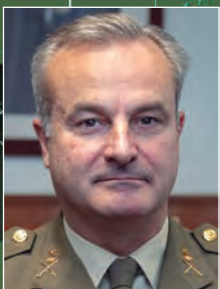


PARADIGM SHIFT IN EUROPEAN DEFENSE COOPERATION

INTERVIEW



**FELIPE
DE LA PLAZA
BRINGAS**

Subdirector General of International Relations
Directorate General of Armaments and Material
(DGAM) Spanish Ministry of Defense



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LETTER FROM THE PRESIDENT



The European Union's first two goals are to "promote peace, its values and the well-being of its citizens" and to "offer freedom, security and justice without internal borders". These goals are a reaction to our history, plagued with wars between European countries. After two world wars that left Europe divided and seething with resentments, today we find ourselves in a European Union that has managed to mend even the later division of Europe into two opposing Cold War blocs. The global international picture today is a very different one, with several major powers and diverse regional and worldwide organizations and confederations. In this scenario it is the EU that gives a powerful voice of their own to the European countries.

The defense of freedom, security and justice without internal borders calls for concerted action capabilities rather than for individual ones, efficiently pooling national capacities into a greater whole. This is the goal of various European initiatives that have recently picked up

pace, driven, among other factors, by the UK's likely exit from the European Union, that will leave it significantly weakened.

GMV collaborates with the Spanish Ministry of Defense adapting satnav technologies to suit, developing avionics software or setting up command and control centers, surveillance systems or training simulators. GMV is now also responsible for managing the keys for Galileo's Public Regulated Service signal and works for several European organizations to enable information exchange through the interoperability of international systems and the compatibility of various databases. For all these activities we have often tapped into expertise built up in other areas of civilian application within GMV Group as a whole, which closed 2018 with a turnover of nearly €200 million and an 1800-strong staff.

Mónica Martínez

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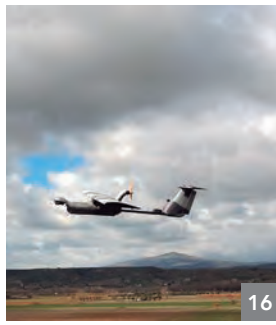
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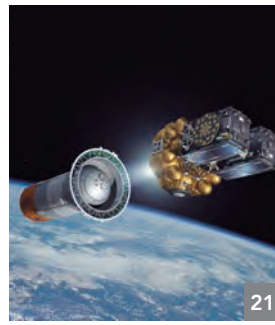
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INTRODUCTION

In recent years the panorama of European cooperation in defense has gone through a radical transformation. In the words of Federica Mogherini (currently holding the post of the European Union's High Representative for Foreign Affairs and Security Policy) "in the last two years we've made the same headway as in the previous 4 decades". Indeed, when Mogherini first came into her post in November 2014 she knew she faced a sterling challenge. In an atmosphere of utter political uncertainty within the EU, and amidst a worldwide downturn, Mogherini had to encourage European cooperation in defense while respecting the member states' right to their own budgetary decisions on this matter, which impinges on the sovereignty of each nation in such a crucial area as national security.

Back in 2007 Mogherini's predecessor in the post, Javier Solana, called on member states to make a bigger investment in technology, urging them to "spend more, spend better and spend better together". Today, over 10 years later, the European Union has cooperation mechanisms in place that are firmly backed by member states and are amply funded for the first few years of the undertaking.

In this new scenario the gap between industry and the politicians in charge of both national defense and technological development (ministries of defense, industry, economy, etc.) has closed considerably. In fact it is no longer rare to find joint work teams (made up by members of the government and industry) defending and negotiating initiatives before European institutions or other EU countries.

BACKGROUND

To understand this transformation we need to glance back for some perspective. The Common Foreign and Security Policy (CFSP) was established in the Maastricht Treaty of November 1993. This policy sought the following objectives: preserving peace, strengthening international security, promoting international cooperation and developing and consolidating democracy, the rule of law and respect for human rights and fundamental freedoms.

Looking back now, the initial plans of the CFSP (subsequently fleshed out in other official texts such as the revision

of the Common Foreign and Security Policy in 2003) seem fairly ambitious. We need, however, to bear in mind here that, after the armed conflict in the former Yugoslavia, the EU had taken the firm decision not to find itself embroiled again in a situation that jeopardized its independence or ability to take its own decisions.

The feeling of political uncertainty only increased after the EU's expansion to the countries of Eastern Europe in 2004 and 2007, whereupon some doubts were cast on the continuity of the CFSP itself. Nonetheless, the Treaty of Lisbon in 2009 notably shored up the CFSP by extending the Union's competence in matters of





PARADIGM SHIFT IN EUROPEAN DEFENSE COOPERATION

common foreign and security policy to cover all areas of foreign policy and all questions relating to the Union's security (article 24.1).

In article 42 the Treaty of Lisbon also declared the Common Security and Defence Policy (CSDP) to be an integral part of the CFSP in order to provide the Union with an operational capacity drawing on civilian and military assets. The Union was also authorized to use them on missions outside the Union for peace-keeping, conflict-prevention and strengthening international security in accordance with the principles of the United Nations Charter, albeit also stipulating that the performance of these tasks

shall be undertaken using capabilities provided by the Member States.

The long drawn-out process of creating a common European Defense policy chalked up possibly its watershed feat on 28 June 2016, when Federica Mogherini presented the Global Strategy for Foreign Affairs & Security Policy to the European Council. This initiative, which served as the starting pistol for the breathtaking changes of the last two years and laid down the bases for today's cooperation framework, establishes the fundamental principles for protecting Europe and Europeans, helping the various governments to build up a joint military capacity and

develop a better response to crisis situations.

This global strategy sets itself five strategic priorities:

- Building resilience and taking an integrated approach to tackle conflicts and crises.
- Security and Defense.
- Strengthening the internal/external nexus.
- Updating existing strategies or preparing new ones.
- Enhancing public diplomacy.

CURRENT PICTURE

The EU has decided to implement the EU Global Strategy on Foreign and Security Policy (EUGS) by means of the European Defence Action Plan (EDAP), approved in November 2016. This plan rests on four pillars:

- Set up a European Defence Fund (EDF).
- Foster investments in SMEs, start-ups, mid-caps and other suppliers to the defense industry.
- Strengthen the Single Market for defense.
- Bring in wider-ranging European Union policies.

EUGS also includes reinforcement of the Capability Development Plan (CDP) and urges member states to provide assistance in the development of capabilities deriving from the political objectives of said strategy. The most recent CDP version was drawn up in 2018 together with the EU Capability Development Priorities, approved in June 2018. This CDP has been developed by the European Defence Agency (EDA) together with member states, with further contributions from the EU Military Committee and the European Union Military Staff (EUMS).

The CDP stands as a benchmark reference and provides guidelines for coherent development of Europe's security capabilities, including the

most important activities of the current working framework:

Coordinated Annual Review on Defence (CARD)

CARD's overriding aim is to drive development in areas where shortfalls have been detected, promote defense cooperation and ensure optimum use of defense expenditure plans. CARD will thus bring in a gradual synchronization and mutual adaptation of national defense planning cycles and member states' capability building practices.

EDA, which acts as CARD secretariat, in cooperation with the European Union External Action Service (EEAS), has drawn up a plan detailing the main elements of CARD; this plan has received inputs, among others, from the EU Military Committee, the defense-policy decision makers of member states, capability directors and national armaments directors.

In May 2017 the European Council approved the working arrangements laid down by CARD, kicking off a trial period working towards full implementation by autumn 2019.

Permanent Structured Cooperation (PESCO)

The Permanent Structured Cooperation (PESCO) program, under joint secretariat of EDA and EEAS, is a working framework and associated process based on the EU Treaty; it encourages "willing and able" member states to jointly plan, develop and invest in shared capability projects. This mention of "willing and able" is crucial, establishing as it does the voluntary character of this cooperation. Its overriding aim is to jointly develop

defense capabilities to be employed on European military operations. Although it is true that there are similar European defense-cooperation initiatives, what makes PESCO stand out from the rest is the binding nature of any commitments taken on by member states. That is to stay, for the first time ever, 25 EU nations have undertaken to collaborate regularly in a defense project, thus opening up the door to a wide range of unprecedented capabilities.

Each member state is urged to communicate yearly its National Implementation Plan (NIP), thus telling the rest of the nations how it proposes to respond to the commitments taken on in the program.

Note that the military capabilities built up under the PESCO program remain in the member states, which in turn may make them available to other organizations such as NATO or the United Nations.

As of today a total of 34 PESCO projects have been formally adopted by the Council in two series (17 of them on 6 March 2018 and another 17 on 20 November 2018). The projects, divided into operations and capability-building, take in a wide range of areas such as a European Medical Command, a European Union Training Mission Competence Centre, Cyber Rapid Response Teams or the European Command and Control System (led by Spain).

The decision has been taken to update the list of PESCO projects in November of each year.

European Defence Fund (EDF)

The main aim of the European Defence Fund (EDF) is to coordinate, supplement and amplify national investments in defence research. It is no secret that Europe's defense market is highly fragmented. Witness one telling example: Europe of the 28 member states has a defense budget that is about one quarter of the USA's and nonetheless has three times as



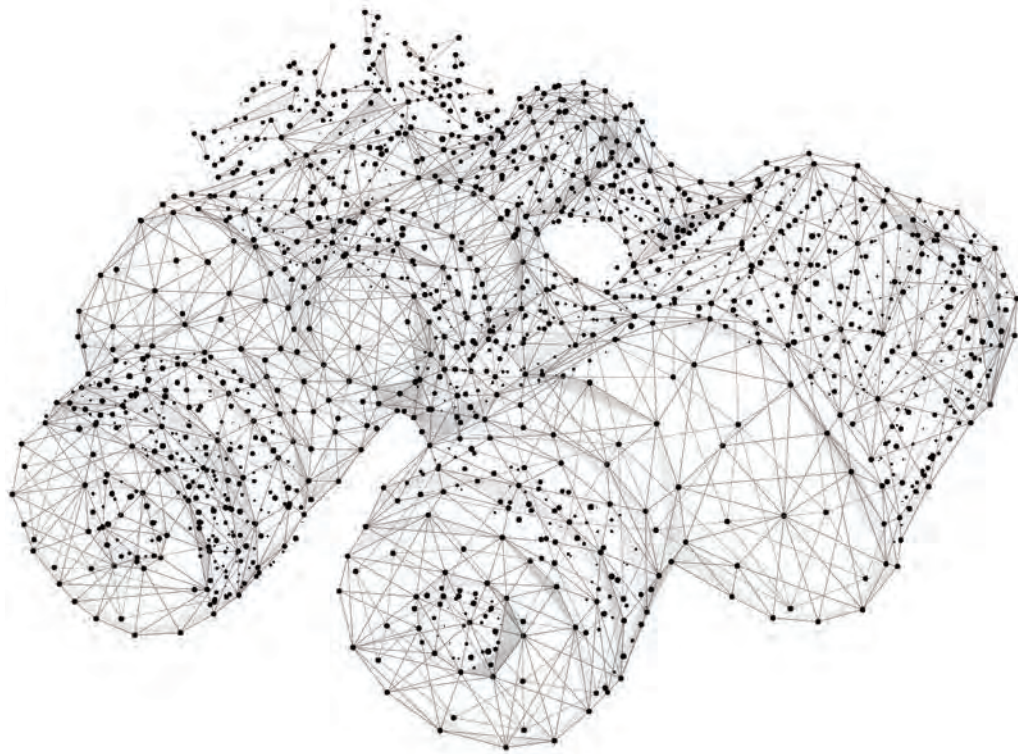
many combat aircraft models. This lack of cooperation between European member states spawns overspenders reckoned to be between €25 billion and €100 billion a year. This striking market-fragmentation picture in comparison with the defense market across the Atlantic is largely due to the fact that USA deals with a single client whereas in Europe it is estimated that about 80% of defense procurements are made in an environment restricted to each particular nation, originating a huge overlap of military capabilities. Be that as it may, the aim of the EDF is not to replace the efforts of each nation's defense outlay but to serve as a multiplier of same.

By virtue of the €13 billion investment for the 2021-2027 period, the EU intends to enter the group of Europe's main defense research investors. It is planned to divide this outlay, firstly, into €8.9 billion to be spent on co-funding collaborative capability-building projects, as a complement to the contributions of each member state, and, secondly, €4.1 billion to finance research projects centering on emerging security threats.

The EDF has been structured (according to the term chosen by the sector to describe this initiative) into two "windows":

■ **Research Window.** This aims to finance collaborative research projects on groundbreaking defense projects and technology. The EU directly finances entire project costs. The research areas have to be agreed previously between the member states; the main areas to be covered are electronics, metamaterial, encrypted software or robotics. This research window is divided into two phases:

- Preparatory Action on Defence Research (PADR). Paralleling the EU's security research initiative from 2004 to 2006, the research window kicks off with a €90-million preparatory action running from



2017 to 2019. The PADR largely adopts the EU-defined Horizon 2020 funding and execution mechanisms.

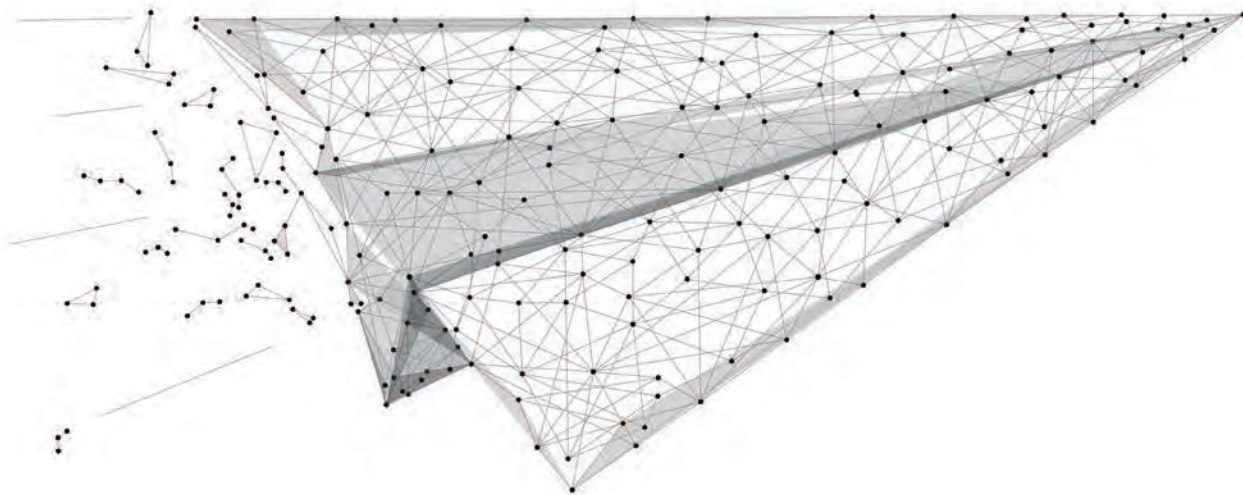
- European Defence Research Program (EDRP). This program is to work on a €500 million yearly budget as from 2020.

