.

This situation calls for specific, groundbreaking measures to bring the

staff make-up back into balance. GMV is now promoting various initiatives designed to encourage women's take-up of technology careers and achieve all the following: get more women to come forward and widen the trawl for finding them; promote the company as a guarantor of equality between men and women; sign agreements with universities and training centers to increase

women's take-up of jobs where they are currently underrepresented. Although the cybersecurity gender gap reflects a worldwide problem, the short-term aim is to achieve a female representation rate of at least 20 %.

GMV is getting behind such initiatives. In particular it is supporting #mujeresciber, an event organized by Spain's National Cybersecurity Institute (*Instituto Nacional de Ciberseguridad: INCIBE*) to bring budding female talent into the cybersecurity industry.

Patricia Tejado, Manager of GMV's Digital Public Services sector, has taken part in the 3rd "#mujeresciber, held in León from 5 to 6 November.

GMV joins forces with Andalusia's cybersecurity strategy

■ GMV, as a benchmark cybersecurity firm, has taken part in the 2nd SEDIAN Day, a cybersecurity congress organized by Andalusia's Regional Ministry of Economics, Knowledge, Entrepreneurship and Universities (*Consejería de Economía, Conocimiento, Empresas y Universidad de la Junta de Andalucía*) and held in Seville on 25 September.

Cybersecurity is today a top priority for the Regional Authority of Andalusia (Junta de Andalucía), as pointed out in the congress by Rogelio Velasco, Andalusia's Regional Minister of Economics, Knowledge, Entrepreneurship and Universities. Small wonder: Andalusia is the Spanish region hardest hit by cyberattacks, with 8110 incidents reported in 2018 and 5800 so far in 2019, according to Loreto del Valle, General Manager of Digital Security of Andalusia (*Seguridad Digital de Andalucía: SEDIAN*).

GMV has swung firmly behind the Junta's bid to bring its cybersecurity

strategy into the limelight. The company helped to draw up the agenda and also ran a stand in the exhibition area to showcase its cybersecurity prowess and expertise, built up over two decades as it works to protect its customers and, ipso facto, the public at large.

Keynote speakers included Javier Zubieta, Marketing and Communications Manager of GMV's Secure e-Solutions sector, who advocated the role of innovation, entrepreneurship, talent and

cybersecurity as drivers of the digital economy.

Javier's SEDIAN-Day speech stressed the cybersecurity sector's huge career potential, ranging from executive jobs like CISO or CSO to data analysts, researchers and criminologists. Zubieta also spoke about the importance of soft skills, i.e. those skills that, without being specifically technical, are also highly coveted today as prerequisites of success. Examples might be empathy, communication skills and teamwork.



GMV neurosurgery technology: surgical navigation precision

GMV is leading a project that sets out to achieve greater precision in brain, breast and maxillofacial surgery, developing surgical simulation algorithms, looking into enhanced positioning systems and exploring the use of intraoperative imaging

Precision in assembling any apparatus is crucial if it is to work properly afterwards. Occasionally, we may have a second chance if the first attempt failed. This is not so in surgery, however, and even less in the case of neurosurgery, where initial accuracy is vital, and tiny, millimetric errors might turn out to be fatal. For that very reason, if there are any specialists who hold healthcare technology in particularly high esteem, these are neurosurgeons.

The takeup of digital technology like computerized tomography (CT) or magnetic resonance imaging (MRI) helps to give a 3D image of the patient's anatomy by means of a computerized procedure. Surgical success has soared on the strength of such developments as the surgical microscope, available in the operating-theater; precision integration of pre-surgery diagnostic images with those observed by the neurosurgeon during the operation itself, thanks to neuro-navigators.

Technological advances such as infrared detection and emission hardware and software, detection of electromagnetic emission and integration of pre- or intra-operative images now allow clinicians to study, plan and simulate surgery as well as locating anatomical structures beforehand. In the words of Carlos Illana, **Radiance** product manager, "neuro-navigators work with GPS to tell the surgeon where to act

at each moment, feeding in more intraoperative anatomical references in real time, enhancing both the precision and safety of brain and spinal surgery".

The neurosurgeon of the Hospital La Paz in Madrid, Dr. Marisa Gandía, explains that in the case of brain tumor resection "neuronavigators have boosted patients' survival rates by allowing us to remove more difficult tumors and completely resect them. We surgeons can now work more quickly and safely, with much less bleeding".

New technological challenges include reduction of current error rates and provision of real-time images to find out how the brain is behaving at each moment of the surgery to respond accordingly. In the words of Gandía "these are systems with a certain millimeter-scale error rate; as such they cannot be used in high-precision surgery such as deep brain stimulation

or image-guided biopsy in some deep-lying tumors". He adds "we also have to factor in that any patient's anatomy is still dynamic even under an anesthetic (pumping veins, blood pressure, liquid-holding tissues, etc.)"

All these challenges are now being tackled by the NAVIPHY project, currently being worked on by Research Institute of La Paz University Hospital (Instituto de Investigación del Hospital Universitario La Paz: IdiPAZ). This GMV-led project, also involving the Virtual Reality and Modelling Group (*Grupo de Modelado y Realidad Virtual: GMRV*) of the Universidad Rey Juan Carlos and the Canary Island Healthcare Research Foundation (*Fundación Canaria de Investigación Sanitaria: FUNCANIS*), aims to improve precision in brain, maxillofacial and breast surgery by developing surgery-simulating algorithms, researching into improved positioning systems and exploring the use of intraoperative.



Carlos Illana, **Radiance** product manager



Dra. Marisa Gandía, neurosurgeon of the Hospital La Paz in Madrid

M²OLIE: Advanced Cancer Therapy



■ GMV forms part of the German Research Campus called Mannheim Molecular Intervention Environment (M²OLIE), which aims to set up an innovative cancer-therapy infrastructure to turn cancer into a chronic disease with time-optimized treatment paths. To that end it is working on the development of new molecular imaging-, diagnosis- and therapeutic-

techniques in a digitalization and automation context. The project works with oligometastasized patients, i.e., those whose primary tumor has migrated into different metastasis while the cancer remains treatable and controllable.

To treat such patients M²OLIE has set up a multidisciplinary center involving

managers, researchers, clinicians and technology specialists from the business world, such as GMV, plus representatives from the public sector and universities.

To guarantee treatment efficiency, a closed-loop process has been designed, within which, acting in a coordinated and simultaneous fashion, the entire treatment process (admission, biopsies, diagnosis, treatment, release) takes place on only one work day.

Furthermore, joint work in the research campus within a tight network involving medical research, natural sciences, engineering, information science and business administration ensures the overall success of the M²OLIE project.

GMV brings to M²OLIE its expertise in image-guided surgery. In particular, the planning software and navigation system for the work package M2INT, with robotized biopsy extraction applications, treatment of low-dose-rate brachytherapy and intraoperative radiotherapy (IORT) with low-energy photons.

GMV presents the Harmony platform at the BioData World Congress

GMV has presented the Big Data Harmony platform at the BioData World Congress, held on 4 and 5 December.

This is Europe's leading congress for big data & AI in life science and healthcare, bringing together the pharmaceutical industry and biotechnology and data-analysis firms.

4500 of the 100,000 data items of treatment-awaiting patients suffering from hematological malignancies from Germany, Spain, France, England and Italy.



The Harmony Alliance is an unprecedented Big-Data-driven initiative in the fight against blood cancers. Its partners include 51 key organizations from all the following fields: clinical, academic, patients, healthcare technology assessment, legislation, economic, ethical and pharmaceutical.

GMV is the alliance's only technology firm. Under the Harmony umbrella the company is responsible for designing its Big Data platform, which now records

Rubén Villoria, Head of Healthcare Privacy, Security and Evidence Solutions of GMV's Secure e-Solutions sector, shared billing with representatives from the pharmaceutical industry, from the Broad Institute, NASA, Google, Cancer Research UK, German Cancer Research Center (DKFZ), the Bill and Melinda Gates Foundation, the Curie Institute, the American Heart Association, the British Heart Foundation, the Farr Institute, INSERM, the Swiss Cancer Institute, Mayo Clinic, etc.

Antari breaks down barriers in the Peruvian Amazon by providing specialized medicine

GMV brings its **Antari** telemedicine system to Fundación EHAS's NAPO project, which aims to provide Peru's most scattered, far-flung inhabitants with specialist healthcare services



The irruption of internet in advanced societies has shaken up traditional models and completely redrawn the picture, leaving no one indifferent and almost nothing untouched. Depending on the type of opportunities it offers in each particular sector, however, its advent might have very diverse effects.

Healthcare, in particular, is offering the most fortunate citizens advantages such as the possibility of online medical appointments, checking their electronic medical record or obtaining diagnoses from various specialists from any part of the world. The less favored, those living in far-flung, poorly communicated places with fewer resources, can now for the first time ever, thanks to internet, see the faces and hear the voices of their loved ones thousands of miles away or obtain a medical diagnosis by telemedicine without having to make long journeys.

In rural zones of the Amazon, in particular, a foundation called Fundación EHAS has

been working for some years now with cutting-edge ICT to improve healthcare here as well as in developing countries in general. To this project GMV is now collaborating with its telemedicine platform, **Antari**.

To quote Ignacio Prieto, Director General of Fundación EHAS, "since 2016 our NAPO project has managed to bring a broadband mobile service to 3000 people from six isolated communities of the Peruvian Amazon jungle as well as bringing internet connectivity and telemedicine services to 13 rural health centers".