■ **Capability Window.** Under this mechanism the EU will be creating incentives for member states to cooperate both in technology development and in the procurement of defense equipment, doing so by means of cofunding against EU budgets and supporting program implementation. The funding of collaborative projects only is envisaged, and the program offers incentives to promote international cooperation of SMEs.

This capability window is in turn divided into two phases:

- European Defence Industrial Development Programme (EDIDP) from 2019-2020, designed to finance (among other initiatives) feasibility studies, system prototyping, testing or certification. The program has a €500 million budget.
- As from 2020 the funding is expected to be stepped up to €1 billion per year. By then this outlay is expected to spawn a multiplier effect of 5 in the defense market and thus build up to a volume of activity worth €5 billion a year.





MAIN CHALLENGES

As all the above has shown, the cooperative defense development picture is frankly bright right now. We are dealing here with a paradigm shift and the sector is looking ahead with hope. Nonetheless, we still face many stiff challenges. One of them is the sheer complexity of cooperation arrangements between civil and military organizations. Decrying the need for civic-military cooperation is a constant feature in current humanitarian response operations, given the continually shifting nature of modern conflicts, natural disasters and international crises.

Each crisis scenario is unique; this means that this cooperation has to be analyzed on a case-by-case basis; this often poses sterling challenges in terms of combining the mission's operational objectives, avoiding overlapping effort, minimizing inconsistencies, maintaining neutrality and promoting humanitarian principles. In fact the civic-military cooperation scenarios take in a wide range of possibilities, from simple coexistence (typical in high-intensity combat situations) through to effective cooperation (more frequent in peace-keeping and conflict-resolution operations).

This cooperation is crucial, bearing in mind that in any crisis situation there will be certain needs that

one of the actors will generally be better equipped to deal with, such as communications support, airport reconstruction, support for road- and bridge-rehabilitation operations in the case of military forces; or refugee support, local mediation, support for teaching programs and development of environmental programs in the case of civil organizations.

Another of the standout challenges, which also represents a fine development opportunity, is EU-NATO relations, which are one of the mainstays in the construction of European defense (in fact enshrined in the EUGS); this factor is also making considerable headway at the moment.

In July 2016 the president of the European Council together with the President of the European Commission signed a joint declaration in Warsaw designed to drive and reinforce EU-NATO relations. This agreement lays down seven strategic areas:

- The fight against hybrid threats.
- Broaden and adapt operational cooperation including at sea and on migration.
- Expand coordination on cyber security and defense.
- Develop coherent, complementary and interoperable defense capabilities.

- Facilitate a stronger defense industry and greater defense research.
- Step up coordination on exercises.
- Build the defense and security capacity and foster the resilience of partners in the East and South.

Although the potential of this cooperation agreement is obvious, external threats, the establishment of political agreements and the aforementioned fragmentation of the European market mean that the path towards fully effective cooperation is still strewn with difficulties.

Last but not least, another challenge to be met by the construction of European defense is handling the consequences of Brexit, with a final deal still in the air at the time of writing. The shilly-shallying nature of the negotiations makes it impossible at the moment to hazard even an educated guess about what future EU-UK defense relations will look like.

For example, a hard Brexit would undoubtedly be dire for both parties, setting up market barriers that would considerably constrain the development of defense capabilities in Europe and call for a rethink of the industrial strategy of companies with common interests on both sides. Upon leaving the EU, the UK will cease to be a member of EDA, whereupon the participation of British organizations in all the above mentioned cooperation programs would be severely affected.

GMV'S POSITION IN THE INTERNATIONAL MARKET

GMV boasts a long track record of cooperation with international agencies by way of contracts won in open tender. The company has collaborated with the European Defense Agency (EDA) since its creation back in 2004. Under the Joint Investment Program in Force Protection GMV was the only European company that managed to land two contracts. This collaboration with the EDA has grown even closer in the last two years and the company is now working for the agency in such important areas as cyberdefense, Big Data, C2 systems for dismounted soldiers and federated mission networking.

In the first batch of projects under the Preparatory Action on Defence Research (PADR), GMV is one of the few European firms to take part in two of the selected projects, OCEAN2020 and GOSSRA. In the former, which focuses on research into maritime surveillance technology, GMV's contribution revolves around C2 (Command and Control) and Joint Intelligence, Surveillance and Reconnaissance (JISR). GOSSRA, for its part, will boost compatibility of the components of complex systems (such as sensors or digital protective goggles) carried by dismounted soldiers.

In 2010 GMV became the main contractor for the design, maintenance, deployment and future development of the EUROSUR network for the FRONTEX Agency. The collaboration began with a pilot project and then moved onto two fully-fledged framework contracts between GMV and the Agency.

For the European External Actions Service (EEAS), moreover, GMV is priming the design and development of the European Command and Control Information System used by EEAS on its missions outside Europe.

GMV is also a longstanding collaborator

of the European Maritime Safety Agency (EMSA) in such activities as studies to pinpoint the user benefits of Remotely Piloted Aircraft Systems (RPAS) in the marine environment or the provision of ICT services. GMV is additionally providing satellite image processing services in the area of security through two framework contracts with the European Satellite Center, namely Reference Mapping and Support to External Actions

In the JISR area (Joint, Intelligence, Surveillance and Reconnaissance), and as part of Spain's participation in NATO's MAJIC project, GMV is collaborating with diverse NATO organizations as well as MoDs of NATO member countries on both sides of the Atlantic, offering its inhouse Mobile ISTAR Operating system (called SEISMO after its Spanish initials: Sistema de Explotación ISTAR Móvil), **csd sierra** (Coalition Shared JISR, Interfaces and Services), **atenea** (Intelligence Requirements Management & Collection Management Tool) and **collector** (ISR sensor simulator), which pools information from many different sources

to provide intelligence analysts with the necessary tools for exchanging ISR information and performing workflows that enable interaction throughout all JISR phases.

Finally, GMV is playing a standout role in the European Commission's framework security research programs, mainly H2020 and its forerunner FP7. GMV's activity has centered on maritime surveillance by means of participating in diverse projects such as CLOSEYE (Collaborative evaluation Of border Surveillance technologies in maritime Environment by pre-operational validation of innovative solutions), EUCISE2020 and MARISA (Maritime Integrated Surveillance Awareness), as well as crisis management with the DRIVER project (Driving Innovation in Crisis Management for European Resilience).





FELIPE DE LA PLAZA BRINGAS

**SUBDIRECTOR GENERAL OF INTERNATIONAL RELATIONS
DIRECTORATE GENERAL OF ARMAMENTS AND MATERIAL (DGAM)
SPANISH MINISTRY OF DEFENSE**

Felipe de la Plaza is a Major General of the Spanish Army. Since April 2017 he has held the post of Deputy Director General for International Relations of the Directorate General of Armaments and Material (Dirección General de Armamento y Material: DGAM).

His army career has always been closely bound up with the artillery units of the Paratrooper Brigade, Air-Transported Brigade and Campaign Artillery Command. He is a veteran of operations in the Balkans and Afghanistan.

Graduate of the United States Artillery School and General Staff Diploma holder, his international experience includes postings in the Army and Joint Staffs, the Directorate General of Defense Policy and the Supreme Headquarters Allied Powers Europe (SHAPE), as well as Spanish Deputy Representative in NATO and EU Military Committees.

COULD YOU GIVE US A BRIEF ACCOUNT OF THE DUTIES OF THE SUBDIRECTION GENERAL OF INTERNATIONAL RELATIONS WITHIN THE ORGANIZATION CHART OF THE MINISTRY OF DEFENSE?

The Underdirectorate for International Relations is responsible for promoting bilateral and multilateral relations in defense material and armaments, encouraging institutional support for internationalization of Spain's defense industry, coordinating international promotion of the disposal of defense products and property and controlling international trade of defense material and dual-use technology and products, as well as the management of foreign defense investments in Spain.

WHAT ARE THE SUBDIRECTION GENERAL OF INTERNATIONAL RELATIONS' MECHANISMS FOR SUPPORTING AND DRIVING INTERNATIONALIZATION OF SPAIN'S DEFENSE INDUSTRY?

I'd say that the subdirectorate's prime asset is its magnificent human team made up by a set of highly skilled men and women with a wealth of international experience.

Working around the market study and planning teams of the Foreign Support Office (*Oficina de Apoyo Exterior*: OFICAEX), the Multilateral Cooperation Area and the Trade and Investments Units, they represent an authentic guarantee of a modern and efficient institutional support, representing us

in the main international debating forums and making sure that the capital investments of Spain's industry and the sales of armaments and material are carried out lawfully and in keeping with Spain's interests.

«The subdirectorate's prime asset is its magnificent human team made up by a set of highly skilled men and women with a wealth of international experience»

These are the real reasons why we are today able to provide Spain's industry with effective support enjoyed only by the top European countries.

WHAT ARE THE MAIN WORKING RELATIONSHIPS WITH EUROPEAN INSTITUTIONS OF THE DGAM IN GENERAL AND OF THE UNDERDIRECTORATE FOR INTERNATIONAL RELATIONS IN PARTICULAR?

From my point of view the European Union has made an unequivocal commitment to defense as a capital factor in its development project, doing so by means of two complementary initiatives: the European Defense Action Plan and the Permanent Structured Cooperation (PESCO). Both share the same objective: to boost Europe's defense cooperation.

The first of them, the European Defense Action Plan, aims to develop military capabilities cooperatively and set up a European Defence Technological and Industrial Base. I'd define this as a veritable driving force behind Europe's defense policy.

The second, initially promoted by Germany, France, Spain and Italy, with the immense majority of the EU countries then joining in, advocates defense as one of the construction mechanisms of the European identity. In practical terms this takes the form of a commitment to increase defense budgets regularly; to drive a mid-term increase in investment in new military capabilities; to boost participation

«The European Union has made an unequivocal commitment to defense as a capital factor in its development project, doing so by means of two complementary initiatives: the European Defense Action Plan and the Permanent Structured Cooperation»

in cooperative military programs and, finally, a willingness to play a substantial role in the development of all necessary wherewithal for achieving the EU's defense ambitions.

In both cases the subdirectorate coordinates all these efforts on a national basis to ensure Spain, in keeping with its status, plays a key role in both initiatives.

This is a new playing field, unexplored hitherto, in which European funds are going to form part of research financing and the development of military capabilities. I sincerely believe that we should be heading this effort, accepting our responsibilities and demanding our rights as one of the fundamental countries in the construction of the future European Union.

IN RECENT YEARS THE EU'S IDEAS OF THE DEVELOPMENT OF EUROPE'S DEFENSE CAPABILITIES HAVE CHANGED BEYOND RECOGNITION. IN LIGHT OF THIS, HOW DO YOU SEE COOPERATION AND COORDINATION WITH THE ATLANTIC ALLIANCE?

Well I'd say that the European Union, or rather its member states, have responded in recent months to a longstanding demand, mainly from the United States: i.e. greater co-responsibility in defense and security matters. Europe no longer wants to be a bit player in defense affairs.

But I'm also sure that when 22 countries are, simultaneously, members of both organizations, sharing values, forces, capabilities and budgets, then words like cooperation and coordination will become key. I believe this is the path we've all struck out on... there can be no turning back.

FOLLOWING ON FROM THE PREVIOUS QUESTION, EU'S DECISIVE SUPPORT OF INTERNATIONAL DEFENSE COOPERATION PROGRAMS SEES CIVIL ACTORS PLAYING AN IMPORTANT PART IN CRISIS SITUATIONS. DO YOU SEE THIS AS A RISK OR OPPORTUNITY?

No one longer any doubts that coordination between civil and material efforts is now crucial in dealing with

modern conflicts, that both should be an essential part of the response to crises.

If we factor in too that many of the modern technologies clearly have a twofold use, then the answer is clear.

In the future, for example, there are bound to be command and control systems involving civil actors in any theater of operations or drones capable of acquiring intelligence from military targets and watching out for wild fires. This opens up a whole debate about use, financing and inter-ministerial cooperation, which it is no longer possible or desirable to halt.

AT A TIME WHEN MEMBER STATES, EUROPEAN INSTITUTIONS, INDUSTRY AND ASSOCIATIONS ARE WORKING TO DEFINE THE FUTURE CAPABILITIES AND DEFENSE FINANCING METHODS, WHAT PART DO YOU THINK SPAIN SHOULD PLAY IN THIS SCENARIO? IN WHICH SECTORS OR INITIATIVES COULD IT PLAY A PROMINENT ROLE?

Spain is one of the EU's four great industrial and military powers, especially after the foreseeable exit of the UK next March.

It therefore behoves us to take on an important role in the construction of this European defense now looming up on the horizon.

Spain's industry is ready for this and, in collaboration with the Ministry of Defense and industrial associations, has been closely tracking ongoing political and legislative events in this field of the development and financing of military capabilities. This is now happening at breathtaking speed, measured against the normal pace of events in Europe. One of the positive effects of the crisis of recent years has perhaps been that of diverting Spain's industry towards international markets; this has placed it in a much more favorable starting position than would otherwise have been the case.

I believe we have a sound industrial base, especially in terms of small and mid-sized firms. This will allow us to become trustworthy and highly skilled partners in future European industrial

consortia, whichever field may be involved.

DO YOU BELIEVE THAT BREXIT WILL IMPINGE ON DEFENSE AND SECURITY RELATIONS?

It's bound to. But it's a sovereign decision we all need to come to terms with. The United Kingdom has a considerable military and industrial capacity, but setting up shop outside the EU is a huge ask for any country; it's not a risk I'd like Spain to take.

I believe the ball is now in the UK's court and it now has to define the role it wants to play and how it wishes to address its future relations with an industrial, economic and, maybe soon, military power of the dimensions of the European Union.

HOW WOULD YOU WEIGH UP THE EUROPEAN DEFENSE INITIATIVES THAT ARE NOW UNDERWAY (CARD, PESCO, PADR, EDIDP, EDRP, ETC) AND HOW DO YOU SEE THE CAPACITIES OF SPAIN'S INDUSTRIAL FABRIC FOR TAPPING INTO THE NEW BUSINESS OPPORTUNITIES THAT ARE NOW CROPPING UP?

As I've already said I do believe that the European Union has decided to shrug off its bit-part role in security and defense matters. This involves defining and regulating a planning and supervision system of the capability-building process and a common industrial policy in defense matters.

All these initiatives, plagued with initials, are pretty difficult to understand for the public at large, but they are no more than development tools working to this end. We are now tidying up an affair that, up to now, each country carried out individually without any overall cohesion and, I must admit, with a large leeway for improvement as far as common goals in European cooperation are concerned.

I believe that the future of Spain's industry depends on its catching this bus and playing a key role in Europe's future industrial consortia.

If we miss this bus it will soon become very difficult to compete or keep up. I believe our industry has cottoned on to this fact and has reacted very positively.

The challenges are daunting but the opportunities are huge.

Spain's future lies in cooperation and this calls for an economic effort at individual and country level. European defense is no longer a pipedream; it is now a tangible reality. Spain and its industry cannot afford to look aside.

«I do believe that the European Union has decided to shrug off its bit-part role in security and defense matters»



GMV develops U-Space services under the SESAR program

GMV WILL BE PROVIDING TRACKING, EMERGENCY-MANAGEMENT AND GNSS PERFORMANCE FORECASTING SERVICES FOR NAVIGATION AND SURVEILLANCE WITHIN THE DOMUS PROJECT, ONE OF THE FIVE EUROPEAN PROJECTS SELECTED BY THE SESAR PROGRAM FOR DEMONSTRATION OF U-SPACE SERVICES FOR UNMANNED TRAFFIC MANAGEMENT

G MV has been chosen by Spain's air-navigation services provider, ENAIRE, to provide tracking, emergency-management and GNSS performance forecasting services for navigation and surveillance within drone-regulating legislation (*U-Space*) of Europe's air transport program SESAR (*Single European Sky ATM Research*).

The ENAIRE-led DOMUS project, also involving GMV, is one of the five European projects selected by the SESAR program for demonstration of U-Space services for Unmanned Traffic Management (UTM).

Within Europe's great drone-integration challenge, SESAR is defining U-space as a set of new services and specific procedures designed for ensuring secure and efficient drone airspace access. U-space's remit is to provide a working framework for secure drone operations of all types in any environment, including built-up areas, and with a clear interface with manned aviation, ATM service providers and the authorities that be.

U-Space implementation, establishing four main service categories (U1 to U4), is tied up with the availability of services and technologies. Within the



DOMUS project GMV will be providing U2 services, supplying support in the management of drone operations in the field of tracking, emergency management and GNSS performance forecasting for navigation and surveillance.

- The tracking service is responsible for processing and merging speed and positioning data provided by different systems such as U-Space Service Providers, the e-Identification service, ADS-B transponders and other positioning sources such as Radio Positioning System (RPS) services for mobile telephony operators. This is a crucial service for proper working of other U2 and U3 services such as the service for detection of drone-intrusion in prohibited areas (geofencing) or the conflict prediction service, both with drones and manned aircraft.
- The emergency-management service is responsible for managing alerts generated by the various unmanned aircraft traffic management services plus any alerts issued by drone operators, such as a loss of control. This

service also caters for notification of recorded alerts to authorities and other U-Space services, as well as airspace restriction arrangements in emergency-affected areas.

- The GNSS Surveillance and Navigation Performance Forecasting service will see to previous calculation of service levels reachable by navigation and surveillance functions of onboard drone avionics, thus allowing would-be drone operators to check beforehand if they will be capable of complying with such requisites as may be laid down for various types of operations (e.g., in built-up areas).

GMV's participation in DOMUS places it at the cutting edge within U-Space and cements its position in the development of advanced technological solutions for drones, thus rounding out its range of flight computers for drones of the "specific" category, the drone-information operating systems for defense and security applications and the application of GNSS systems for air-navigation surveillance.



The DOMUS project, is one of the five European projects selected by the SESAR program for demonstration of U-Space services for Unmanned Traffic Management (UTM)

GMV analyzes EGNOS and Galileo capabilities as applied to unmanned aircraft

■ The U-Space goal will be fulfilled in 2035. By that time it is estimated that there will be around 400,000 drones flying in Europe, fully integrated into the emergency and safety system and used for such purposes as telecommunications, messaging, smart-city applications and of course for entertainment, and even for transport of persons.

In collaboration with CATEC, GMV is involved in a VVA-led project that aims to standardize EGNOS and Galileo services in aircraft such as drones,

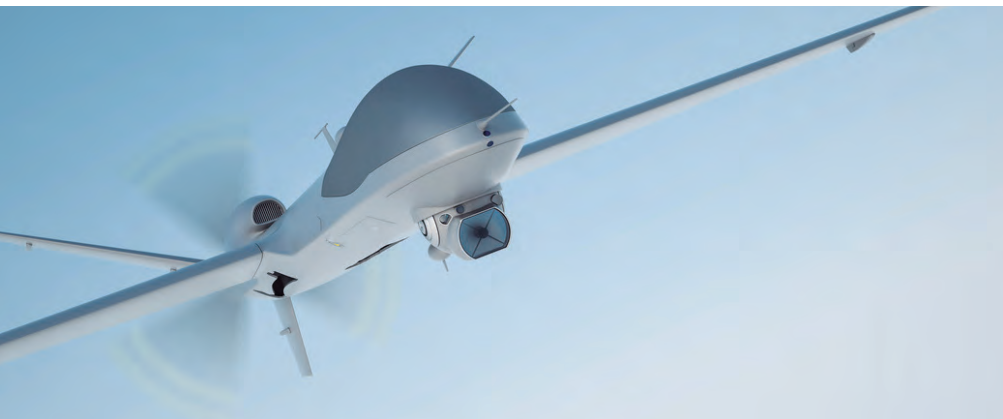
Remotely Piloted Aircraft Systems (RPASs), Unmanned Aerial Vehicles (UAVs) and Unmanned Aerial Systems (UASs).

The consortium will show how European GNSS services (EGNOS and Galileo), in comparison to other GNSS solutions, will add value to navigation, electronic identification and geofencing functions. In addition, the capacities of EGNOS and Galileo for this type of aircraft will be analyzed, carrying out the necessary tests and campaigns. The consortium will draw up the

standardization requests and evaluation of the project's economic viability. The project is currently in its first phase, identifying the strong points of Europe's GNSS services and the necessary regulation that now needs to be brought in to favor their use. In this endeavor the consortium members have become involved in most of the possible initiatives at European level, such as this European Network of U-space Demonstrators.

The second phase will entail three UAV tests to gauge the performance and behavior of Europe's GNSSs in the aforementioned components of U-Space; one of these tests will correspond to urban flight, in which the SORA methodology will be used for the first time, a prior step to requesting flight clearance from air traffic control services.

Finally, the results obtained in these tests will be examined and an economic and viability assessment will be carried out for its promotion to the UAS user community.



Conference "The current situation and future of Spain's military aeronautics sector"

GMV took part in the conference on "*The current situation and future of Spain's military aeronautics sector*", to be put on by the Defense and Security Technology Foundation (*Fundación Círculo de Tecnologías para la Defensa y la Seguridad*) in collaboration with the Higher Space and Aeronautical Engineering School (*Escuela Técnica Superior de Ingeniería Aeronáutica y del Espacio: ETSIAE*) of Madrid's Polytechnic University (*Universidad Politécnica de Madrid: UPM*) on 17 October in Madrid.

The military segment of Spain's aeronautics sector now turns over more than 3.3 billion euros a year. Spain ranks eighth as a worldwide aeronautics power and is also one of the only dozen or so countries capable of catering for an aircraft's complete lifecycle under FAR/CS 25 airworthiness standards: design, development, ground and flight tests, certification, production, marketing, delivery and after-sales service.

The aeronautics sector, depending as it does on innovation and technological leadership, is also one of those that plows back the biggest share of its earnings into R&D. Nonetheless, Spain's aeronautics industry faces stiff challenges; hence the holding of this conference to reflect on the direction Spain's military aeronautics sector should now take, the necessary action to be taken and this sector's requirements for maintaining the capabilities already developed, guaranteeing Spain's sovereignty and freedom of action in this field.



GMV signs a collaboration agreement with AUREA Avionics

THE MAIN PURPOSE OF THE AGREEMENT IS TO DRIVE DEVELOPMENT OF THE UNMANNED AERIAL VEHICLE (UAV) SEEKER. THIS IS AN AUTONOMOUS, RAPID-DEPLOYMENT SYSTEM DESIGNED FOR SURVEILLANCE AND RECONNAISSANCE MISSIONS

■ GMV has signed a collaboration agreement with the technology firm AUREA Avionics. Under GMV's overarching development strategy in the aerospace and defense markets this agreement sets out to boost the company's capacity of supplying complete turnkey solutions.

The main purpose of this agreement is to drive development of the unmanned aerial vehicle (UAV) Seeker. This is an autonomous, rapid-deployment system designed for surveillance and reconnaissance missions, providing intelligence, surveillance and reconnaissance capabilities over a 15 kilometer range.

The UAV has a takeoff weight of 3.5 kg and an endurance of up to 90 minutes. Its onboard equipment guarantees endurance in all flight phases: manual

launch, belly landing, waypoint navigation, orbits and flight with command from the Remote Hand-held Controller (RHC).

This alliance further strengthens GMV's position in the aeronautics, defense and security markets. In the former it has proven expertise in onboard avionics software, navigation systems, mission systems, etc, and has built up a wealth of experience in the development of UAV systems such as the Flight Control Computer of the RPAS ATLANTE. In the defense and security market it will strengthen the company's range in Joint Intelligence, Surveillance and Reconnaissance (JISR) and border surveillance. In JISR GMV now boasts a leadership position within Spain's participation in NATO's MAJIIC program, using the SAPIIEM system's suite. GMV's border surveillance

activities, including its priming since 2010 of the design, development, maintenance, deployment and upgrading of the EUROSUR network, will also be complemented and enhanced.

For AUREA this agreement represents a great stride forwards in its strategy for marketing the product.





GMV enhances inter-nation cooperation in aircraft mission systems

■ The Movement Coordination Centre Europe (MCCE) has selected GMV's inhouse ATARES system to improve the air-transport service interchange and flight refueling system.

Located at the Eindhoven Military Air Base, in The Netherlands, the Movement Coordination Centre Europe (MCCE) is an organization established to address the shortage of Strategic Lift



(air and surface). By providing a multi-national coordinating body to optimize efficiency, throughout the full spectrum of movements and transportation, the main purpose of the MCCE is to provide cost saving alternatives for member nations.

The Air Transport and Air-to-Air Refueling Exchange of Services (ATARES) system provides a balance of all services exchanged between nations, accounting for individual mutual support without any requirement for equivalent financial transactions. Specifically, ATARES is an IT system that allows quick exchange of information among participating nations on Air Transport and Air-to-Air Refueling (AT/AAR) requirements and availability and facilitates cash-free exchanges of services between participating nations.

ATARES is like an account whose currency is expressed in C-130 Equivalent Flying Hours (EFH), exchanged among nations. Such operations produce savings for its member nations participating in these operations, by coordinating their transport requirements and matching

those requirements to existing capacity, thus making the most efficient use of that capacity (for example, avoiding half-full flights or empty return flights), whether owned or leased.

The primary goal of the present project is to provide an upgraded version of the ATARES Web-Based Accounting Software Tool. The tool will be built from the ground up, making use of the good aspects of the previous tool, while improving it. As presented in this proposal, GMV will use the newer and more recent technologies in order to provide better performance, security and a wider range of current and future functionalities.

ATARES provides a balance of all services exchanged between nations, accounting for individual mutual support without any requirement for equivalent financial transactions

GMV attends the annual event of Portugal's Aeronautics, Space and Defense Industries cluster

The 5th edition of the AED DAYS once again brought the main national and international ASD players to Lisbon. Sponsored by the Portuguese cluster of the aeronautics, space and defense industries, AED DAYS 2018 took place at Taguspark (Oeiras, Lisbon) between November 20-22.

At AED DAYS 2018, the participants had the unique opportunity to know and meet the Portuguese aeronautics, space and defense communities, develop

new business opportunities, improve participation in collaboration networks/partnerships, and debate the upcoming challenges for ASD industries.

José Neves, GMV's Director of Security and Defense in Portugal, was part of the panel that discussed "Fostering R&D for Competitiveness".

AED was given the mandate to promote the development and further explore the synergies among the 3

sectors, tighten the cooperation links between industry and the scientific and technological entities and boost their participation in national and international R&D collaborative projects.

AED Cluster Portugal presently represents 61 national companies and research centers and provides 18,000 highly-skilled jobs. It generates revenue of €1,700m and currently exports 86% of its production.



The complete MetOp family now in orbit

THE THIRD COMPONENT OF THE FAMILY OF POLAR-ORBIT METEOROLOGICAL SATELLITES OF THE METOP CONSTELLATION HAS SUCCESSFULLY BEEN LAUNCHED. THIS LAUNCH FURTHER ENHANCES WEATHER FORECASTING PROCEDURES AND GUARANTEES A SMOOTH TRANSITION TO THE SECOND GENERATION OF THE EUMETSAT POLAR SYSTEM (EPS)

On 7 November MetOp-C was successfully launched onboard a Soyuz rocket from the Kourou spaceport in French Guiana. This polar-orbit satellite will collect fundamental numerical data for weather forecasting services. MetOp-C will also guarantee transition to the Eumetsat Polar System (EPS) second generation.

GMV's input to this mission is noteworthy. It holds responsibility for development of the Mission Planning System and Flight Dynamic System. Under this remit it has seen to the ground development, testing and verification of the processor of the GRAS (Global Navigation Satellite System Receiver for Atmospheric Sounding) and GOME-2 (Global Ozone Monitoring Experiment-2) instruments of the EPS program to assess instrument performance and validate operational processors.

GMV is also giving engineering and operational support to EUMETSAT in the areas of flight dynamics, mission planning and control centers. It likewise

offers support in the development and maintenance not only of LAND SAF for Portugal's Meteorology Agency but also NOWCASTING SAF for Spain's State Meteorology Agency (*Agencia Estatal de Meteorología: AEMET*).