A virgin, off-the-beaten-track environment

The pristine isolation of the Department of Loreto (Peru), lying in the catchment area of the River Napo, an Amazon tributary, has protected its nature but also makes life difficult for a far-flung, scattered population. Getting to one of the nearest hospitals in Iquitos, for example, might take up to six hours by boat while Lima lies eight hours away. By

that time any illness that local medicine has not been able to cure might be irremediable.

In answer to this problem, *Fundación EHAS* is working on the NAPO project, which taps into GMV's inhouse telemedicine systems and, with the help of the Healthcare Network of Napo (dependent on the Regional Healthcare Directorate of Loreto and the Peruvian Health Ministry) gives over 21,000 people access to top-quality, specialist healthcare services.

The project is also supported by the Development Bank of Latin America (*Corporacion Andina de Fomento*: CAF) as the main financier, plus the Universidad Politécnica de Madrid; the Regional Authority of Madrid (2017 call) and the Spanish Agency for International Development Cooperation (*Agencia Española de Cooperación Internacional para el Desarrollo*: AECID) since 2019 (Development Innovation Actions 2018).

GMV provides Grupo Avanza with eco-driving systems

Avanza turns to GMV for setting up the eco-driving system for the fleet of Madrid's Regional Transport Consortium (*Consortio Regional de Transportes*)

Grupo Avanza once more turns to GMV for answers, awarding it an ECOdriving driving contract for its 540-vehicle fleet. The project is born from the growing need of governments, companies, NGOs and private institutions all around the world

for CO² and NO² emission reduction solutions, limiting climate-change damage to persons and the planet. The project also seeks the consequent fuel saving and knock-on economic benefits, while giving passengers a more comfortable, pleasant and safer driving experience.

Within this overall endeavor ITS systems also enable driver behavior to be continually monitored, obtaining key performance-measurement indicators. Data is obtained by connecting up the vehicles' data bus (Can bus) with certain sensors of the onboard equipment. GMV's implementation of eco-driving



systems dates back to Grupo Avanza's Portillo fleet.

This involved application of a GMV -enhanced training- and monitoring model. The excellent results prompted Avanza to expand the model to other fleets, i.e., those providing a service to the Regional Transport Consortium of Madrid. The company's ITS systems have already been widely taken up by the whole set of consortium operators; in fact the group boasts the biggest number of vehicles and systems contracted within the consortium: advanced fleet-management system; passenger information system, both onboard buses and at bus-stops and an

onboard video-surveillance (CCTV) system, with an electronic fare-collection system then being phased in during a second phase in 2014.

The scenario is a complicated multi-vendor system. Both companies therefore set themselves the goal of implementing the eco-driving system by July 2020, by which time the system has to be fully up-and-running and providing the first results.

This project not only helps to forge an even closer working relationship with Grupo Avanza but also sets the trend for future large-fleet, cost-saving projects.

GMV in the new edition of TRAKO



From 24 to 27 September Gdańsk tradefair site in Poland hosted TRAKO 2019. Held this year for the 13th time, TRAKO is the biggest industrial railway fair of Eastern and Central Europe, showcasing the very latest train- and tram-technology

GMV exhibited its portfolio of inhouse sector solutions, highlighting its ticketing solutions, integrated fare and passenger-information systems and also demonstrating the capabilities of its **GMV Planner** for a more efficient scheduling of any railway service.

GMV's new family of inhouse Intelligent Transportation Systems products will soon be unveiled. As a foretaste of this upcoming generation, GMV showcased at the fair the contactless validator **TV10**, an EMV-enabled fare payment system that is already up and running as a pilot scheme on the fleet of SURBUS Almería.

This must-attend event, backed by Poland's Infrastructure Ministry, attracted a varied turnout of managers and operators, technology vendors, manufacturers, experts, distributors, engineers, researchers, local authorities like the Commercial Chamber of Land Transport (IGTL) and organizations like the Association of Polish Electrical Engineers (SEP).



Pedro Duque visits GMV's site in Boecillo Technology Park



■ On 25 September last, Spain's acting Minister of Science and Innovation Pedro Duque, visited the company's office in Boecillo Technology Park (*Parque Tecnológico de Boecillo*) in Valladolid.

After a few words of welcome from GMV's CEO, Jesús Serrano, the visit proper began with an introduction by Miguel Ángel Martínez, GMV's General

Manager of Intelligent Transportation Systems, of some of GMV's main areas and projects run from its Valladolid office. The minister was given detailed explanations of the company's various inhouse solutions in this field.

During this guided tour the minister saw with his own eyes the company's ongoing progress in electronic fare

collection systems, such as the ticket and farecard validation arrangements within the onboard video-surveillance projects for the metros of Barcelona and Seville. He was also shown the new onboard **TV10** validator for payment with contactless EMV bank cards. This new validator is now up and running in an urban bus-fleet pilot scheme of Almeria and will soon be phased into the urban buses of Pamplona and all busses and turnstiles of the transport network of the Balearic Islands transport consortium.

The minister was then given explanations of the validation system of the project carried out in Sydney's light rail network in Australia for ALSTOM, in which GMV is supplying the advanced fleet-management system and passenger-information system, which bring in significant breakthroughs such as automation of some functions that drivers had up to now carried out manually and the incorporation of advanced, specific regulation functions for trams and light rail vehicles.

Agreement to digitalize fare payments of Valladolid's public transport

■ Valladolid City Council (*Ayuntamiento de Valladolid*) has signed an agreement with Santander España Merchant Services (SEMS), the electronic-payment-managing subsidiary of *Banco Santander*, and with GMV to set up a fare-digitalizing pilot scheme for two of Valladolid's main bus lines.

Under this pilot scheme the company called *Autobuses Urbanos de Valladolid S.A.* (AUVASA for short) and Valladolid City Council will set up a one-year cashless and contactless fare-payment system on lines 1 and 2 to see how this technology works on Valladolid's bus network. Passengers boarding the buses will be able to pay a single-journey fare by passing their bankcard through a second validator to be fitted on the

buses running on these lines. This new validator will be identified with logos of the enabled fare-payment cards. The scheme will collect information on how the system works before it is extended over the whole network.

SEMS will be responsible for providing the single-fare payment network and also for processing these transactions by means of Redsys's security-guaranteeing fare-payment gateway called "Transys".

GMV will be supplying 21 next-generation card readers to work alongside the existing ticket-processing units. The pilot scheme will be conducted on AUVASA's bus lines 1 and 2, made available for this trial, while

AUVASA will also be providing technical support for commissioning, fitting and running the scheme.

In the future this scheme, in combination with Valladolid's Municipal Services Card (*Tarjeta de Servicios Municipales*), will enable combined fare payments and post payments. Passengers will thus be able to benefit from combined fares between the city's various services, paying with their citizen card, bankcard or handheld, the system at the end of the day calculating and applying the most favorable fare in each case.

This groundbreaking system has already been set up in cities like London, Paris or, more recently, in Madrid.

GMV supplies Tel Aviv's tramline with a shift scheduling and management system

Citadis asks GMV to supply a shift scheduling system based on its inhouse **GMV Planner** for the personnel of the Red Line of Tel Aviv's new tramline

The railway company Alstom Israel (Citadis) has asked GMV to supply a shift scheduling and management system (called SHM by Alstom) for the personnel of the Red Line of Tel Aviv's new tramline. GMV will be supplying its inhouse shift-scheduling and rostering product **GMV Planner**. This system will ensure driving personnel is assigned in the best possible way, meeting current collective bargaining agreements and other operational constraints.

This new project results from the award to Alstom of a contract for the supply of several tramline components (the rolling stock itself plus several systems). The red line is the first line to be set up in Tel Aviv's tramline project, scheduled to open in 2020. It runs through 20 kilometers of Tel Aviv's metropolitan area with both underground and overground stations, enhancing mobility within the city itself and its whole metropolitan area.

The shift management system will interact with several external systems. One of its interfaces will obtain the daily timetabling data to be covered with the necessary drivers and vehicles.

Another of these interfaces will keep track of available personnel, bearing in mind various shift-allocation constraints, also factoring in the number of available vehicles to assign them accordingly. All this data will be tapped into for the rostering system.

The output of this whole process will be the best possible shift allocations, not only for trams and drivers but also the rest of the shift-working personnel. Automatic SMS notifications will be sent to drivers telling them their corresponding allocations for each day.

GMV's system will also include a web application enabling personnel to communicate with the shift-allocation system from handhelds like tablets or smartphones, with the added possibility of feeding back their own shift preferences.

GMV Planner is a GMV portfolio product developed by its Polish partner DPK. This powerful tool takes in the complete planning cycle, from strategic to tactical planning, coming up with the best possible rostering solution. It also includes day-to-day management, offering as it does the best alternatives to deal with any unforeseen event that might crop up during any working day. Last but not least, **GMV Planner** also performs payroll calculations, taking into account shifts carried out and any overtime, drawing on a whole set of on personnel-, vehicle- and incident-reports, among other features.



Talgo turns to GMV the setting up two onboard systems of the “Tren Hotel” vehicles

■ Talgo has awarded GMV a contract for development and supply of the PA/ Intercom and Vehicle Human Machine Interface (VHMI) to be fitted on its trains within the reform project of the “Tren Hotel” (Hotel Train) of Spain’s national railway operator RENFE. Under this project TALGO will be fitting these systems to a total of 13 trains to be transformed into high-speed trains for RENFE.

The first of these systems supplied by GMV for these trains is the PA and Intercom service, very similar to the one previously supplied to Talgo in other projects, such as the high-speed project for Saudi Arabia (Haramain Mecca-Medina high-speed railway) or RENFE’s 30 new high-speed (AVE) trains. This system maintains its predominantly digital architecture with analog redundancy by means of a UIC communications bus.