MetOp-C is the third member of the MetOp family of meteorological satellites, after its forerunners MetOp-A (2006) and MetOp-B (2012). They were originally designed and conceived for sequential launch, each one then to be replaced by its successor, but the sheer quality of the first ones has enabled the whole system to continue working flat out.

The three satellites are made up by a solar array and two main modules: the Payload Module (PLM) and the Service Module (SVM). They also carry onboard instruments of France's Space Agency

(CNES) and the National Oceanic and Atmospheric Administration (NOAA) as part of Europe's contribution to the multi-satellite system shared with this US administration.

ESA and EUMETSAT hold joint responsibility for these circumpolar meteorological satellites, which make up EPS's space segment. The MetOp satellites, together with METEOSAT's geostationary satellites, represent the two mainstays of Europe's meteorological observation satellites, operated by the European Organization for the Exploitation of Meteorological Satellites EUMETSAT. Spain makes an 8% contribution to EUMETSAT's budget through the *Agencia Estatal de Meteorología*.



GMV develops groundbreaking applications and services based on space technology

■ From Portugal, GMV has kicked off two new projects with ESA to explore the use of space-based data in down-to-earth applications and services. These concepts are driven by user needs and they result from selecting adequate earth observation data and products, and understanding how to process and integrate this information into a service,

often bringing innovation through different extraction methods or added value from the fusion with non-space information.

One project, led by the Oceanic Platform of Canary Islands (PLOCAN), aims to produce a downstream service for exploiting potential correlations between

remotely-sensed oceanic environment data and biological data in order to provide a marine mammals' dashboard in the context of the Macaronesia area (Atlantic Ocean). In particular, the EO_MAMMALS service aims at identifying biological hotspots for cetaceans and, therefore, help the management and identification of marine areas that should be protected because of its present significant conservation value.

The other project focuses on the definition of viable space-based services for reducing the vulnerability of Critical Infrastructure, but also for reducing the impact and the stress on the environment surrounding the infrastructure. GMV and its partners are working closely with the end users to derive user needs and technical solutions as well as business cases for the commercial exploitation of these GMV solutions. Examples of current and related Critical Infrastructure EO satellite applications in which GMV has been involved are the provision of Critical infrastructure maps (e.g. characterization of the Critical Infrastructure and context areas) and Risk assessment maps (e.g. landslide and subsidence monitoring, Target detection, Fuel maps and Flooding maps).



GMV attends the Sixth High Level Forum with the aerospace industry

On 9 October the European Space Research and Technology Center (ESTEC) in Noordwijk (the Netherlands) hosted the sixth High Level Forum with the aerospace industry organized by the European Space Agency (ESA) in collaboration with Europe's space industry association, Eurospace.

Jorge Potti, GMV's General Manager Aerospace attended this event together with other top-level representatives from Europe's space industry and institutions.

During the forum Jan Woener, Director General of ESA, argued

that space activity is set to take off anew in various fields and talked about the roles to be played in this future development by stakeholders, especially ESA's activities and programs over the coming years. He also presented his ideas to work towards a united Europe by means of programs and activities as from 2020.

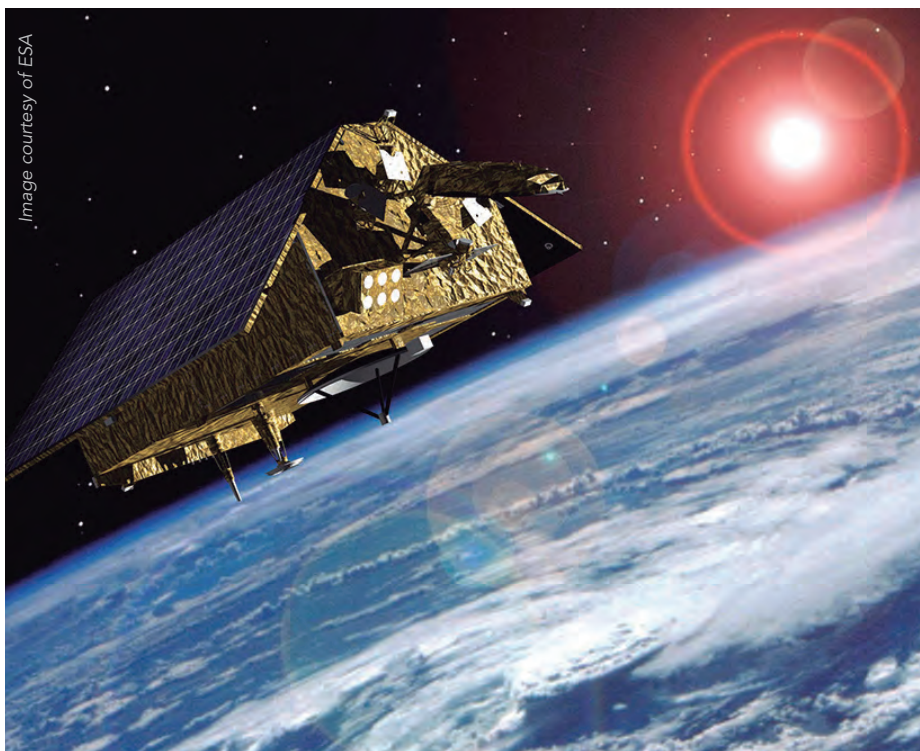
For his part, Jean-Loïc Galle, President of Eurospace, explained that the substantial growth of resources recently proposed by the European Commission in the space program EU MFF 2021-2027 calls for an increase in member

states' ESA-brokered investments to keep up with the space powers' long-term growth.

Both Woener and Galle agreed on the need for Europe's space sector to be provided with resources in keeping with the political ambitions of the European Union and its member states and the industry's competitiveness challenges. They therefore pointed to ESA's upcoming ministerial council in 2019 as a turning point in the prospects of the space sector.



GMV completes the ground segment of the Sentinel 6/Jason-CS program



■ GMV has been selected as provider of the mission planning system of the Sentinel-6/Jason-CS satellites, thus fulfilling its overall responsibility for the whole set of the main components of this mission's ground segment.

Sentinel-6 is the seventh in the series of satellites to cater for the needs of the Copernicus program. The Sentinel-6/Jason-CS mission comprises a two-satellite constellation equipped with a radar altimeter to provide high-resolution measurements of ocean topography. This is crucial information for monitoring changes in sea levels and an essential climate-change indicator.

GMV had already been awarded the contract for the orbital control system and the satellite control system, including the launch phase. The three systems, satellite control, orbital control and the recent mission planning are based on a modification and upgrading

of the analog systems in the forerunner Sentinel-3 mission, all of them also falling under GMV responsibility. For the mission planning system in particular, certain components have been generalized while new functions have been phased in to increase flexibility of the operation planning process. Some of these new functions involve reuse of **flexplan** technology, GMV's commercial space-mission planning product.

All the systems have been developed in record time in view of the urgent need to have the system ready for the mission launch, due to take place in less than one year. The mission planning system in particular has been rolled out in less than 6 months.

This new award retains GMV's leadership in the development of necessary ground segments for the various Copernicus missions, especially in Sentinel 1, 3 and 5, and now Sentinel 6.

GMV features at Satellite Innovation Symposium

■ San Francisco hosted one more the latest Satellite Innovation Symposium. Leaders and experts from the professional satellite communications sector came together from 8 to 11 October in this innovation-centered symposium to talk about the latest trends and input new, groundbreaking SatCom insights and ideas.

GMV ran a stand to showcase its inhouse products and capabilities, including, most notably: **hifly**[®], its real-time satellite monitoring and control system; **focusSuite**, its flight dynamics system; **smart payload**, its satellite payload management system and **flexplan**, its satellite resource planning system.

Symposium workshops and sessions dealt with emerging technology like space robotics applications, security systems, new propulsion systems, Big Data, Artificial Intelligence, earth observation and remote sensing.



Success of the seventh edition of the "GMV Users Conference (GUC)" reflected by high attendance

■ GMV held the seventh edition of the "GMV Users Conference - GUC", in relation to the products and services of the ground segment of space missions which took place in the *Parador de Alcalá de Henares (Madrid, Spain)* from 28 to 30 November. The event was attended by over 80 representatives from more than 35 different organisations, including space agencies, satellite manufacturers and telecommunications operators.

For three days, participants had the opportunity to attend different technological presentations, including the description of the new functionalities of GMV's products as well as the roadmap of their future developments.

Moreover, they could share their operational experiences and participate

The participants were able to obtain information and attend demonstrations on the line of products that GMV currently offers to the Space sector

in debates and round tables on current subjects that affect the sector, namely the automation of operations, fleet management, new technologies applied to ground management systems both satellite and payload, space debris monitoring, online security and new challenges in the provision of orbital control systems, especially in the use of low-thrust electric propulsion systems.

The participants were also able to obtain information and attend demonstrations on the line of products that GMV currently offers in the market, including **hifly**® for the control and monitoring of satellites, **focussuite** for orbital control, **smart** for payload management, **magnet** for the management of ground stations, **autofly/autofocus** for the automation of operations, **flexplan** for mission planning, **flyplan** for the complete programming and automation of mission operations, **closeap/focusoc** for space debris management and collision risk assessment and associated services, plus GMV's online security solutions. In addition, those attending could find out about and discuss the new functionalities for these products and their future development.

The full list of organisations registered for the conference, which this year was

an outstanding success in terms of attendance, included Airbus, Arabsat, Avanti, Brazilian Air Force, Brisat, CDTI, ChinaSat, CNES, CreoTech, ESA, Eumetsat, Eutelsat, GlobalIP, Globalstar, HellasSat, Hisdesat, Hispasat, JSAT, Measat, OHB, Oneweb, Optus, OrbitalATK(NGC), Sat-Biznet, SES, SSL, Starone, Thales Alenia Space, Telebras, Telenor, Turksat, UPM, Yahsat and Zodiac.





BepiColombo, on the way to Mercury

BEPICOLOMBO IS A JOINT MISSION OF THE EUROPEAN SPACE AGENCY (ESA) AND THE JAPAN AEROSPACE EXPLORATION AGENCY (JAXA), SCHEDULED TO REACH MERCURY IN 2025



■ At 01.45 GMT (03.45 CEST) on 20 October the BepiColombo mission was successfully launched atop an Ariane 5 rocket from the European Spaceport of Kourou (French Guiana).

BepiColombo, a joint mission of the European Space Agency (ESA) and the Japanese Aerospace Exploration Agency (JAXA), comprises a Mercury Transport Module (MTM), built by ESA, and two independent orbiters, ESA's Mercury Planetary Orbiter (MPO), nicknamed "Bepi", and JAXA's Mercury Magnetospheric Orbiter (MMO) or "Mio". These have inbuilt solar panels, electrical propulsion systems, several antennae and a complex thermal management system. All these tools have been designed to withstand Mercury's harsh environment.

ESA's Mercury Planetary Orbiter (MPO), fitted with 11 instruments, will basically map Mercury's surface, taking high-resolution images and analyzing the makeup of the soil (unknown hitherto)

and the magnetic field. JAXA's Mercury Magnetospheric Orbiter (MMO), for its part, octagonal in shape and covered in mirrors, carries four instruments to study the magnetic field and look for dust particles while also analyzing Mercury's thin atmosphere, the exosphere.

Bepi Colombo is due to reach Mercury in 2025. One year later its science operations will begin, possibly then lasting for two years. The scientific data will be collected by ESA's receiving antenna in Cebreros, Ávila, and then sent on to ESAC, Madrid, where it will be processed and distributed to the researchers. The spacecraft's instructions will be sent up from the European Space Operations Centre (ESOC) in Germany.

Within the mission GMV has developed the Control Center for ESA's European Space Operations Centre, including operational support during the launch phase. It has also designed the Science Ground Segment (SGS) for the European Space Astronomy Centre

(ESAC). Another notable activity has been development of the orbital control system in association with operational support during the launch and routine phases, including the complex transfer phase until the satellite is successfully inserted into Mercury orbit. During the initial phases, under the aegis of ESOC, GMV also helped out in the necessary mission analysis activities for designing the whole ensemble of this interplanetary exploration mission. Lastly, GMV has led various important studies for defining the system and the relative navigation algorithms used onboard the satellites.

BepiColombo is due to reach Mercury in 2025. One year later its science operations will begin

GMV's Space Systems and Robotics stands out in ESA's Clean Space Industry Days

■ The Clean Space Industrial Days (CSID) – where experts in Active Debris Removal, EcoDesign for Space, and Space Debris Mitigation technologies come together - took place once again at ESTEC from October 23-25.

The Industrial Days, which started in 2012 with the "Clean Space: EcoDesign and Green Technology Workshop" & the "Clean Space: Workshop on Active Space Debris Removal" events, have quickly grown to be an unmissable event - over 250 representatives from more than 100 European entities (space industry, agencies, universities and research centres) have attended, allowing fruitful discussions on the main technical challenges and advances in this area.

This platform allows a variety of stakeholders, including the public sector and industry, to discuss the development of the required technologies, encouraging all actors to exchange both their advances and setbacks, thus strongly promoting European cooperation.

ESA's Clean Space initiative considers the entire lifecycle of space activities, from the early stages of conceptual design to removal of space debris.

A current focus are the synergies between in-orbit servicing and Active Debris Removal, at a time when ESA's flagship activity e.Deorbit is stemming



what it has learned, and Design for Removal technologies.

GMV's presence was ubiquitous in its capacity as technological leader. Its teams have played key roles in developing the Guidance, Navigation and Control algorithms for ESA's flagship Active Debris Removal (ADR) mission e.Deorbit, as well as pushing technologies forward. The audience showed great interest in GMV's presentations of the activities featuring technological advances which it is leading, such as COMRADE - combined control of robotic manipulators and space vehicles for Servicing and ADR missions.

GMV's presence is also felt as an enabler of a wider range of technologies: from COSINE's spectral imagers for relative navigation, on-orbit servicing and debris removal to Lusospace removal-friendly Magnetotorques that passively stabilize a spacecraft ready for end-of-life disposal. In both, GMV's participation as an expert technological and research authority is key to their success.

It was on the basis of this recognized expertise that João Branco, Head of Space Segment and Robotics in Portugal, was invited to participate as an expert in the roundtable for drawing up ESA's guidelines for Close Proximity Operations.

Coimbra Space Summer School

From 12 to 14 of September Coimbra received the 4th edition of Coimbra Space Summer School whose main goal is to motivate young entrepreneurs to develop innovative solutions that integrate aerospace technology.

During 3 days students, researchers and businesses were invited to explore the space economy through a program with several activities, combining the sharing of knowledge, networking between

people, entities and companies related to space.

Teresa Ferreira, Director of Space at GMV in Portugal, was invited to form part of the panel on the last day of the event to discuss the future and challenges of space in Portugal as the space-sector leader.

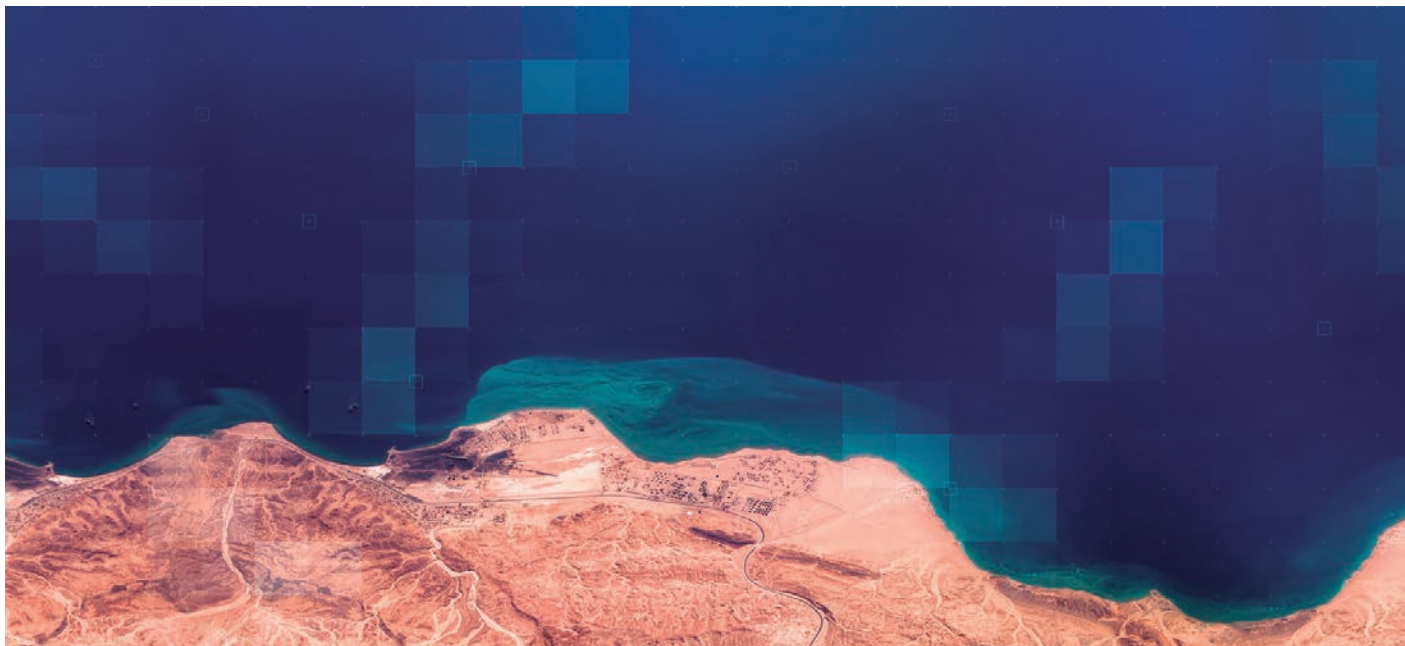
During the conference, several questions were debated, such as what

kind of knowledge, technologies and information are obtained as a result of special missions and the possibility of providing new services and products for other areas using space resources. João Lousada, member of GMV INSYEN and Analog Astronaut, was a special guest who helped to answer these and other questions. João also talked about his participation in the Mars Simulation Mission AMADEE-18.



GMV renews the SATCEN framework mapping contract

THE REFERENCE MAPPING SERVICE OF SATCEN (EUROPEAN UNION SATELLITE CENTER AGENCY) CONTRIBUTES TO THE COPERNICUS SECURITY SERVICE IN SUPPORT OF THE EU'S EXTERNAL BORDER SURVEILLANCE INFORMATION EXCHANGE FRAMEWORK EUROSUR



■ For the fourth time in a row, GMV has been awarded the implementation of the Framework Service Contract for the provision of the Reference Mapping Service (2018-2019). This service contract is issued by the SATCEN (European Union Satellite Center agency) and began in 2015.

The service contributes to the Copernicus Security Service in support of the EU's external border surveillance information exchange framework (EUROSUR), by providing real-time data on what is happening on land around the EU's borders while also improving the decision-making and response capabilities of the authorities in charge of the control and monitoring of the frontiers.

The Reference Mapping Service provides terrain geo-databases of European country neighbors' areas, including hydrography, topography, land cover, infrastructures and relevant population activities. The service is mostly based on the exploitation of very high resolution

satellite images through the analysis of IMINT (imagery intelligence) experts.

The reference mapping is an adapted version of the Multinational Geospatial Co-production Program (MGCP) standards.

In recent years, as the result of a successful strategic decision, GMV has notably enlarged its expertise and technical capacity, in response to the increasing demand for updated

cartographic information using remote sensing data worldwide. Recent examples of these activities are the Copernicus Security Service in support of EU External Action, where politically unstable areas of relevance to the EU, but outside Europe, are monitored. In addition, it is expected that as from 2019 GMV will participate in the Copernicus Emergency Service for rapid-mapping activities in support of responses to emergency situations, such as those resulting from natural disasters.



GMV collaborates in initiatives to drive digital transformation in the rural world

■ In November Córdoba University officially inaugurated the new master's degree in the Digital Transformation of the Agrofood Sector (*Digital Agri*), a specific postgrad course brokered by the Higher School of Agricultural Engineering and Forestry School (*Escuela Técnica Superior de Ingeniería Agronómica y de Montes: ETSIAM*), to encourage specialization in new agrofood technology.

GMV, together with other leading companies of the sector, is participating in this initiative by giving various teaching courses and also

offering students external practice opportunities.

The presentation was hosted by the Vice Rector of Postgraduate Studies and Innovation of Córdoba University, the deputy regional minister of agriculture, fishery and rural development of Andalusia, the director of ETSIAM and the academic director of the master's degree. Luis Mariano González, director of PDPA Aerospace, gave the conference an overview of the implications of the introduction of Industry 4.0 in farming and forestry and the contribution of Copernicus

and Space 4.0 to the innovation process that is raising the supply-side added value of agrofood services and products.

With this new degree Córdoba University takes on the commitment of training up professionals to facilitate, support and drive digital transformation in the rural world. This involves the generalization of sensors, IoT, cloud computing, the 4.0 food industry, precision agriculture, Big Data, decision support systems (DSS), cognitive techniques in general and Artificial Intelligence.

Analysis of the contribution of Copernicus to sustainable city development

■ On 9 November the European-Commission-brokered NEXTSPACE consortium put on in Brussels "the Copernicus for Future Cities" Workshop to explore how the Copernicus earth-observation program can support sustainable development of future cities.

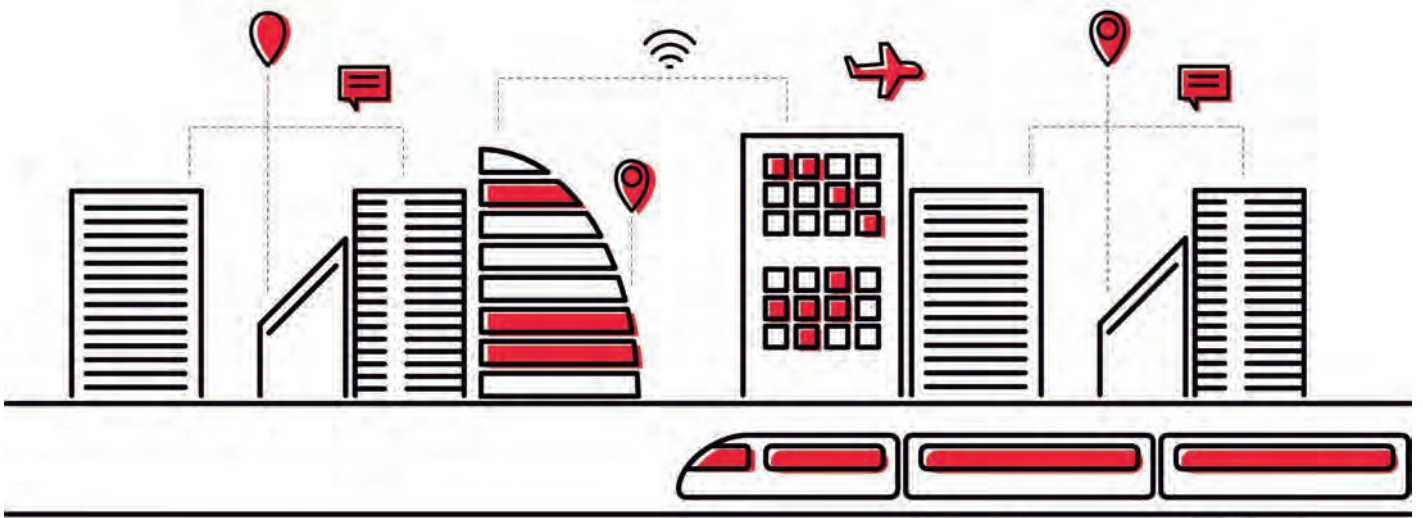
In particular, the workshop explored European citizens' needs in terms of the Urban agenda for the EU in order to improve such urban features as air quality, energy efficiency and mobility, among other issues. It also took stock of the current state-of-the-art of earth observation in cities and discuss potential Copernicus developments and upgrades to address any identified gaps.

The Urban Agenda for the EU, launched in 2016 with the Pact of Amsterdam, puts forward a series of actions driven by key European stakeholders to bring out the full potential of urban zones and help them achieve common objectives at national and EU level. Its remit is to

strengthen the urban dimension of both national and EU policies, advocating a new multilevel working method that will allow all EU institutions, member states, cities and other stakeholders to pull together towards this end.

At the moment GMV is priming the European Commission's NEXTSPACE framework contract, which sets out to define user requirements of the future generation of Copernicus satellites. It is also one of Spain's Copernicus Relays, groups that act as national champions coordinating and promoting activities around the Copernicus Programme to bring it to wider notice and encourage its use.

GMV is priming the European Commission's NEXTSPACE framework contract, which sets out to define user requirements of the future generation of Copernicus satellites





GMV and Lusospace put their heads together to tackle the space-debris challenge

■ A safe and secure space environment is a requirement for all current and future space activities. Through its Clean Space initiative, ESA is devoting an increasing amount of attention to the environmental impact of its activities, both its own operations and those carried out by European industry in the context of ESA programmes.

A potential technology vector is that of passive stabilization methods installed on-board the target satellite, which could limit the rotational rate of the satellite at end-of-life, thereby simplifying and de-risking an Active Debris Removal mission.

GMV and Lusospace kicked off an ESA-commissioned activity to identify the feasibility of magnetic damping using a Magnetotorquer technologies (MTQ) to detumble a non-operational satellite in Low Earth Orbit through interference with the magnetic field.

The Portuguese company Lusospace manufactures the magnetic torquers which are expected to be used in their nominal lifetime to control the attitude of the next generation of Earth

Observation Sentinel Spacecraft. Through meticulous engineering for location and triggering of short-circuiting, these devices will gain permanent magnetic and hysteresis passive behaviour.

GMV will use their expertise in Attitude and Orbital Control (AOCS) and analysis to set requirements for these devices by: mapping the magnitude of orbit-attitude perturbations due to

environmental sources and analysing how the design of the spacecraft and magnetorquers impact the attitude stabilization of a perimeter of study cases; characterizing the potential for satellites to be stabilized through the interaction with the Earth's magnetic field using MTQ technology; and identifying and performing a trade-off of the different MTQ design concepts which lead to a stable condition for the satellite at the EOL.



Lusospace Magnetic Torquer Rod (Engineering drawing)

GMV shares its experience in orbital control systems and the removal of space debris

From 26 to 28 September Portugal's University of Beira Interior in Covilhã hosted the eleventh International Workshop and Advanced School "Spaceflight Dynamics and Control".

The main experts in Astrodynamics and Attitude and Orbital Control Systems from around the world came together for an enthusiastic exchange of ideas in this event organized by the Centre for Mechanical and Aerospace Science and Technologies of the

University of Beira Interior (C-MAST) and SpaceWay. Specialists from places like the Keldysh Institute (Moscow), Columbia University (New York), Gauss Institute/Sapienza (Rome), and the Canadian Space Agency, shared their hands-on experience obtained over decades in historical and current space programs, state-of-the-art and visionary proposals for the future.

They were joined by the main players in the Portuguese Space Industry, and

an passionate audience of researchers and students.

GMV provided an exhaustive introduction to the challenges of Active Spacecraft Debris Removal, with a particular focus on its long-term involvement in the e.Deorbit program to deorbit ESA's Envisat. It also participated in round-table discussions about the current renewed emergence of Portugal in Space 4.0.

New requirements are defined in the project for improving food production in Africa, AfriCultuReS

■ Last November, a new users' workshop about AfriCultuReS was held in Nairobi. It was hosted by LocatelT, one of the 17 entities that form part of the consortium for this project which aims to foster development in the African continent.

Those attending the workshop discussed new ways of making progress in this project, whose objective is to design, implement and validate operationally an integrated information system covering monitoring, analysis and early warning in order to help improve food production in Africa.

The event was attended by representatives from the Kenyan Ministry of Agriculture, the World Bank, the UN's Food and Agriculture Organisation (FAO), the Regional Centre for Mapping of Resources for Development (RCMRD), the insurance company Jubilee Insurance, the Kenya Institute for Public Policy Research and Analysis (KIPPRA), the Kenya Forestry Research Institute (KEFRI) and the Lake Victoria Basin Commission (LVBC), among other state agencies and academic institutions, together with experts in Earth observation, final users and potential clients.

Apart from this workshop held in Nairobi, similar events have taken place in Tunisia, Niger, Ghana, South

Africa, Mozambique, Ruanda and Ethiopia. These workshops were attended by more than two hundred entities concerned about food production including national and local governments, representatives from multilateral bodies and from the private sector (banks, insurance companies, suppliers of agricultural inputs etc) plus those from the academic world, sectoral associations, ONGs and the civil society.