The PA incorporates all the components of a complete system: public-address systems to be fitted with individual loudspeakers in each car; the voice-input points enabling the crew to make passenger announcements plus an intercom between onboard personnel and the emergency intercoms allowing passengers to report any serious incident to the train crew.

The groundbreaking PA feature in this project is the new emergency intercom solution, which is different from the system previously supplied by GMV in other Talgo projects. The new intercom has a mechanical design, allowing it to be integrated in the existing mechanisms of the Tren Hotel cars. This means that the current intercom can be upgraded without any significant modifications.

The system will operate in several languages; furthermore, diverse built-in redundancies ensure proper operation in critical situations.

For the Vehicle Human Machine Interface (VHMI) system Talgo has also renewed its trust in technology supplied by GMV beforehand. The model to be used is similar to that used on previous Talgo projects. This consists of a diagnosis display system based on an alphanumeric terminal with graphic capabilities, fitted on each car so that onboard personnel can keep track of the unit’s main parameters. This system interacts with the Train Control and Monitoring System (TCMS), which indicates the information to be displayed and enables certain basic commands to be sent.



GMV installs 1000 digital panels on Houston's public-transport system



■ GMV's Los Angeles ITS company SYNCROMATICS has been awarded the largest project in the company's history to deploy over 1,000 digital signs at transit stations throughout Houston, Texas. These signs will improve the rider experience by providing real-time arrival information and service alerts across Houston METRO's service area of 1,300 square miles (3,370 km²).

To support this project, GMV SYNCROMATICS plans to establish a satellite office in Houston and hire additional project management and technical field support staff. These new team members will work with the Los Angeles office to support GMV Syncromatics' growing presence in Houston and across the United States.

GMV SYNCROMATICS is already at work on the initial phase of the project to install digital signs at bus rapid transit (BRT) platforms on the new Uptown BRT Project. The project, part of Houston METRO's expansion of their METROrapid BRT network, is anticipated to launch in spring 2020.

GMV SYNCROMATICS' project award comes at a time of tremendous growth for Houston METRO. The agency ranks as one of the top ten largest public transit agencies in the United States by bus ridership and fleet size, and it is expanding service after voters approved a \$7 billion USD capital program of new light rail, bus rapid transit, and transit center projects.

These investments in transit are critical for Houston, the fourth largest city in the country, where the population is expected to increase by 50 % in the next 20 years. GMV SYNCROMATICS' digital signage technology will support the region's efforts to increase transit ridership by improving the rider experience with real-time passenger information.

As the largest award in the company's history, the project with Houston METRO signals a new chapter at GMV SYNCROMATICS, establishing the company as a major player for significant projects at the country's largest transit agencies.

GMV at the forefront of Mexico's public transport at Expo Transporte'19

A grand total of 445 exhibitors from over 30 countries came together at the latest Expo Transporte ANPACT held in Puebla from 16 to 18 October 2019.

GMV, as a regular exhibitor at this event, showcased its scheduling and shift-planning solutions, its fleet-management systems and passenger-information systems, plus its fare collection and prepayment systems and passenger-information mobile apps.

Attracting particular interest on GMV's stand were its smart bank, a tropicalized single-ticket vending and contactless farecard-recharging machine, specially adapted for the Mexican market, for installation in stations or onboard buses. This system means the bus driver does not have to handle cash, greatly cutting down the risk of mugging and improving passenger experience and safety.

GMV also presented its new dual NFC/EMV-enabled ticket validators and vending machines, catering for direct bankcard- or cell-phone-payment onboard the bus or at the access gates.

GMV also presented the success story of the advanced passenger-information and monitoring system on the bus rapid transit (BRT) system of SITEUR, the Public Transport Manager of Guadalajara, capital of the state of Jalisco and one of the country's biggest conurbations; this system has now clocked up its seventh year, helping to improve the service's quality and punctuality and providing passengers with more trustworthy information.

GMV wins a contract from the Basque railway fleet manager Euskal Trenbide Sarea (ETS)

■ The Basque railway fleet manager Euskal Trenbide Sarea (ETS) has awarded GMV a contract for phasing several upgrades into its management system called Graphic Service Application (*Aplicación Gráfico de Servicio: AGS*), a system originally supplied by GMV back in 2016.



One of the main upgrades to be phased into the system under this project is automation of the generation of train-crossing events, drawing on timetabling schedules both in its generation phase and real-time monitoring phase. This new automation feeds into the Centralized Traffic Control System (*Control de Tráfico Centralizado: CTC*), boosting ETS's overall efficiency.

Other improvements will be enhanced management of ever-growing volumes of data, adding in an analysis of coherence between the various data sources. Lastly, some new historical reports will be added to the system.

The AGS stems from a personalization of GMV's inhouse advanced railway fleet-management system (*SAE-R®*) to cover the many stages of railway fleet-management. The first stage (scheduling) involves drawing up the running plans to be used in the

future; these plans, containing all the railway network's planned traffic for a given day, are then sent up to the CTC systems.

The next, real-time stage provides for daily monitoring of trains, reacting accordingly to any deviations in planned running. The system thus caters for diverse amendments throughout the day, keeping a series of external systems updated, such as station indicator screens, the CTC systems, Euskotren's published schedules and the company's Tetra systems.

Finally, in the last stage, an analysis will be made of past running, producing a series of personalized reports.

This whole system, founded on GMV technology, will underpin ETS's daily running.

GMV collaborates with Transports Metropolitans de Barcelona (TMB) to provide intelligent transportation solutions

■ For over ten years now GMV has been working jointly with Barcelona's metropolitan transport company (Transports Metropolitans de Barcelona: TMB) to equip its 1100-vehicle fleet with an onboard solution. The bulk of the onboard system was originally made up by an energy management system, a passenger information system, a tracking system and a general-purpose CPU called CPUPPAL.

The original idea was to set up a system in which functions were distributed between the various items of the GMV-designed-and-developed equipment. This scheme has undergone modifications over time as each piece of equipment has reached the end of its useful life and enhanced functions were phased in. The first appliance to be replaced was the CPUPPAL, for a new,

much more powerful and up-to-date CPU called CPUCOM.

The system's paradigm shifted; the idea now was to try to minimize the amount of onboard equipment in favor of enhancing system complexity and maintainability. Afterwards all the tracking-system functions were migrated to CPUCOM, eliminating other equipment in each vehicle.

The next equipment to be redesigned will be the passenger-information system and the energy management system, continuing TMB's track record of developing and running one of the country's most important and trailblazing fleets.

GMV already has several TMB projects planned for the coming year, such as

integration of a time-of-flight ridership counting system, CAN telemetry on 200 new vehicles for obtaining technical vehicle data directly in the control center (battery loading, fuel consumption, breakdowns, etc.) and fleet-wide integration of external panels with onboard equipment, allowing for the greatest number of indication-panel functions without needing any manual intervention on them.



GMV renews EL Gato's electronic fare-collection system



■ The business group Interbus, operator among others of several passenger transport concessions belonging to the Regional Transport Consortium of Madrid (Consortio Regional de Transportes de Madrid: CRTM) through its subsidiaries Interurbana de Autobuses, S.A. and Herederos de J. Colmenarejo, S.A., took over another CRTM firm, El Gato, back in April 2018.

After this takeover Interbus has renewed its trust in GMV, awarding it in recent months the contract for renovation of the electronic fare-collection system for EL Gato's 29-vehicle fleet. This brings up to 1060 the number of vehicles now fitted with GMV's systems.

The **ETC-606i** ticketing machines acquired under this contract, like those

already up and running in Interurbana de Autobuses, S.A. and Herederos de J. Colmenarejo, S.A, have been selling single-journey tickets for 9 years and validating CRTM farecards for 4 years.

This equipment is integrated with a third-party fleet-management system, providing wireless communication for sending/receiving configuration files, updating of firmware and transaction files. It likewise acts as an onboard fleet-management system, to input service parameters, sending and receiving texts to and from the control center and displaying regulation indications, among other features. GMV is also responsible for the onboard external panels displaying the vehicle's line- and route-information.

El Gato's fare-collection control center, like those of other CRTM companies, is integrated with CRTM's control center through shared files, allowing for travel entitlements to be validated and farecard black lists to be kept. Also integrated is the sending of transactions for CRTM's all-in operator management.

GMV presents its technological solutions for Intelligent Transportation Systems at ExpoBus

From 21 to 23 November GMV took part in the second ExpoBus Iberia, the Road Passenger Transport Fair held in Silleda (Pontevedra).

GMV's stand showcased its whole array of advanced fleet-management, fare-collection and ticketing systems as well as passenger-information systems such as ecodriving systems and service-planning solutions.

Among the most interested visitors were the operators bidding for concessions under the Regional Authority of Galicia (Xunta de Galicia)'s

concession-renewal scheme, for whom GMV's technological solutions could certainly come in handy.

As well as the exhibition area the fair also featured the presentation of interesting papers dealing with the subjects of "The Future of Urban Transport", "Long-Haul Transport" and "The Sector's Shortage of Skilled Drivers".

A third Expobus Iberia is due to be held in 2021: up to now the fair has been annual but now it is to switch to a biennial event.



New equipment for Pamplona's District Transport System

■ In November 2018 GMV was awarded a contract for completing the supply, installation, integration, commissioning and maintenance of the advanced fleet-management and information system, the communication system and electronic fare collection equipment to be fitted on the buses of Pamplona's District Transport System (*Transporte Urbano Comarcal de Pamplona: TUC*).

Under this project GMV will be supplying, installing, integrating, commissioning and maintaining the 150 new ticket validators to be fitted at the central door of TUC's buses. These validators will be EMV-enabled allowing any would-be passenger with a real

bankcard or virtual cell-phone bankcard to get on a bus without having to register beforehand or buy any sort of ticket.