AfriCultuReS aims to tackle the problem of small farmers' difficulties in accessing reliable information, that leverage improved decision making related to agricultural and/or livestock management whose purpose is production security through risk management, facilitating adjustment and resilience in the face of climate change. In general, AfriCultuReS, thanks to the integration of data from

the European constellation of Sentinels from the Copernicus programme, together with field data, climate models, meteorological models and crop forecasting, will provide the information required for sustainable agricultural development, the management of natural resources, the conservation of biodiversity and the reduction of poverty in Africa.

AfriCultuReS is completely financed by the EU's Horizon 2020 (grant agreement no. 774652) with a budget of 8.5 million euros. It commenced at the end of 2017 and will last for four years. The Consortium is formed by eight African entities and nine from Europe, all leaders in fields like climatology, meteorology, monitoring and modelling of crops, information technology, social sciences or Earth observation.



GMV showcases its products and services in the Asian market

GMV participated in the latest Conference and Exhibition of the Asia-Pacific Satellite Communications Council (APSCC), held for the twentieth time this year in Jakarta, Indonesia, from 2 to 4 October.

The lecture cycle this year was divided into three main thematic blocks: firstly, the satellite telecommunications market and the rapid changes this market is

undergoing; secondly, the New Space market, the business fabric of about 1000 private companies and enterprising firms that have made space their business model; and, last but not least, a wide range of critical issues facing the industry such as space debris and cybersecurity.

As well as featuring as an invited speaker in the ground-segment-equipment discussion panel, GMV also ran a

stand in the exhibition area to display its products and services available on the Asian market. Some of the most important projects carried out in the area include development of the whole ground segment or components of it for operators and agencies like NBN, OPTUS, MEASAT, THAICOM, PSN, ETRI, KARI, ISRO, JSAT and MELCO, plus the private bank PT. Bank Rakyat Indonesia (BRI).



GMV participates in Galileo PRS Joint Test Action

■ A consortium of European Member States and industry is starting a joint test action to monitor and evaluate the Galileo PRS quality of service with respect to its robustness, security, and navigation performance.

With the final goal of promoting PRS, this project will compare PRS applications to other Galileo services applications and benchmark PRS against other navigation/timing systems.

The performance comparison will lead to the proposal of a preliminary navigation policy and the initiation of actions to promote the use of PRS services towards the PRS community and decision-makers.

In the process Member States will increase their expertise in PRS functionalities and quality of service while preparing the operational phase with the establishment of improved procedures as an outcome of the Joint Test Action.

In its final step, the project will publicly promote PRS with specific communications towards the PRS users to ensure confidence in the quality of the service and its benefits.

The simultaneous participation of GMV through its Spanish and Portuguese branches, in support of each country's Competent PRS Authority, demonstrates GMV's expertise and experience built up from its participation in different PRS activities, its involvement in innovative Galileo services like Commercial Service (CS), Navigation Message

Authentication (OS-NMA) and the development of the GMV PRS receiver PRESENCE, which is one of the receivers to be put through their paces in the different test campaigns that will demonstrate, with real use cases, the added value of PRS.



New perspectives at IAC

■ One of the must-attend events of the space sector took place held in the German city of Bremen from 1 to 5 October. This year's International Astronautical Congress (IAC) attracted a turnout of over 6000 space experts and professionals to deal with various issues in the most comprehensive congress to date, with over 180 sessions.

IAC is 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 Center of Applied Space Technology and Microgravity (ZARM).

Under the banner theme "IAC 2018 - involving everyone" this year's Congress made a special effort to encourage international collaboration by way of new arrangements and

colloquies while also setting out to overcome current stumbling blocks and inspire new generations.

GMV had a standout role in this year's congress, presenting eight papers on space and robotics and running through the projects it is currently working on, including all the following: AIM for planetary defense; GNC and robotics projects for space like FASTMOPS and IOA-GNC; COMRADE; PROBA3; ERGO and FACILITATORS of the PERASPERA program; and the SST project for radar detection of space debris. GMV INSYEN also took part with another paper on its early experience with commercial operations in Columbus.

The exhibition part of the congress also featured prominently this year, with 144 organizations showcasing their capabilities in various areas. GMV's stand displayed its latest space breakthroughs and advances.



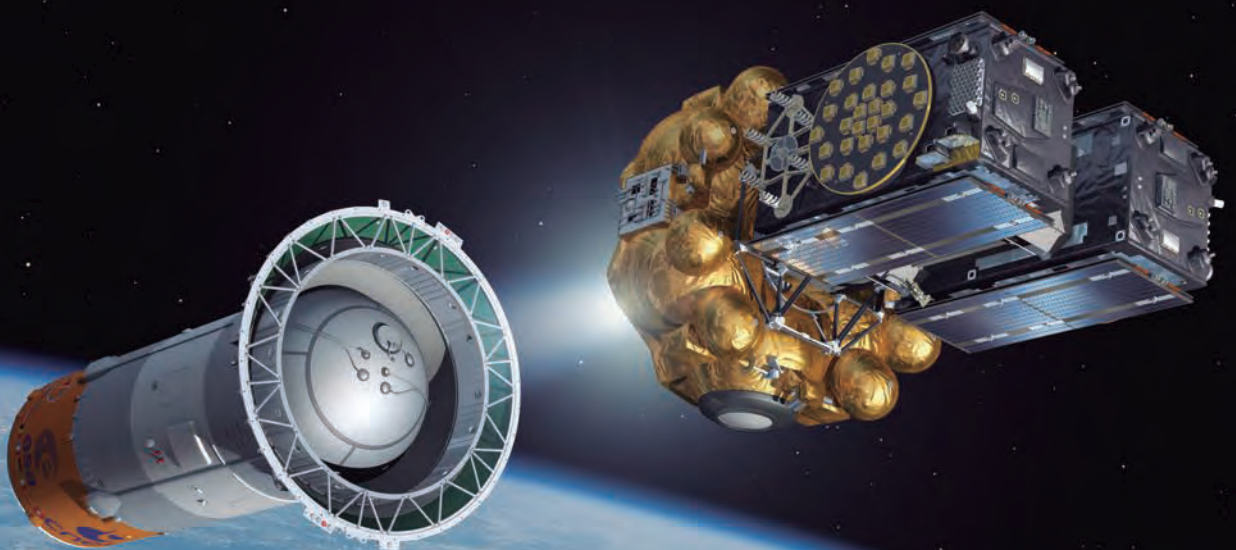
GMV in charge of the exploitation phase of the Time and Geodetic Validation Facility of the Galileo programme

GMV IS LEADING THE CONSORTIUM RESPONSIBLE FOR THE DESIGN, IMPLEMENTATION, DEPLOYMENT AND OPERATION OF THE NEW GEODESIC AND HIGH-PRECISION TIMING AND SYNCHRONIZATION REQUIREMENTS CALLED FOR BY EUROPE'S SATELLITE NAVIGATION SYSTEM GALILEO IN ITS OPERATION PHASE

During the initial phases of the Galileo Project, the TGVF (Time and Geodetic Validation Facility) has been the element entrusted with providing the geodetic services (GRSP, Geodetic Reference Service Provider) and the precise time synchronisation (TSP, Timing Service Provider), which have played a key role in the integration, verification and system's functioning monitoring activities.

Since 2013, a consortium led by GMV has been responsible for the development and operation of TGVF services, as well as of the operations of the Galileo Processing Centre located at ESTEC, through a project that ended in November 2018.

It is now, in the exploitation phase of Galileo, when it is necessary to continue updating the TGVF, increasing its capacities with new





functionalities and improving its features in line with the actions foreseen in the Galileo system. For this reason, earlier this year the European Space Agency launched the contract for the design, implementation, deployment and operation of the infrastructure in the new phase, the TGVF-X, which was awarded once again to a consortium led by GMV that comprised prestigious organisations such as Septentrio Corporation (Belgium), ESOC (Germany), Deutsches GeoForschungsZentrum (Germany) Physikalisch-Technische Bundesanstalt (Germany), Istituto Nazionale Ricerca Metrologica (Italy), Ovik Inc. (Canada), Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) and Thales Alenia Space France (France).

As leader of the consortium, GMV is ultimately responsible for the management of the whole project at both the contractual and technical level. It is also responsible for developing the whole infrastructure, with the exception of the GNSS receivers that will be installed in the reference sites, as well as in the system operations, once deployed and accepted by the ESA.

Among the main activities required in this new phase of the TGVF, the following are worth highlighting: real-time monitoring and detecting of signal-in-space anomalies and their notification to ESA and to Galileo operations; telemetry and telecommand monitoring for space segment trend analysis and radiation monitoring; support to system performance/satellite troubleshooting and investigation in general; other activities, like current in-orbit test support (orbit/clock characterisation of Galileo navigation messages) and verification and validation of the functioning of the Galileo system.

In addition, the TGVF-X will provide the testing platform to support the Second Generation of Galileo and activities involving experiments on updates from the European programmes H2020 and NAVISP (The Navigation Innovation and Support Programme).

TGVF-X will also provide support to the improvement of the Galileo system regarding Safety-Of-Life, OS-NMA (Open Service Authentication), Commercial Service and INAV improvements.



TGVF-X Team Madrid



TGVF-X Team Netherlands

GMV participates in the worldwide GEO Week initiative held in Japan

■ From 29 October to 2 November GMV was present at GEO Week 2018, the most important event put on by the Group on Earth Observation, (GEO). Held in Kyoto, Japan, the event attracted a turnout of 500 people to hear EO experts sharing their ideas and technical and scientific knowledge by means of stands and debating sessions.

The week's events focused on GEO's three priority engagement areas: the Sendai Framework for Disaster Risk Reduction, the Paris Climate Agreement, and the United Nations 2030 Agenda for Sustainable Development.

GMV took part in the discussion panel of the European Association of Remote Sensing Companies (EARSC): *"Identifying, communicating and delivering the value of Earth observations - a regional approach"*, focusing on the importance of earth observation data and services in a time marked by the advent of Big Data the policy of free access to Copernicus data, plus the appearance of new business models.

At the event GMV also presented AfriCultuReS (Enhancing Food Security in African Agricultural Systems with the support of Remote Sensing), a Horizon-2020-funded, GMV-coordinated project that sets out to design, implement and operationally validate an integrated monitoring, analysis and early-warning system to contribute towards the improvement of food security in Africa.



TGVF-X project is funded by the EU. ESA has received funds as funding body under a Working Arrangement with GSA. The view expressed herein can in no way be taken to reflect the official opinion of the European Union, the European GNSS Agency or the European Space Agency. Neither the European Union, the European GNSS Agency nor the European Space Agency shall be held responsible for any use that may be made of the information it contains.

Satellite-based earth-observation systems crucial in adapting to climate change

■ In October, as part of the Climate Resilience project, GMV visited three Multilateral Development Banks (MDB): the World Bank (WB), the Asian Development Bank (ADB) and the Inter-American Development Bank (IDB).

The Climate Resilience Cluster project, led by GMV, forms part of the European Space Agency (ESA)'s Earth Observation for Sustainable Development (EO4SD) initiative. This project aims to demonstrate to International Financial Institutes (IFIs) the benefits of satellite-based earth observation systems in establishing effective strategies for boosting developing countries' climate-change resilience.

The project consortium is made up by various benchmark European organizations in diverse fields of specialization: climatology, earth observation, data-visualization and -processing software, teaching, climate services, etc.

Every year the development banks back thousands of projects in countries that

have little access otherwise to private financing outlets. Part of this input of funds and technical advice goes towards adapting the country's critical infrastructure against climate change, i.e., reducing the potential damage of climate change.

The project, working in alliance with the IBDs' main actors, will generate a series of use cases that provide the Banks with key geospatial information. This will improve their decision-making procedures in terms of increasing the climate-change resilience of the country's population and its most vulnerable and damage-prone sectors. The final goal is to increase the uptake of earth-observation data in IFI's decision-making procedures.

The visit to these three banks gave the consortium first-hand knowledge of these institutions' needs and regions of interest. This will then allow them to draw up a climate-services portfolio that favors a practical assessment of the usefulness of earth observation data.



GMV attends the 13th edition of the UK China Space Conference

GMV participated in the biggest conference on Space held in China, in which academic and industrial specialists from the British and Chinese space sectors met to foster knowledge, capacity and synergies between the two markets. The Rutherford Appleton Laboratory, part of the British Science and Technology Facilities Council (STFC RAL Space), and Beijing University joined forces to organise this thirteenth edition in Ningbo (Zhejiang, China), from 10 to 13 December.

Celestino Gómez-Cid, GMV's Space Director in the UK, attended the conference in order to present GMV's capacities in relation to space exploration, ground segment and Earth observation applications and to put forward possible cooperation schemes for the development of missions, technologies or applications under potential bilateral agreements or other funding agreed between the UK Space Agency and the Chinese National Space Administration.

The event examined subjects such as Earth observation, Astronomy and Space Science, technological developments, sales policies and training and education.

The conference was supported by the Foreign and Commonwealth Office, the National Space Academy, UK Research and Innovation and the UK Space Agency.



GMV leads the system that "drives" the HERA mission for planetary defence



GMV leads an international consortium entrusted with designing the analysis of the HERA mission and

developing its Guidance, Navigation and Control (GNC) System. The HERA mission is run by the European Space Agency (ESA) and led by OHB-System AG.

Based on the heritage of the Asteroid Impact Mission (AIM) project, HERA aims to be the first interplanetary mission that visits a binary asteroid system, Didymos. This system is composed of a main asteroid (Didymain) and another asteroid that orbits around it (Didymoon).

The mission's main objective is to develop planetary defence technologies. To this end, NASA will send a first spaceship called DART, which will crash into the secondary asteroid Didymoon, in order to study how an asteroid could be deflected if it were on a collision course with Earth.

HERA's role will be to characterise the asteroids system after the impact and obtain data of incalculable value that will make it possible to develop strategies to handle an eventual impact on Earth. This mission would place Europe once

again as the vanguard of planetary exploration, science and technology, repeating Rosetta's great success.

But planetary defence is not the only purpose of the mission – scientific development and the research of the origins of the Solar System is another of the main pillars of the HERA mission. Asteroids, small moons, and comets are not only dangerous objects wandering the Solar System, but also possibly the most interesting objects that can be visited.

All these celestial bodies are replicas of the primitive Solar System, since they were formed in the very early stages of its development and have remained unchanged, which means that there is an unconceivable amount of scientific information to be gathered.

GMV'S ROLE IN THE MISSION

The GMV-lead consortium is composed of four companies in the GMV group (Spain, Romania, Poland and Portugal), OHB-SWE and Spinworks. Within GMV alone, the HERA team is made up of 20 professionals who for 12 months will be entrusted with developing the technology required to handle the spaceship.

GMV, European leader in GNC systems among others, is a pioneer at the global level in exploration missions including those involving asteroids. Of the European projects which GMV has led in this field, it is worth mentioning AIM, Marco POLO, Neoshield2, SYSNOVA-BEAST and Rosetta.

Asteroid proximity operation and navigation are extremely demanding tasks. The small size and mass of these bodies, as well as their irregular shape and the unknown environment of deep space, make it very difficult to control safely spaceships moving around one of these bodies. For this purpose, GMV is developing a highly innovative autonomous GNC system to provide this additional safety, thereby guaranteeing the mission's success.

The tests to certify the level of technological preparation of GMV's autonomous GNC system will be carried out using a camera designed to work in space. The hardware-in-the-loop simulation tests will be developed in GMV's optical laboratory and in its **platform-art**[®] robotic facilities.

Final Presentation of the MLAUNCHER Project

■ On 6 November a seminar on the European Space Agency (ESA)'s microlauncher program kicked off in Paris, with presentation of the final results of the five ESA contracts awarded in parallel for the development of a microlauncher service in Europe. These included the results of the MLAUNCHER activity led by PLD Space and also involving the participation of GMV.

The purpose of the MLAUNCHER project was to define, analyze and design a self-sustainable launch service making use of a microlauncher. Within

this study GMV was responsible mainly for definition and analysis of trajectory optimization, the avionics system (including GNC modules), telemetry and the ground segment for the launch service, focusing on PLD's ARION-2 microlauncher, recently renamed MIURA 5.

Working from project results, a proposal was made to ESA for definition of a complete microlauncher service (MIURA 5), identifying and defining all ground and flight components with an assessment of recurrent and non-recurrent costs. In

GMV was responsible mainly for definition and analysis of trajectory optimization, the avionics system, telemetry and the ground segment for the launch service, focusing on PLD's microlauncher MIURA 5

view of the seminar's main results, ESA will decide on possible prolongation of the MLAUNCHER contract for the PLD/GMV consortium.

GMV studies possible improvements in guidance algorithms for launchers

■ AVIO's Colleferro site recently hosted the kick-off meeting of the Adaptive Guidance project. This activity, part of the Adaptive Guidance and Control system of the European Space Agency (ESA)'s Basic Technology Research Programme (TRP), is being run by AVIO as system integrator and design authority for the VEGA launcher family.

The main purpose of this project is to cut the recurrent guidance, navigation and control (GNC) cost of a launch vehicle, minimizing the modifications needed from one flight to another while also saving time and reducing outlay on the validation and verification campaign.

Under this contract GMV intends to analyze various guidance scheme alternatives for the atmospheric and exo-atmospheric phases of the launcher's ascent flight, allowing the vehicle to react to any deviations from nominal parameters, especially the thrust level and wind profile. The project also involves compliance with flight constraints in terms of maximum dynamic pressure or thermal flow and terminal conditions impinging on the precision of payload orbit injection.

GMV's activity under this contract includes a literature review, a selection of possible schemes and a subsequent prototyping of these schemes in a Matlab environment. It is also planned to develop a simulator based on launcher data and the mission profile furnished by AVIO for the purpose of finally evaluating the performance of the chosen guidance techniques.

This approach will allow the various proposals to be weighed up in terms of robustness, computational cost, required control authority, while also proposing a unified and complete guidance solution by integrating the most promising methods.





The prototype of Avio's M10 engine successfully tested

■ On November 13th, a scaled prototype of the new M10 liquid oxygen-methane engine was successfully tested in Colleferro Avio. The engine has been developed by Avio in partnership with the European Space Agency in the framework of the Vega E program and will be the upper stage propulsion engine of the Vega launcher from 2024, replacing the second and third stages (Z9 and Avum) of the current configuration.

The M10 engine - the first European Methane engine and stage - opens the path to a new generation of launchers for both propulsion efficiency and environmental sustainability, therefore increasing the competitiveness of European Small Launchers.

At the nominal point and steady-state the engine has to provide 98kN thrust, maintaining a mixture ratio (oxidizer over fuel mass ratio) of 3.4. The fuel and oxidizer flow rates to be injected into the combustion chamber are controlled by the regulator valve (RV) and the throttle valve (TV), allowing to have direct control on chamber pressure and mixture ratio respectively (more information available here)

About this specific engine, Avio has recently awarded GMV a contract in the frame of VEGA-E program. VUSEC



(Vega Upper Stage Engine Controller) project has the main goal of specifying and prototyping a controller for the engine actuation valves during the start-up, steady state and shut down sequences, with the objective of maximising system performances. Indeed, introducing real-time measurements in the control system can extend the operational envelope of the engine by making it more robust against external disturbances. The controller, under design at GMV, uses sensors measurements at the injectors to link this information to thrust and mixture ratio performances.

After validating the control process, GMV is going to step forward in the process implementing the control logic within a dedicated processing board. This will permit validating the controller in a real-time representative environment and so paving the way for exiting future developments.

With this stimulating project, GMV has the chance to strengthen an already well established collaboration with AVIO, and consolidate GMV participation in the internationally recognised Vega program.

ICATT 2018

GMV was present at the 7th International Conference on Astrodynamics Tools and Techniques (ICATT) held from 6 to 9 November 2018 at DLR Oberpfaffenhofen, Germany.

ICATT is organized jointly by the European Space Agency (ESA), the National Aeronautics and Space Administration (NASA), the Japan Aerospace Exploration Agency (JAXA), the Deutsches Zentrum für Luft und

Raumfahrt (DLR), the Centre National d'Études Spatiales (CNES) of France, the Agenzia Spaziale Italiana (ASI), the Tsentralniy Aerogidrodinamicheskii Institut (TsAGI) of Russia, the United Kingdom Space Agency (UKSA), and the Romanian Space Agency (ROSA).

Its main aim is to provide agencies, companies, organizations, universities and research institutes with a forum of excellence in the area of astrodynamics and space flight mechanics. Participants

are invited to showcase their latest developments to encourage an interchange of ideas and pinpoint the latest trends.

The 7th ICATT was dedicated to the exploration of the Moon and beyond.

GMV played a very upfront role this year. As well as sponsoring awards for the best paper, the company was also chaired one of the sessions and gave ten lectures and presentations.

Campaign of space robotics trials under the EC's SRC program

THE FINAL QUARTER OF THE YEAR SAW A THOROUGHGOING TESTING CAMPAIGN OF THE SIX PROJECTS OR TECHNOLOGY BUILDING BLOCKS INCLUDED IN THE EUROPEAN COMMISSION'S STRATEGIC RESEARCH CLUSTER (SRC) AND AIMS TO PAVE THE WAY FOR FUTURE ORBITAL OR PLANETARY-SURFACE MISSIONS





From mid-September to 15 December GMV took part in the final tests of the space robotics projects included in the European Commission's H2020 Space Research Cluster (SRC).

The main aim of the space robotics SRC is to create, within the timeframe of 2020-2030, the necessary tools for consolidating the technical maturity of robotics systems for in-orbit-servicing and planetary-exploration missions. The PERASPERA project which is providing the roadmap and technical supervision of the programme, funded under the Research and Innovation Programme, Horizon 2020 (H2020), is being coordinated by the European Space Agency (ESA); the partners are the Italian Space Agency (*Agenzia Spaziale Italiana: ASI*), Spain's Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial: CDTI*), the French Space Studies Center (*Centre National d'Etudes Spatiales: CNES*), the German Aerospace Center (*Deutsches Zentrum für Luft- und Raumfahrt: DLR*) and the UK Space Agency (UKSA).

Initial SRC activities have addressed designing, manufacturing and testing of reliable and high-performance common robotic building blocks (through six operational grants-OGs) for operation in space environments (orbital and/or planetary). In the last and most challenging phases of the first Cluster call, the six technology building blocks are being tested to serve as the basis for future orbital and planetary missions.

GMV is leading 3 of these technology building blocks: the European Space Robotics Control and Operating System-OG1 (ESROCOS), centering on the creation of operational

software capable of controlling a space robotics system in all mission phases; the European Robotics Goal-Oriented Autonomous Controller-OG2 (ERGO), the block designed to develop the autonomy system for planning, scheduling and overseeing the execution of elementary activities of robotics systems; and Facilities for Testing Orbital and Surface Robotics Building Blocks-OG6 (FACILITATORS), for providing the orbital and planetary scenarios for the rest of the projects, including the preparation of facilities for validation of robotics systems and the organization of field testing campaigns.

In September the Test Readiness Reviews (TRRs) of the three projects were carried out, using **platform-art®** as an in-orbit servicing validation scenario. These tests marked the end of development and software-integration activities and the start of the test campaign led by the FACILITATORS project, to validate the project framework in scenarios representative of space robotics.

Afterwards, and up to mid-December, the northern tip of the Sahara desert in Morocco, chosen as a Mars-like terrain, hosted the final tests of ERGO and INFUSE, the latter led by the Belgium company Belga Space Application Services. In this field-test campaign, carried out under the FACILITATORS project and coordinated by the German Research Center for Artificial Intelligence (DFKI), the robotics technology developed in the SRC was put through its paces outside the laboratory.

The robotics platform chosen for field-testing the technology developed by both projects was the Rover SherpaTT, a desert veteran that successfully carried out a simulated space mission in the Utah desert (USA).

GMV organizes the fourth I-MECH face to face meeting

■ GMV hosted the fourth face to face meeting of the I-MECH (Intelligent Motion Control Platform for Smart Mechatronic Systems) project on 12-14 of November.

I-MECH is a H2020-ECSEL project with a total budget of € 17M, kicked off in mid-2017. It is led by the Netherlands Institution SIOUX CCM and gathers 31 organizations from 10 different member states, taking in not only multinationals of the industrial sector, like Philips, Siemens and Johnson & Johnson, but also prestigious universities such as University of Brescia, Eindhoven University of Technology or University of West Bohemia.

The remit of I-MECH is to develop hardware and software components adaptable to current motion-control

systems and favoring achievement of industrial processes as efficiently as possible using smart mechatronic technology. This will enable motion control processes to be simulated beforehand and systems to be optimized as swiftly as possible. Within the scope of the project the core I-MECH platform will be built supporting the application of all the developed components. Furthermore, to make I-MECH sustainable, the project outcomes will be available for European smart industry through the envisioned I-MECH Center, after the completion of the project.

GMV is leading the test campaign "On-ground validation of space GNC systems through the use of robotic devices", being held in the advanced robotics testbed **platform-art**[®]. Control

algorithms and related technology developed under I-MECH will be used to improve the performance of **platform-art**[®] in hardware-in-the-loop testing scenarios calling for high accuracy in the dynamic control of handling robots.

The meeting was a resounding success, finalizing definition of the various hardware and software components to be developed in the project and making further headway in definition of development methodology. Participants were also taken on a guided tour around GMV's site, finding out at first hand about the company's space breakthroughs, such as the fine detail of the recently won contract for maintenance and upgrading of Galileo's GCS, robotics developments and the projects implemented in **platform-art**[®].



GMV showcases its latest space robotics breakthroughs at SET-FPDS



GMV had a standout role in the Space Engineering and Technology Final Presentation days (SET-FPDS), held on 13 and 14 November in ESTEC, Noordwijk, the Netherlands.

GMV presented 7 papers on the GNC and robotics projects it is currently working on, namely LUCID, GOTCHA, SARGON, ESROCOS and ERGO. SET-FPDS is designed to allow European industries, academia and ESA technical experts to present their achievements in

developing advanced technologies for space missions.

Using these technology achievements and bringing them to wider notice is an essential role of the Directorate of Technology, Engineering & Quality and fundamental in maintaining its position as the ESA technology innovation engine. One of the Directorate's main objectives is to develop a broad range of advanced technologies up to a sufficient maturity level for use in space missions.

The first phase of the COMRADE space debris removal contract comes to an end

THE PURPOSE OF COMRADE IS TO DESIGN, DEVELOP AND TEST THE CONTROL SYSTEM OF A ROBOTIC S/C FOR TWO TYPES OF MISSION: AN ACTIVE DEBRIS REMOVAL (ADR) MISSION AND A SPACECRAFT REFUELING MISSION

■ The first phase of the ESA-funded COMRADE project (Control and Management of Robotics Active Debris Removal) has now been brought to a successful close.

The purpose of the two-year project is to design, develop and test the control system of a robotic S/C (including manipulator and end-effector) for two types of mission: an Active Debris Removal (ADR) mission and a spacecraft refueling mission. They take their cue from ESA's e.Deorbit mission (which aims to capture and deorbit the ENVISAT satellite) and the ASSIST mission (refueling demonstrator) respectively.

GMV is leading a team comprising all the following: ADS Germany, which is supplying a robust docking-control system with 13 degrees of freedom (platform + manipulator); DLR (Germany), which is supplying a second docking-control system with 13 degrees of freedom; Bordeaux University, which is seeing to fault detection and recovery; NTUA-CSL, which is inputting its floating platform testbed (2D microgravity) as validation testbed; and lastly PIAP, which is providing a gripping mechanism, specially designed for ADR work and in particular for the e.Deorbit mission.

This first phase of project activities has centered on analysis, design, prototyping and validation based on software simulators of the guidance, navigation and control algorithms. Successive phases will consist of the testing and validation activities using GMV's dynamic testbed, **platform-art**®. These activities include use of real hardware and equipment representing space missions (processors, robotic manipulators, gripping mechanisms, cameras, image processing algorithms and satellite mockups).