A future post-payment system means passengers can always be confident they have obtained the best possible fare based on their previous public-transport use. It also ensures greater security in card-terminal transactions since the EMV card validates operations on the basis of its chip-stored information.

The overriding aim of this new system is to make public transport easier for reduced-mobility people in wheelchairs,

thus coming up with a response to the growing need of increasingly accessible and adaptable buses with safer and simpler fare payment arrangements. From now on people who need to access the bus from its central door will not need to move down to the driver's door to validate their farecard.

This new contract reflects a renewal of Pamplona and TCC's trust in GMV's completely integrated, cutting-edge advanced fleet-management and information system and communication and ticketing systems, once more showcasing the company's prowess in Spain's interoperable public-transport systems.

GMV sponsors the 26th edition of the National Metropolitan and Urban Transport Congress



On 3 and 4 October 2019 GMV participated as sponsor in the 26th National Metropolitan and Urban Transport Congress (Congreso Nacional de Transporte Urbano y Metropolitano) held in Gijón under the banner title "Sustainable Mobility, the best experience" and organized by the Metropolitan and Urban Transport Association (Asociación de Transportes Públicos, Urbanos y Metropolitanos: ATUC).

The Congress has been a meeting point where GMV has met again with the main agents of Urban and Metropolitan Transport in Spain, with a high presence

of Managers and Technology Directors of the most important urban transport companies. GMV has made available to the attendees its stand where it has been able to show its catalog of solutions, being also a sponsor of the closing lunch.

Speakers at the congress spoke about the exclusive benefits of public transport, both in urban and rural areas. They also reminded the audience that mobility is "an open, opportunity-filled and ever-changing scene" and, for that very reason, public transport's role as urban and metropolitan mobility coordinator needs to be strengthened.

Another aspect brought out by the speakers was the importance of giving passengers a good traveling experience, even taking precedence over other more objective advantages. High customer satisfaction, they pointed out, prompts them to share their experience with their peers.

One of the burning issues in this area is the influence of transport on the environment and competitiveness. Congress speakers stressed that improving mobility ensured a higher quality of life to the public at large and boosted the economy as a whole.

GMV again enhances Bydgoszcz and Gdańsk's fleet-management and passenger-information systems

■ The public- and private-sector purchasers with whom GMV cooperates repeatedly emphasize how much they value the high quality of GMV's products as well as the timeliness and professional approach of the executives supervising the performance of each contract. They therefore readily turn back to GMV as a partner for carrying out the work involved in any expansion or enhancement of the Passenger Information Systems expansion.

Bydgoszcz is a city where GMV set up one of Poland's first urban-transport fleet-management and passenger-information systems.

As part of municipal road investments (thorough modernization or construction of new roads), the Passenger Information System (PIS) covers subsequent bus and tram stops. After the recent supply of 18 PIS

panels, in October 2019, GMV concluded another contract, with a contractor for tele-technical work, for the supply of 14 PIS panels. The delivered panels will be equipped with two 42" high-brightness Full HD LCD arrays. The glass will have high IP 65 protection, and a system using the Peltier effect will be applied to dissipate heat from inside the enclosure.

Furthermore, in October 2019 GMV received an order from the Transport Authority of Gdańsk to replace the C11 driver's terminals used since 2009 with 250 new TFT touch terminals integrated with OBU-M20 onboard computers.

The onboard computers with GPS locators delivered by GMV collect identification data of the vehicles as well as the stops on bus and tram routes. The collected data make it

possible to provide the passengers with bus- and tram-stop ETAs, which Gdańsk residents can read on electronic panels.

The data from the onboard computers, processed in the fleet management system, are also used by the dispatchers (who regulate the operation of the vehicles in public transport), in order to improve punctuality in the whole transport system, to the benefit of all users.

The replacement of the driver's consoles with the new TFT type terminals will enable display of the regulation time to the bus driver in a more user-friendly and clearer way, thus ensuring more effective communication between the driver and the dispatcher. It will also allow future system functions to be phased in later.

Moviloc® present at the 25th ANAPAT Convention

■ **Moviloc®** was present for yet another year at the Convention of the National Association of Mobile Elevating Work Platform Hire Firms (Asociación Nacional de Alquiladores de Plataformas Aéreas: ANAPAT), held in Malaga on 5 and 6 June 2019.

This year's convention coincided with ANAPAT's 25th anniversary. The all-time-high participation of 230 included 62 of ANAPAT's member hiring firms, all potential **Moviloc®** customers.

This year's convention also featured the CEOs of Europe's most important hiring firms, including Alexandre Saubot, CEO of Haulotte, Pedro L. Fernández (GAM), Olivier Colleau (KILOUTOU), Gérard Déprez (LOXAM), Pascal Van Halst (MATECO) and Pedro Torres (RIWAL).

For yet another year ANAPAT's convention helps to cement its reputation as Spain's benchmark event for Spain's mobile elevating work



platform hire firms, serving as a meeting point for the main sector companies at home and abroad.

Many of the attendees showed particular interest in the **Moviloc®** development targeted at the construction-machinery hire sector. **Moviloc®** allows sector firms to keep a permanent, real-time track of all their machinery and which client

has been allocated each one. They can also find out the machine's real number of work hours. Monitoring of this information then allows each machine's performance and efficiency to be optimized.

Another of the highly valued **Moviloc®** features was immobilization of the machine after theft or overdue hire return.

GMV to renew the maintenance contract of the fleet-management systems of Malta and ATM



■ In 2019 GMV renewed the maintenance contract of Malta Public Transport (MPT)'s 409-bus fleet, involving an advanced fleet-management system, electronic fare-collection system and video-surveillance system (CCTV).

GMV's maintenance work is based on a remote support system to deal with any software incident in the control center's applications or in the firmware of onboard video-surveillance and fare-collection equipment, plus third-level maintenance, i.e., hardware repair of the GMV-supplied onboard equipment.

GMV has also renewed maintenance of ATM's 1084-vehicle multifleet-

management system, originally set up back in 2001. These vehicles are divided into 29 operational fleets, the most important being Grupo Moventia with 412 buses shared out in 9 fleets; Grupo Baixbus with 218 buses shared out in 2 fleets; and Grupo Sagalés with 216 buses shared out in 8 fleets.

The fleet-management system is made up by control-center applications, onboard tracking systems and bus-stop information panels to give would-be passengers up-to-date ETAs.

For complete system maintenance GMV is currently working with 11 maintenance contracts, distributed

between ATM, Sermetra and some private fleets. The earliest date back to 2005, since when they have been annually renewed.

The main tasks of the various contracts are first- and second-level maintenance of onboard equipment and bus-stop information panels, preventive maintenance of bus-stop information panels, support and assistance for daily operational tasks (importation of schedules, allocations, deviations), management of common topology changes, vehicle, data, scheduling, etc... and also drawing up monthly monitoring reports for the various system components.

GMV upgrades the electronic fare-collection system of Oujda's bus fleet



■ GMV is to renew the electronic fare-collection system run by the company Mobily Dev, belonging to the CityBus group, on its urban bus fleet of the city of Oujda, in northeast Morocco.

Mobily Dev's fleet currently comprises 84 vehicles fitted with the onboard ticket vending machine ETC-500; the fleet is integrated in the backoffice of another of the group's companies (CityBus Meknes). In this renewal the onboard ticket machine will be replaced by a more modern

ETC606i-8, and its own back office will be deployed with client-required personalization to do with driver interface and management of travel entitlements.

The ETC606i-8's GPS/3G module will make automatic downtime detection possible while also sending ticket-sale files and configuration updates by the mobile network instead of the Bluetooth system operating up to now. This module will also pave the way for a future advanced fleet-management system.

C-STREETS project Kick off

The project's purpose is to set up pilot schemes for cooperative intelligent transportations systems (C-ITS) in various Portuguese local authorities, building on the spadework of the C-ROADS Portugal project

The first Steering Committee meeting of the C-STREETS project took place on September 30 last, bringing together all its 28 partners for the first time.

This new project, 50 % financed by the Connecting Europe Facility (CEF) and running in Portugal, aims to implement pilots in the cooperative services of smart transport systems (C-ITS) in different cities and municipalities of Portugal, continuing the work already carried out during the C-ROADS Portugal project.

Mobility is under transformation. Today it is no longer possible to dissociate the mobility concept from the emergent technologies that are behind the transformation process. New challenges are changing the

paradigms underpinning mobility, while others arise from the ongoing changes.

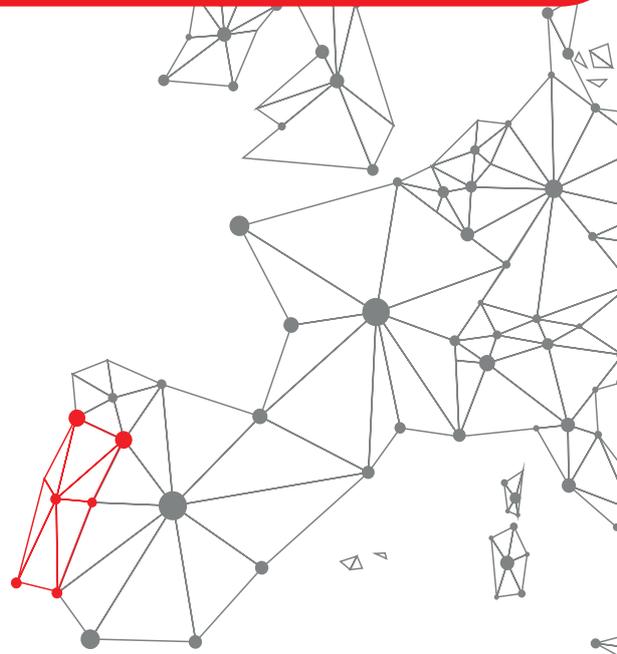
As a result of autonomous and connected vehicles, C-ITS represents a revolution in the way we look at mobility. Not long ago it was unthinkable for a car to be driving alone on a freeway or even for drivers to know in advance where to park the car before getting to the final destiny. Today's technology, however, to be developed under C-STREETS, makes all this possible and much more.

The prime focus of C-STREETS pilots is the urban environment with the main aim of answering the challenges posed by multimodality and by interoperability. This enables data to be shared and reused through the National Access Point (NAP) while at

the same time preparing the roadside infrastructure for C-ITS services day 1, day 1.5 and day 2.

This project sets out to explore issues such as: road safety, territorial cohesion, de-carbonization and mobility as a service (MaaS).

GMV has as main objective the study of solutions that allow access management of restricted areas; parking information with specific data about places for electric vehicles or special needs people (disabilities, pregnant women, etc.); this expands C-ITS services initially developed in the C-ROADS project. The idea is thus to develop and upgrade the ITS products suite, phasing in the features needed to allow GMV to lead the C-ITS market, then field-testing it in a pilot implementation in the Lisbon area.



GMV gives its take on mobility to members of the PROSPECT project



■ Valladolid, as a smart, sustainable and integrating city, is one of the cities chosen by the European Commission to take part in the PROSPECT project as mentor to other cities in good practices of sustainable mobility.

PROSPECT “Peer Powered Cities and Regions”, which kicked off in 2017 under the Horizon 2010 umbrella, encourages peer-to-peer learning in regional and local authorities, enabling them to find out about groundbreaking systems to finance

and implement their sustainable energy and climate-action plans.

On 3 and 4 October representatives from the project’s 12 participating cities met up in Valladolid to check out the various projects being carried out in Valladolid. An action-packed program involved two days of visits and meetings looking in depth at sustainable mobility measures, including projects like REMOURBAN (REgeneration Model for accelerating the smart URBAN transformation), where GMV is leading smart-mobility activities.

In the subsequent visit to Valladolid’s Integrated Transport Center (Centro Integrado de Transportes de Valladolid: CENTROLID) the visitors were shown some of GMV’s inhouse solutions in this project, featuring the monitoring solutions and a car-sharing app for Valladolid City Council’s fleet of electric vehicles.

Recognition of a 15-year career in Intelligent Transportation Systems

■ On 3 December Ana Herrera, head of Smart Cities business development in GMV’s Intelligent Transportations Systems sector, received the “Women and Traffic Management” prize in the fifth award ceremony held by the Association of Mobility Technicians and Traffic Engineers (Asociación de Ingenieros de Tráfico y Técnicos de Movilidad).

The award hails the work of those women from the government, university or business worlds with a standout performance in traffic and, especially, traffic engineering in Spain. Ana’s particular track record in the mobility and automotive areas of GMV’s Intelligent Transportations Systems sector makes her more than worthy of this prize.

Ana Herrera joined GMV’s space GNSS team in 2005. Throughout her whole GMV career Ana has grabbed the chance to work on



Ana Herrera receives the prize from Luis Miguel Martínez Palencia, Managing Director of Madrid’s Regional Transport Consortium (Consortio Regional de Transportes de Madrid).

projects of very diverse types (OASIS, FOTSIS, HeERO2 and REMOURBAN, among others) both in the public and private sectors, working on cooperative system applications initially and afterwards sustainable mobility and intelligent public transport in cities.

Ana has also represented GMV in various forums and associations related

to her activity, such as the European Innovation Partnership on Smart Cities and Communities, the Spanish Association of Electronics, Digital Contents and ICT Companies (Asociación de Empresas de Electrónica, Tecnologías de la Información, Telecomunicaciones y Contenidos Digitales; AMETIC), ITS España and the Valladolid and Palencia Smart City Association, among others.

GMV achieves level 3 of the Automotive SPICE® Assessment Model

■ GMV has obtained capability level 3 (CL-3) of Automotive SPICE®, a specific assessment scheme for automotive software processes.

This achievement vouches for the continuous improvement of GMV's inhouse automotive software development processes, which had already reached level 3 in several of the processes back in July 2018. In November 2019 it duly achieved this level for all processes within the scope of VDA QMC.

ISO/IEC 15504, known as the Software Process Improvement Capability dEtermination (SPICE) standard, and its subsequent upgrading into the ISO/IEC 33000 family of standards, is a model for assessment of development processes and maintenance of information systems and software products. Automotive SPICE® is an initiative of the Automotive

Special Interest Group and Quality Management Center of the German association of the automotive industry (VDA QMC). It is a specific automotive software-processes assessment scheme created by a group of top automotive manufacturers. It has by now become a de facto automotive standard, used widely for assessment of software suppliers in this sector.

Automotive SPICE® has two dimensions: process assessment and process capability assessment. Processes are based on ISO 12207, which has been extended and tweaked to bring it into line with specific automotive requirements. Capability is broken down into 6 levels (from 0 to 5) as defined in ISO15504: Level 0: Incomplete process, Level 1: Performed process, Level 2: Managed process, Level 3: Established process, Level 4: Predictable process and Level 5: Optimizing process. For each level

there are standard process attributes for assessing the capability levels. Although the Automotive SPICE® model establishes these 6 levels, level 3 is the top level considered in practice.

The processes assessed (VDA) comprise management processes (MAN), software- and system-engineering processes (SYS/SWE) and support processes (SUP).

This achievement represents a new milestone in the quality management system of GMV's intelligent transportation systems sector, which has also been successfully assessed this year at CMMI Level 5.

It also provides a series of benefits in development process management and guarantees total alignment with the requirements laid down for the automotive sector's software providers.



The CITIES Timanfaya project hailed in the 7th enerTIC Awardss

On Thursday 12 December the State Secretariat for Digital Progress hosted the prize-giving ceremony of the 7th enerTIC Awards.

CITIES Timananfaya came out the winner in the Smart Mobility and Smart Tourism categories, within the award section that identifies and recognizes ICT-promoting initiatives for improving energy efficiency and sustainability.

Kicking off in late 2018, CITIES Timanfaya is a project led by Madrid's Universidad Carlos III and the Spanish Road Association (*Asociación Española de la Carretera*); its remit is to design a technology demonstrator vehicle to pave the way for running state-of-the-art, electric, adapted, autonomous and multimedia buses on Lanzarote's tourist route around the *Montañas del Fuego* volcanic landscape in the National Park of Timanfaya.

GMV's task in CITIES Timanfaya is to provide a communication system that tracks the GNSS position at all times while passing on information from the vehicle's various subsystems to a control center that will run the whole monitoring system, also supported by



The President of Lanzarote Island Council, Maria Dolores Carujo, picks up the prize for the best mobility project, CITIES Timanfaya, from GMV's Industry Manager, Miguel Hormigo

GMV's inhouse solutions. This system will then keep a permanent track of the vehicles' exact location and state, flagging up any incident and ensuring a rapid response.

The technology demonstrating vehicle, an electric and autonomous microbus, is scheduled to be up and

running during 2020, as a trendsetter for bringing renewable energy sources into tourism-mobility endeavors. A study is also underway for replicating the scheme in other points of the Canary Islands to promote a new, more ecofriendly mobility model of electrified transport and lower emission rates.

GMV presents its automotive prowess at ELIV 2019



GMV ran a stand at ELIV 2019, held from 16 to 17 October in Bonn (Germany).

ELIV is an international congress that brings together automotive electronics experts every two years to showcase the latest innovations, developments and the biggest challenges of the automotive sector. ELIV has by now become a biennial meeting point for manufacturers, vendors, universities and researchers from all around the world.

GMV ran a stand to display its solutions for autonomous and connected vehicles, an expertise built up over nearly two decades of work on the development and fine-tuning of enabling technology for vehicles of this type. Telematics, secure and precise positioning, connected- and autonomous-car services and cybersecurity are the four main thrusts of the company's expertise and skills in this field.

Exponential Organizations at APD's First Innovation Congress

Luis Fernando Álvarez-Gascón, General Manager of GMV's Secure e-Solutions sector, was one of the members of the congress's advisory committee and chaired the exponential-organization panel discussion

Under the banner theme "The Future of Spain and Europe in the Hands of Innovation" APD's 1st Innovation Congress was held on 18 September 2019 to deal with the main challenges and solutions for C21st firms from various viewpoints.

Luis Fernando Álvarez-Gascón, General Manager of GMV's Secure e-Solutions sector and a member of the conference's Advisory Committee, chaired the panel discussion on Exponential Organizations, posing the question of whether what has worked for firms in the past will necessarily work in the future.

The concept of Exponential Organizations was coined by Singularity University in 2008 to refer to those whose impact (or output) is disproportionately large – at least 10X larger – compared to its peers because of the use of new organizational techniques that leverage exponential technologies. Prime among these technologies feature artificial intelligence, robotics, biotechnology, neuroscience, data science, 3D printing or nanotechnology, in a context of ubiquitous connectivity and virtually limitless and elastic cloud access to new capabilities. A combined use of these technologies powerhouses their potential even more.

Organizations like YouTube or Whatsapp managed to break the billion-dollar capitalization barrier in less than

two years, a feat it would take an average Fortune 500 firm twenty years to pull off. Upon their advent these exponential firms looked set to oust their competitors completely; indeed, they now feature among the most highly valued firms worldwide, reflected the executive.

To quote Álvarez Gascón, "innovation, not only of the technology bedrock, is a key tool for building up exponential organizations". The irruption of new models and tools for attracting and capturing talent, in contexts where demand outweighs supply, also calls for a large dose of innovation.



HITEC Spain: A bridge with USA

The Hispanic IT Executive Council (HITEC), born in the USA, is a premiere global executive leadership organization of senior business and IT executives. In the final quarter of the year California hosted the HITEC Leaders Summits, a chance for executives to meet up and swap notes on best practices, challenges and trends within their sector.

This year's summit presented the "HITEC Spain" project, led by Santiago Moral Rubio, OpenSpring's Vice President of Innovation and Cybersecurity; Julio Casal, founder and technology manager of 4iQ; and Luis Fernando Álvarez-Gascón, General Manager of GMV's Secure e-Solutions sector.

HITEC España sets out to build a bridge between the USA, Latin America and Spain in order to encourage an enterprising spirit between ICT professionals and companies in countries with Hispanic roots. HITEC Spain thus becomes a meeting point between the Hispanic leaders living and working in Spain, both in Spanish companies and international companies trading in Spain, helping to promote their careers.

HITEC Spain's activities also spill over into universities and business schools to help the business world capture budding digital talent and make it easier for Hispanic IT students and professionals to land jobs in multinational firms. In general its remit takes in all activities that might bear any relation to the encouragement and promotion of ICT and the development of the information society.

Luis Fernando Álvarez-Gascón is one of the key members of this organization; on various occasions he has been proclaimed as one of the 50 most influential professionals in the Spanish-speaking ICT world.

Spain needs to bring innovation into the forefront of the country's concerns



■ In November the Forum of Innovating Firms (*Foro de Empresas Innovadoras: FEI*) presented the book "*Innovación Tecnológica y Empleo*" (Technological Innovation and Employment) as well as the Extraordinary Chair of Innovation Studies (*Cátedra extraordinaria de Estudios de la Innovación: CESIN*), set up jointly by FEI and the Universidad Complutense de Madrid. The event also hosted FEI's annual award ceremony.

Luis Fernando Álvarez-Gascón, FEI President and General Manager of GMV's Secure e-Solutions sector, advocated innovation as the best way of taking on our society's major challenges.

FEI considers urgent action to be necessary. It therefore proposes the setting up of a state pact in which innovation holds a place in keeping with its real importance, as well as reindustrialization of the whole country.

CESIN Chair of Extraordinary Innovation Studies

The CESIN Chair of Extraordinary Innovation Studies (*Cátedra extraordinaria de Estudios de la Innovación: CESIN*), led by José Molero Zayas, has been set up with the strategic perspective of studying and encouraging innovative activities. It brings together efforts from the Science-Government-Company triumvirate and is a unique proposal in the panorama of innovation studies in Spain.

The Chair, backed and sponsored by companies like GMV, aims to concentrate efforts in the study and assessment of public, in-company R&D policies and assess their real impact on technological, strategic and competitive behavior.

CESIN is backed up by a significant network of researchers both from Spain (UCM, UPM, CSIC, UAM, Universidad de Santiago de Compostela, INGENIO, Universidad de Salamanca, Universidad de Sevilla) and from abroad.

"Innovación Tecnológica y Empleo"

To introduce the new book "*Innovación Tecnológica y Empleo*" (Technological Innovation and Employment), Luis Fernando Álvarez-Gascón, FEI President, insisted on innovation's crucial role in boosting competitiveness and generating talent-based, top-quality jobs.

The book gives a hearing to both trade unions and companies. The authors, Gonzalo León, José Varela and Jaime Laviña, analyze not only the present and future job impact of robotization and digitalization of working processes but also the design of governmental policies to address this situation and propose solutions for further debate.

FEI Awards

To round out the event FEI handed out its annual awards in the categories of innovating researcher, innovating firm and innovation-support institution.

Everything you need to know about digital twinning



The concept of Digital twins has been hailed by Gartner as one of 2019's top 10 strategic technology trends. It can be defined as "a model capable of rendering the state and behavior of a real asset in (close to) real-time. Digital twinning has therefore been taken up by companies like Airbus to build its A-320, McLaren to optimize its Formula-1 racing and Masseratti to design its new models".

To learn more about digital twinning and how it works we sketch out below its main components, classification and use of artificial intelligence.

The three main components are, firstly, digital simulation (modelization):



Pedro Hernández Ariznavarreta
Big Data & AI Senior Consultant
GMV's Secure e-Solutions sector

Internet of Things (IoT) connected sensors, i.e., inter-relation between the real system and the model through IoT devices; and thirdly BIG DATA Analytics & AI, namely, a layer to exploit the data generated by the model.

Another important factor is the advanced human-machine interface with two main technologies: Virtual Reality and Augmented Reality (VR/AR) and 3D Computer-Aided Design (CAD).

Artificial intelligence in Digital Twinning

The use of artificial intelligence in digital twins has traditionally involved machine-learning techniques to carry out activities such as the following: the production of synthetic data for supervised machine-learning techniques to solve predictive maintenance problems; data validation and reconciliation; the detection of outliers and data anomalies; and equipment or sensor faults.

But other artificial-intelligence approaches look set to become significant in the future, like production systems embedded in organizations. This introduces the Digital Twin of an Organization (DTO). It allows us to analyze and optimize a product, service or process in a digital instance to replicate what works, or to address issues before they turn into real-world problems.

Process mining could become a data-driven approach to building a DTO. In addition, digital twins can also be used in conjunction with Reinforcement Learning to acquire knowledge about the process and thus be able to bring it up to its optimal control value.

In sum, to build digital twins you have to combine knowledge of the domain, models and computational overload and ensure full maintainability over the complete life-cycle of their physical counterpart. It should also be borne in mind here that, in order to ensure maintainability, you need to have a model that can be operated and then calibrated and validated against observed behavior.



Nuria Gómez Rojo
Business Partner for International Markets
GMV's Secure e-Solutions sector

GMV opts for Automation Anywhere's RPA solution



■ GMV has recently joined Automation Anywhere's Partners Program in order to provide organizations with Robotic Process Automation (RPA) solutions.

The use of RPA-based robots for managing any process not only streamlines the organization's workflow but also ensures maximum scalability and

flexibility within the firm and personalized responsiveness to suit the specific needs of each particular client.

The digital platform Automation Anywhere taps into AI-enabled process automation solutions in order to free professionals from tedious, repetitive tasks and boost firm's operational efficiency.

In the words of José Carlos Baquero, Manager of the Artificial-Intelligence and Big Data Division of GMV's Secure e-Solutions sector, "the agreement with Automation Anywhere helps us to meet the growing demand for market automation solutions, driving productivity and honing precision in companies' business processes".

"The moment of digital reindustrialization" in Spain

In early September, under the banner theme, "The moment of digital reindustrialization" Santander hosted the 33rd Telecommunications and Digital Economy Encounter, organized by the Spanish Association of Electronics, Digital Contents and ICT Companies (*Asociación de Empresas de Electrónica, Tecnologías de la Información, Telecomunicaciones y Contenidos Digitales; AMETIC*) in collaboration with Banco Santander and the Universidad Internacional Menéndez Pelayo.

The encounter is one of the biggest events of Spain's digitalization calendar. Every year, this being no exception, GMV goes to Santander to input its experience and give it take on matters as diverse as innovation, cybersecurity and self-driving cars.

Luis Fernando Álvarez-Gascón, General Manager of GMV's Secure e-Solutions sector and President of AMETIC's Innovation Committee, chaired the panel discussion taking stock of innovation in Spain.

The panel advocated a bigger participation by private investment in the national R&D setup, currently divided equally between

the public and private sectors. Álvarez-Gascón argued that "R&D in Spain should grow to 2.4 % of the GDP with a 70 % participation from the private sector".

For his part the CISO of GMV's Secure e-Solutions sector, Mariano Benito, during his participation in the discussion panel "What should we learn from the most recent security incidents?" stressed that there is a certain resistance within companies to consider the incidents that might occur. The good news, he added is that companies are becoming more aware of the need for design-up, company-wide security rather than reacting to events on a seat-of-the-pants basis, and are now putting up the necessary resources and keeping track of everything that is happening to be able to react in time in all cases.

In the panel dealing with the "Connected vehicle and sustainable mobility", the manager of GMV's Automobile Business Unit, Sara Gutiérrez, focused on autonomous driving's need for systems and technology that cater for positioning with maximum precision, safety and reliability. She gave as an example the recent contract awarded by the German carmaker BMW Group to GMV for developing advanced, precise and safe positioning technology for its new generation of autonomous vehicles.

The congress closed with a final discussion panel looking at "mission-based innovation", with the participation yet again of Luis Fernando Álvarez-Gascón.



Machine as a service: an Industry-4.0-enabling business model

The planet nowadays is being rapidly urbanized. This, together with hyperconnectivity and constant investment in the technological transformation, is steering us towards an increasingly shared and service-based economy. This in turn offers opportunities for outsourcing services, cutting investment costs and getting closer to clients.

Changes that once took years to gel now take months, thanks to servitization. "As a service" models aim to help clients adapt to the new environment and transform their systems, focusing on the change from a transactional business to a contractual business. Such a strategy is based on mutual benefit and confidence and, above all, personalization, focusing on end-client services instead of simply supplying a product. These models endow companies with the necessary flexibility for tapping into new technology, eliminating costly updating- and maintenance-outlays. They are also intrinsically scalable, meaning they can be brought into line easily and profitably with changes in the business itself.

GMV has presented this business model, an offshoot of Industry 4.0, at the industrial innovation event called MetalMadrid, talking about use cases and advantages offered by a Machine-as-a-service model in the industrial sector. This chimes

in perfectly with industry's current needs, offering possibilities of personalizing the service and selling a KPI project (timeliness, parts produced, errors detected, etc.) as a standout feature, as well as cutting machine-acquisition-, maintenance and -commissioning costs and risks.

This new model provides industry with smarter resources capable of supervising remotely and personalizing funding and other services, while also ensuring the equipment works properly with warranty and safety backup. This business model can also be rounded out with the use of applications controlling all assets in a safe, secure and centralized way.

As examples of the application of this business model we now coexist with inspection systems based on autonomous mobile platforms using modular sensor kits where billing is based on information provided and distances run. Similarly, artificial-vision applications based on neural nets and reinforced learning are capable of carrying out classification tasks by learning from human knowledge, with billing based on classified images.

Other features of this model are collaborative and industrial robotics, focusing on the output-boosting automation of production lines with low implementation-, programming- and plant-distribution costs. In this case, as the manufacturer is present



Ángel Lázaro
Business Partner of Industry Sector
GMV's Secure e-Solutions sector

«This new model provides industry with smarter resources capable of supervising remotely and personalizing funding and other services»

throughout the whole robot's life and not only up to plant implementation, equipment-use data can be obtained and monitored to bring the supply progressively into line with real client needs.

GMV participates in UPV's Big Data Analytics Conference



In late September the Polytechnic University of Valencia (*Universidad Politècnica de València: UPV*) put on the Big Data Analytics conference with the participation of GMV and the two banks, BBVA, and Bankia. The session debated the relation between Big Data Analytics and artificial intelligence, in particular Machine Learning. A description was also given of the role of Blockchain as a solution to guarantee the truthfulness of data as well as its wider known role as vector for cryptocurrencies like Bitcoin.

In his speech Carlos Sahuquillo, technical leader of onboard systems cybersecurity of GMV's Secure e-Solutions sector, explained the importance of Blockchain and how a digital identity network could be made with this technology to access all services our data needs without having to sign up for any of them. This would entail a sort of shared digital data repository using Blockchain as base technology. There are at the moment, however, some implementation problems since, by its very nature, Blockchain flouts the GDPR principle of the right to be forgotten.

GMV, present at the Smart City Expo World Congress

■ GMV presented its smart city proposal at the "Smart Cities" event, organized by EnerTIC as part of the Smart City Expo World Congress and held in Barcelona from 19 to 21 November.

Patricia Tejado, Manager of GMV's Digital Public Services, took part together with government representatives in a debate revolving around the rational use of technology to build smart cities in a bid to optimize resource use and benefit the public at large. The debate stressed the need of bringing basic Smart-City infrastructure bang up to date. Participants also agreed that the existing regulatory framework serves as a drag on innovative projects, with

technology running well ahead of legislation.

Patricia Tejado argued that the success of any Smart City service rests on three basic pillars: citizen centeredness, design prioritization; key city-management, -monitoring and improvement-data; and opening up of the city to generate greater confidence, transparency and job opportunities.

The executive also highlighted the role of cybersecurity as a fundamental link in generating citizen confidence, plus the fact that GMV applies design-up cybersecurity in carrying out any data-management and storage and communications services.



GMV sponsors VCLTesting

■ On 27 and 28 November, under the banner theme "God save the code" Spain's IT Institute (Instituto Tecnológico de Informática: ITI) put on the ninth #VCLTesting, an event that brings together professionals with a thirst for knowledge and the desire to improve their processes, methodologies and tools, the overall aim being to enhance software development quality.

GMV once more sponsored the event, while Miguel Peiró, GMV Testing

Engineer, gave a seminar on *¿Qué opciones tenemos automatizando servicios web? (What web service automating options do we have?)*, in which he ran through some of the current web service testing automation options. He also stressed some of the strong points and weak points of each one of the web service tests, as practical examples for choosing the solution best suited to the needs of each particular project.

GMV renews the maximum CMMI[®] Maturity Level

This renewal makes GMV the first European firm to renew level 5 appraisal under the Development 2.0 version of the new CMMI[®] model

G MV has renewed level-5 appraisal of the Capability Maturity Model Integration (CMMI[®]) model. CMMI[®]

is the world's most widely used performance-improvement model. It is owned by the CMMI[®] Institute and has become the world's most prestigious model to ensure the best information-system development and management practices. Renewal of the maximum CMMI[®] maturity level represents recognition of GMV's ongoing quest of quality as the driver of excellence and sustainability.

In the renewals of 2010, 2013 and 2016 the appraisal included the quality management system of GMV Aerospace and Defence, the US space company, and its extension to GMV's space, defense and security activities in Portugal and Poland. On this occasion the appraisal also took in the quality management system of GMV Sistemas, including all GMV's activities in the

intelligent transportation systems and automotive sector, as well as the Romanian subsidiary.

This new milestone has made GMV the first European firm to renew level-5 appraisal under the Development 2.0 version of the new CMMI[®] model, which was launched in mid-2018 and reflects the changing business needs of today.

CMMI[®] level 5 appraisal brings with it a series of benefits, both for GMV itself and its clients. The development processes are brought more closely into line with objectives, business strategy and client needs; project results are more predictable; and project performance improves in terms of effort, cost, scheduling and technical aspects. It also boosts error-detection efficacy during the development process and consequently cuts down the number of defects in products delivered to clients.

On this occasion the appraisal also took in the quality management system of GMV Sistemas, including all GMV's activities in the intelligent transportation systems and automotive sector, as well as the Romanian subsidiary

In an intrinsically complex and demanding sector like technology the value of CMMI[®] level 5 appraisal really comes into its own, especially when we consider that the scope of GMV's CMMI[®] level 5 appraisal takes in the whole life cycle of the system, from the definition of requirements right up to its acceptance by the client.



CMMI DEV / 5SM

Exp. 2021-01-25 / Appraisal #31642

GMV joins the *#CEOPorLaDiversidad* Alliance



■ On 16 October Mónica Martínez, GMV's president, formalized GMV's membership of the *Alianza #CEOPorLaDiversidad* (CEOsforDiversity Alliance) in a ceremony held in the Museo Reina Sofía (Madrid) to celebrate the 20th Anniversary of Fundación Adecco.

This alliance, now backed by GMV's commitment to the cause alongside 59 fellow companies, aims to bring Spanish company executives together around a mutual and groundbreaking view of diversity, fairness and occupational even-handedness. From this participation arises a collaborative platform for research, swapping notes, creating and encouraging good business practices in keeping with today's society.

#CEOPorLaDiversidad is brokered by the two foundations called Fundación Adecco and Fundación CEOE (Spanish Confederation of Business Organizations in Spanish initials) to speed up the development of groundbreaking strategies in Spain's business fabric that are conducive to excellence and competitiveness,

reducing inequality and exclusion in Spain's society.

During the ceremony Antonio Garamendi, CEOE President, Enrique Sánchez, President of Fundación Adecco and José Isaías Rodríguez, Patron of Fundación Adecco, jointly presented the *Alianza #CEOPorLaDiversidad*. Under the honorary presidency of their majesties the monarchs of Spain, the event involved the participation of Magdalena Valerio Cordero, Minister of Employment, Migration and Social Security, and Joaquín Nieto, director of the Spanish office of the International Labor Organization.

Right from the word go GMV has always been fully aware that any company is underpinned by the talent of its staff; this talent is characterized by diversity in the broadest sense, eschewing the shibboleths of gender, culture, age or any other arbitrary condition or circumstance. A view of diversity that, in the words of Mónica Martínez "enriches the firm as an organization and as an integral part of today's society".

GMV once again supports STEM Talent Girl

■ After the success of previous years, GMV took part in the fourth STEM Talent Girl, an educational project to empower the next generation of leading women in science and technology.

The scheme was officially inaugurated on 29 October for the 2019/2020 school year. Present at the ceremony was María Jesús Calvo, Manager of the Customer-

Attention and Engineering-Management Business Unit of GMV's Intelligent Transportation Sector and one of the mentors of the second STEM Talent Girl.

This scheme rests on two mainstays: the masterclasses given throughout the program by leading STEM women and the shadowing sessions led by professionals working in one of the

STEM areas and collaborating as mentors to share their view of the current working environment.

Patricia Cadenas, Mónica Ruiz and María Teresa Fernández are three of the mentors who, on behalf of GMV, will be guiding a group of teenagers under "Science for Her", an initiative geared towards pupils from Spain's 3rd and 4th secondary years.

After last year's STEM Talent Girl held in Burgos, Valladolid and Cantabria, this year's has been expanded to take in León, Ávila, Salamanca, Segovia, Palencia, Madrid and La Rioja, and will soon be extended to Asturias too.



Looking to 2020



■ On the point of clocking up 4 decades, GMV is now a 2000-strong firm that has taken on 600 new recruits just in the last year. Its contract winning rate is continually rising year after year, winning it a place among the biggest sector firms.

2019 was a particularly successful year for the company, so it had to be celebrated in grand style. Colleagues from the US, Portugal, Poland, Romania, Germany, France the UK and from each of the Spanish offices were able to toast the outgoing 2019 and look forward to a prosperous 2020 in their respective Christmas office-parties.

Every year, too, GMV holds a Christmas card competition for our colleague's children, the winner being taken up as the company's official Christmas card. This year's competition attracted 165 participants in the three categories of 0 to 4 years, 5 to 8 and 9 to 12. The jury of company employees picks a winner in each of these categories, who are then presented with their prizes in a ceremony held in the company's Tres Cantos head office. All the entries are displayed in this ceremony, amidst an array of games and robotics workshops for various

age brackets. From the shortlist of the three category winners all the company's employees then vote for the one to be adopted as GMV's official Christmas card.

2019 has been a prolific year, exceeding our wildest dreams. We now confidently expect 2020 to be just as prosperous. Happy new year to one and all!



GMV hailed at LinkedIn's Talent Awards

■ On 4 December Madrid hosted the fifth Spanish prize-giving ceremony of LinkedIn's Talent Awards Spain. The aim of this annual award scheme is to distinguish the best-performing firms in terms of attracting the top talent and then encouraging an ongoing sense of loyalty to the firm.

GMV has been chosen as finalist in the Best Talent Acquisition Team category for firms with over 500 employees. This nomination represents recognition not only of

GMV's People, Strategy and Culture team but also the teamwork and daily effort of all the company's personnel and departments.

Over its 35-year history GMV has always pursued specific talent-attraction and -management policies, in keeping with its overall business strategy and as one of the main planks of its corporate culture. We apply time-thrifty, dynamic and attractive personnel selection processes to keep up with

GMV's non-stop growth. We offer groundbreaking, technological and international projects to work on, and a flexible working environment to help employees reconcile home lives and careers. The upshot is a team of the very best professionals.

This nomination comes at a time of all-out growth for GMV. In the last year GMV has expanded notably and taken up new internal-communication approaches to make the company even more flexible, diverse and innovative across the board.



Camaraderie inside and outside the office



■ Every year, shortly before the Christmas festivities kick off, Madrid welcomes fun-seeking, running-shoe-wearing workers from 1200 different firms. This year's Company Run (Carrera de las Empresas) was held on 15 December, following its traditional route down the Madrid street called Paseo de la Castellana.

GMV, part of the all-time high turnout of 1238 firms, participated in this year's run in its own right, fielding a total of 30 teams running in the two distances of 10 k and 6.5 k.

Whether the runner is a novice or expert this competition is always held with a clear aim in view: sportsmanship and camaraderie to end the year on the right foot.

Beatriz García Navarro

«In GMV you develop not only career-wise but also as a person»

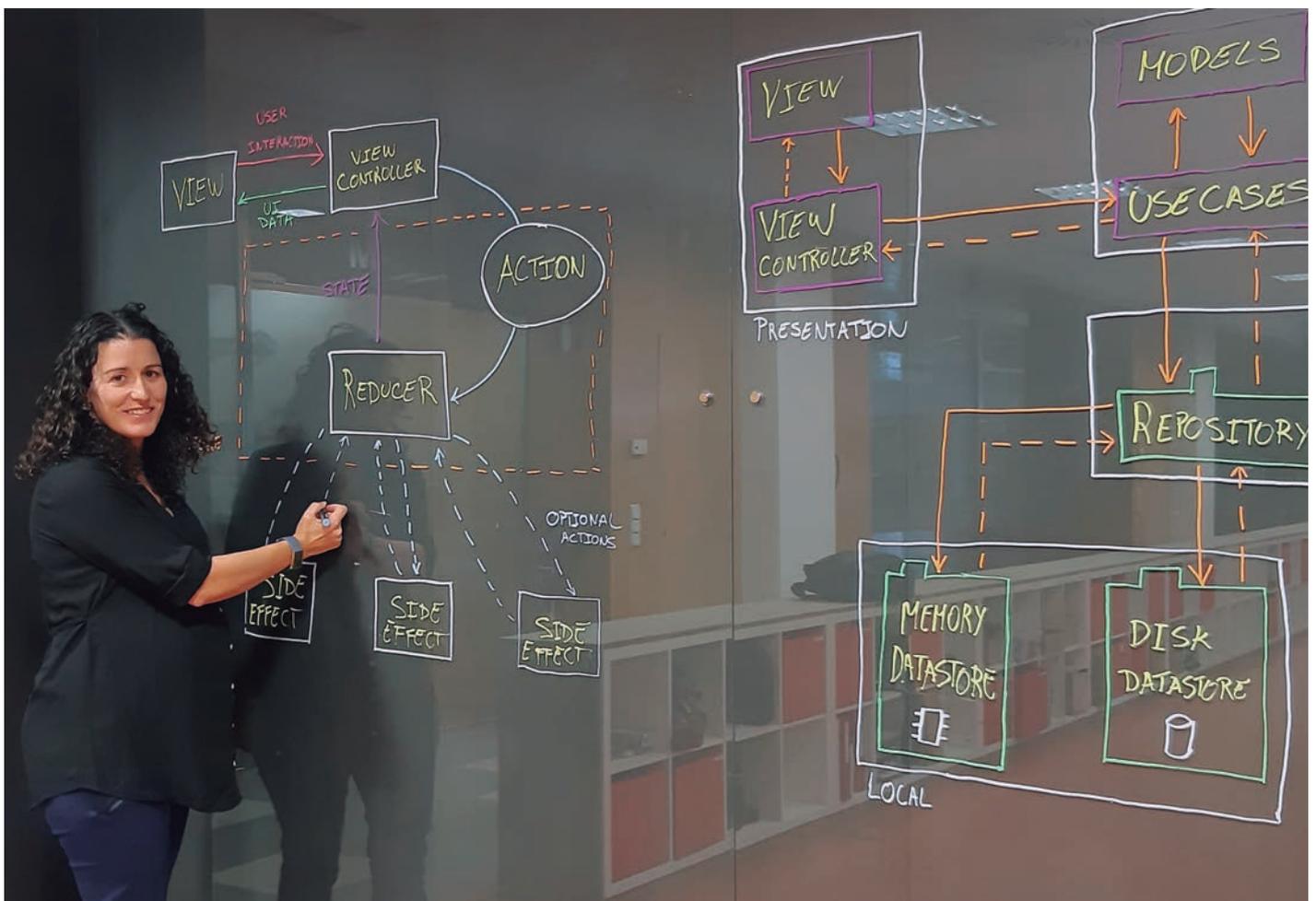
My GMV story starts when I was studying electronics engineering at Valladolid University. While I was checking out the free-choice credit options, the PAVES caught my eye. The acronym "PAVES" stands for "Profesores Asociados Vinculados a Empresas" (Associated Company-Linked Teachers). This particular course was an onsite GMV course on GPS giving students an introduction to GPS signal receivers with classes on the various projects GMV was participating in at that time.

At the start of my last year at university, in September 2007, I was

looking at the notice board when I saw an advert for a bachelor thesis at GMV. This brought back to my mind the previous year's PAVE experience. Although the idea of an in-company bachelor thesis was new to me, it struck me as an interesting prospect and a great opportunity, so I took the plunge and applied for the position. Shortly afterwards I was called to interview at GMV. Truth is I was pretty nervous; after all, this was my first ever interview. Everything went swimmingly, however, and a few days later they called me to tell me I'd been chosen for one of the positions. It was at that moment that I began to work at GMV as external personnel.

Right from the start my career has been geared towards software development for Electronic Control Units (ECUs). At first this was for the new equipment being developed by GMV to be fitted in private vehicles or company fleets. Shortly afterwards, in

The BMW project, calling for the strictest quality standards, posed a huge challenge for GMV as a whole and for all of us who had pitched in



JOB: Section head
Automotive area /Intelligent
Transportation Systems

DOB: 16/03/1984

QUALIFICATION: electronics
engineer

START DATE
June 2009

OFFICE: Valladolid (Spain)

HOBBIES: traveling, movies.

DEFINES HERSELF AS: a patient
person who sets herself high
standards and likes to listen more
than talk



summer 2009, a great chance cropped up. GMV won a Telematic Control Units (TCU) software development tender for an important manufacturer through a TIER-1 network. It was then when I was invited to join GMV's staff. I didn't really think twice because the project was not only fascinating in itself but also boded well for my whole career, even though it meant a complete change in my working methods hitherto and a whole new arrangement of working directly with carmakers (OEMs). Another of the reasons I jumped at the chance was to be able to carry on working with a great team where I had already built up a rewarding camaraderie.

After accepting this opportunity I buckled down to some hardworking years. But the thrill of seeing new cars coming onto the market line fitted with the fruit of part of your time and effort is more than reward enough for all your hard work.

That first opportunity opened the doors to new projects with top-level OEMs, allowing me to develop my own career from software developer through software head and ending up as project manager. These new projects also allowed me to travel a

lot: Barcelona, Paris, Brazil, etc. And although this was at times quite frenetic the continual change of scenery also helps to clear your mind.

Almost a year ago now I was surprised by a new challenge. My line boss up to that time moved on to pastures new so I had the chance to step into his shoes as section head. The emotions were mixed: on the one hand I was sad to see the disappearance of the person who had always been my most stalwart support; on the other, I was thrilled at the new opportunity. But I chose to see it as a vote of confidence in my capabilities and a reward for my career so far, so, albeit somewhat daunted, I took up the post and have been carrying it out to the best of my abilities to date.

As far as this new task left me any leeway, I also joined the team drawing up the BMW tender, working together with other sectors of GMV's business setup. Although this process dragged out, GMV finally came out the winner. It was a project where all GMV's sector-based companies chipped in, my particular role being to manage the operational software side. The project, calling for the strictest

quality standards, posed a huge challenge for GMV as a whole and for all of us who had pitched in.

GMV has also given me the chance to nurture my own career, forming part of STEM Talent Girl, a program that sets out to attract budding female talent into science, technology, engineering and mathematical careers. My participation in this scheme, dating from the start of this current year, has been a very enriching experience for my career and for me personally. Several parties of final-year Spanish high-school pupils have visited us in our workstations and accompanied us for a couple of hours during our working day. This gives us the chance to explain our day-to-day work and the projects carried out by the department.

This has been my GMV story. But I don't want to sign off without pointing out that GMV is not just a job; it's much more. GMV boasts a great working environment, and I form part of a young, highly motivated, hardworking and ever-helpful team. This means that you end up feeling not only a colleague but also a friend and even, in some cases, part of a second family.



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