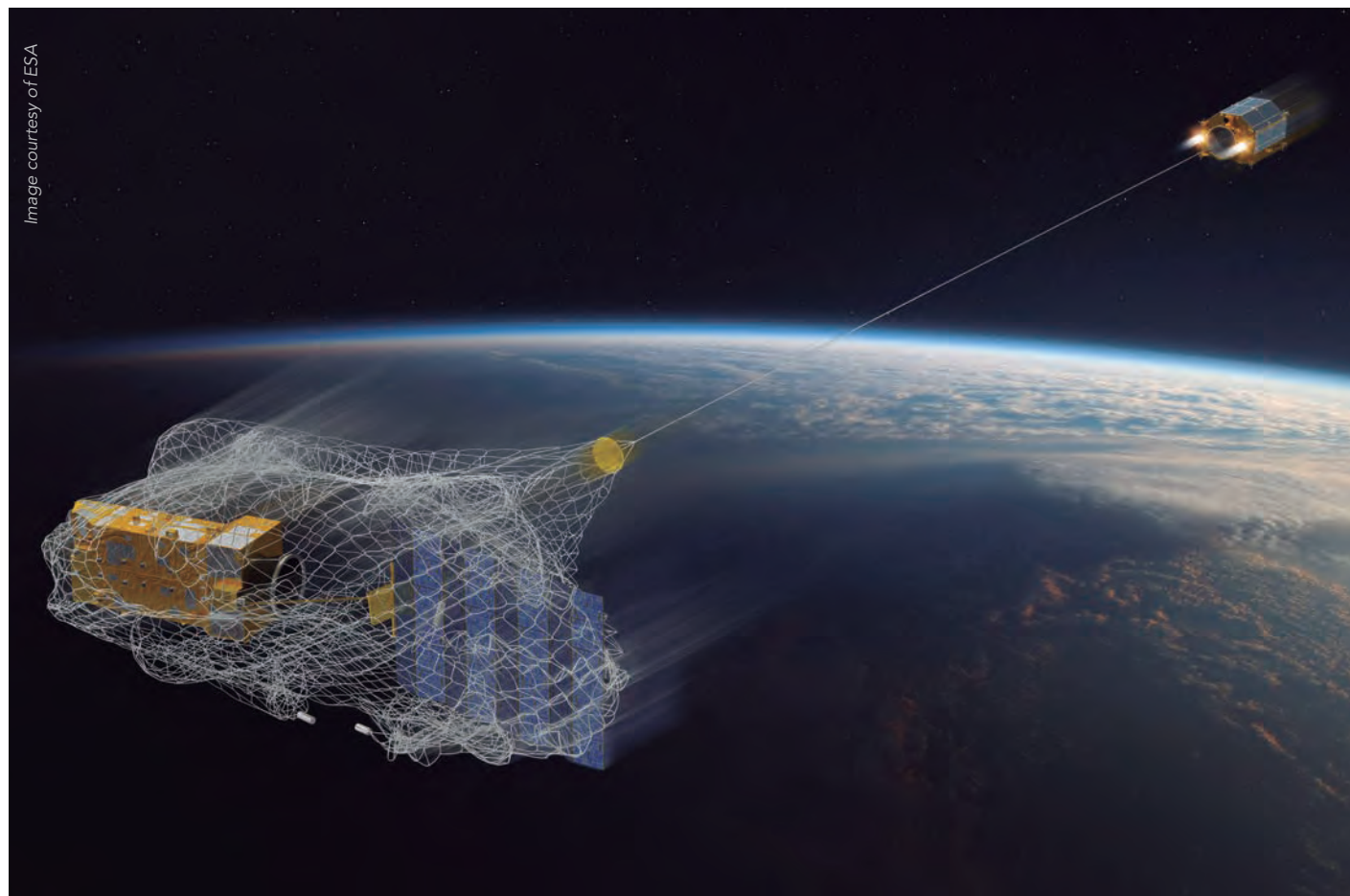


Image courtesy of ESA

New milestone in the SISCAP project

WITHIN THE FRAMEWORK OF THE SPANISH DISMOUNTED SOLDIER SYSTEM (*SISTEMA COMBATIENTE A PIE: SISCAP*) PROJECT, GMV IN A JOINT VENTURE WITH INDRA, IS RESPONSIBLE FOR INTEGRATING THE FIRE EFFICIENCY SUBSYSTEMS AND THE COMMUNICATIONS AND INFORMATION SUBSYSTEM WHILE ALSO DEVELOPING THE ELECTRONICS AND SOFTWARE OF THE SOLDIER'S MAIN COMPUTER

The Spanish Dismounted Soldier System (*Sistema Combatiente a Pie: SISCAP*) project aims to develop and integrate technology that suitably equips soldiers for an efficient combat operation. This national program, kicking off in 2017, is broken down into 7 subsystems: Armaments and Munitions (*Armamento y Munición*); Fire Efficiency (*Eficacia de Fuego: EFU*); Communications and Information Subsystem (*Subsistema*

de Información y Comunicación: SIC); Upkeep (*Sostenimiento*); Survival (*Supervivencia*); Power Source (*Fuente de Alimentación: FAL*); and Training (*Preparación*).

This project, drawing from the lessons learned in the forerunner Future Soldier 2006-2010 program (Combatiente del Futuro: COMFUT), involves the development of 3 prototypes (hardware and software). SISCAP in particular centers on the research, design, development and vetting of the functions of the EFU subsystem to boost its capabilities of detection, reconnaissance and acquisition, together with the basic components of the SIC for the soldier's connectivity, such as the system's screenless computer and device control component or soldier's control unit.



GMV, in a joint venture with Indra, will be responsible for integration of the abovementioned subsystems and will develop the electronics and software of the soldier's main computer, the Central Power Distribution and Processing Unit (*Unidad central del Proceso y distribución de Energía: UCPE*). The UCPE, based on a previous inhouse GMV R&D development, is responsible for command and control capabilities, connectivity with the devices carried by the soldier and power management, one of the most critical factors in the whole soldier system.

The Critical Design Review (CDR); recently held in GMV's Tres Cantos head office, was attended by Brigade General Roberto Soria (head of the terrestrial systems of the Program Management Subdirectorate of the Directorate General

of Armaments and Material (DGAM), Colonel Moisés Serrano Martínez (head of DGAM's SISCAP program) together with the rest of SISCAP's program office plus representatives from the Spanish army, air-force and navy.

The visitors were also given a guided tour around GMV's site, with demos of hardware like the Shot-Detection and Vehicle-Navigation subsystems developed for the VCR 8x8 wheeled combat vehicle, the Electronic Control Unit (ECU) for the A400M

aircraft's crane system and the Flight Control Computer (FCC) for the RPAS ATLANTE. The tour continued with a demonstration of GMV's space prowess, with special stress on the company's recently awarded contract for maintenance and upgrading of the Galileo Ground Control Segment (GCS).



France hosts the second DRIVER+ testbed

■ From 22 to 26 October the head office of Entente Valabre, a French civil-protection organization, hosted the second of the four trials scheduled for the DRIVER+ project (Driving Innovation in Crisis Management for European Resilience).

DRIVER +, a European Commission, FP7-financed project, aims to come up with an answer to the current and future challenges posed by the increasingly serious consequences of natural disasters and terrorist attacks. In pursuit of this overarching aim the project is assessing and implementing groundbreaking solutions that can be used jointly to cope with the various types of large-scale crises. This involves the holding of four trials and a final demonstration to investigate innovative solutions under simulated crisis conditions.

Each one of the trials – the first two already conducted in Poland and France plus the final two to be held

in the Netherlands and Austria – will provide priceless feedback for the pan-European testbed being developed under the project. The DRIVER+ testbed will create a unique opportunity for a transformative change by developing a coherent infrastructure for trialing solutions well into the future. This will open up the pooling and sharing of resources across Europe, allowing experience from trialing in different contexts to cross-fertilize.

The results of the assessment of the solutions will be stored in the Portfolio of Solutions (PoS), a website that describes the capabilities of all the available DRIVER+ solutions. The PoS will then be made available to any external organization, enabling it to share data and experiences on its own solutions. This will in turn pave the way for successful implementation and use of solutions by other practitioners. As well as participating in all DRIVER+ subprojects, GMV is also helping to

work towards a pan-European testbed to deal with crises. Furthermore, the solutions included in the PoS, all of which will be put through their paces during the project trials, take in GMV's complete **SOCRATES OC** operating center.

This second trial was conducted entirely in a virtual environment created by a fire simulator. This presented the timeline of various events related to a forest fire in southern France, threatening nearby towns and followed by cascade effects on a nearby chemical plant. The trialed solutions focused on support for firefighters, emergency medical services and the European Civil Protection Mechanism plus other authorities. This was done by setting up a coordinated management framework giving an overview of response operations and ensuring an efficient information-exchange system that also brought relevant information from social media into disaster management operations.

GMV showcases its cyberdefense capabilities in Colombia

Experts from various parts of the world – Brazil, Spain, Colombia, USA and Israel – met up in Bogotá to take part in the 4th International Cybersecurity and Cyberdefense Seminar, organized by Colombia's Higher Warfare School (*Escuela Superior de Guerra de Colombia*: ESDEGUE).

The event was opened by Ship Captain Oscar Enrique Mantilla Ruíz, Commander of the Joint Cybernetic Command, who is responsible for the defense of the armed forces' infrastructure and the country's critical infrastructure. His opening address focused on the joint command's coordinating and cohering role, and presented the advances within the command over recent years.

He was followed by keynote speakers from Colombia and abroad, including Lieutenant Colonel Jay Anson, Director of J6 Communication Systems of the U.S.



Southern Command, who dealt with the main cybersecurity threats hovering over America's defense infrastructure.

On behalf of GMV, José María Legido, Director of the International Sector of Secure e-Solutions, ran through Spain's cyberdefense capabilities, detailing the organization of national defense and the various organizations that run it, both in

the public and private sectors. Legido also stressed GMV's great cybersecurity capacity; it is an international beacon in this field, as shown by the recent award to the company of the contract under which it takes on responsibility for the data cybersecurity of the satellite constellation of Galileo, Europe's civil satellite navigation and positioning system.



The Spanish Navy and GMV working to improve the exchange of maritime information

IN THE FRAME OF THE UE'S CISE INITIATIVE A LEGAL, POLITICAL AND ORGANIZATIONAL FRAMEWORK HAS BEEN DEFINED TO ALLOW THE EXCHANGE OF INFORMATION AMONG STAKEHOLDER SECTORS (DEFENSE, STATE SECURITY FORCES AND CORPS, MARITIME RESCUE SERVICE, CUSTOMS AUTHORITIES, BORDER CONTROL AUTHORITIES, FISHERY AND THE ENVIRONMENT)

■ On 25 October, in the Headquarters of the Maritime Action Force in Cartagena, the results were presented of the European project EUCISE2020.

The Common Information Sharing Environment (CISE) is a European-Commission-brokered maritime-surveillance initiative that establishes a collaborative process between European authorities to improve maritime situational awareness.

The Commission has been developing the CISE concept since 2009 in collaboration with military and civil authorities of member countries. A legal, political and organizational framework has been defined to allow the exchange of information among stakeholder sectors (defense, state security forces and corps, maritime rescue service, customs authorities, border control authorities, fishery and the environment).

Part of the concept-development work involves a definition of the series of

systems, networks and services that have to be integrated in a comprehensive information infrastructure to ensure CISE operability by 2020.

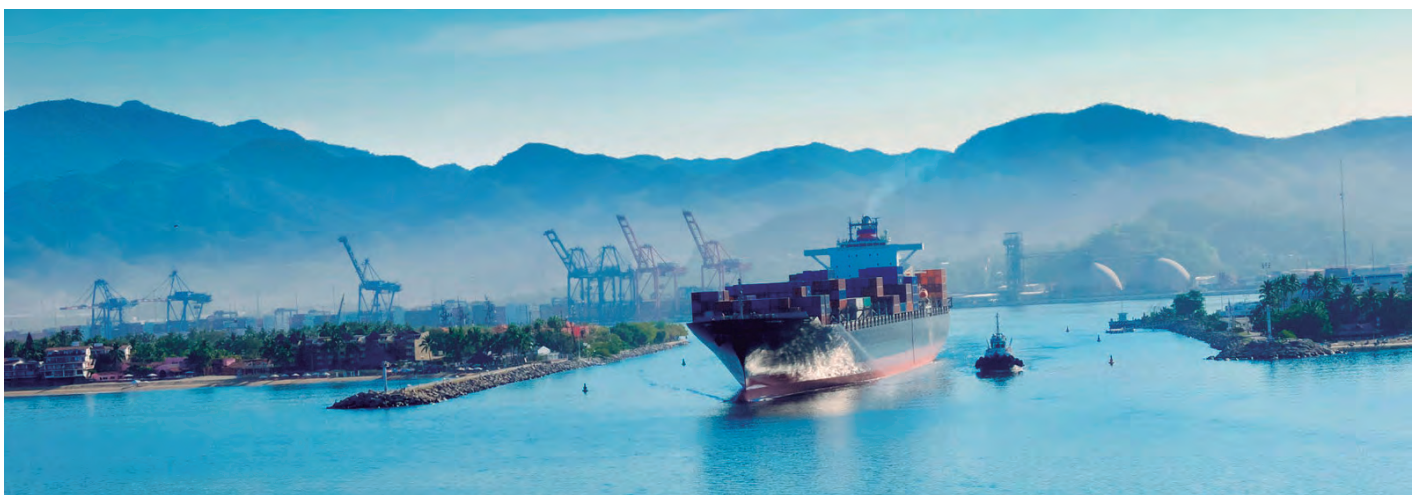
The Commission has therefore launched an FP7 operational validation project called EUCISE2020. This project comprises 37 partners from 15 different countries, including the Spanish MoD through the Navy and other Spanish institutions like the Guardia Civil, the Maritime Rescue Service (*Salvamento Marítimo*) and the Spanish Taxation Authority (*Agencia Tributaria*).

Within this project the industry has also been invited to submit R&D bids for the creation of information-exchanging EUCISE nodes. Among these services GMV has taken on the task of developing the adaptor between the Collaborative Navy Environment (*Entorno Colaborativo de la Armada: ENCOMAR*) and the EUCISE node.

GMV duly attended this demonstration, which clearly proved EUCISE's potential

for sharing real-time information on incidents and ships between Portugal, *Salvamento Marítimo* and the Navy. This represents an important milestone in international maritime collaboration between various countries.

Institutions from 15 different countries, including the Spanish MoD through the Navy and other Spanish organizations like the Guardia Civil, the Maritime Rescue Service (*Salvamento Marítimo*) and the Spanish Taxation Authority (*Agencia Tributaria*) are taking part in the operational validation project EUCISE2020



System engineering comes under the spotlight

■ On 25 October Spain's first National System-Engineering Congress was held, organized by the System-Engineering Observatory of the Horizons Network (*Red Horizontes*) of the public corporation ISDEFE, in collaboration with the Spanish System-Engineering Association (*Asociación Española de Ingeniería de Sistemas: AEIS*).

With joint participation by industry, academia and the public at large, and held under the banner "An inter-sector view of system engineering in Spain", its remit was to swap notes on system engineering and encourage ongoing innovation.

System engineering, as a particular branch of engineering as a whole,

involves an interdisciplinary approach and represents the best way of developing and rolling out successful systems with due consideration given to the development stages and integrating all stakeholders without thereby forfeiting an overview of the problem in hand. System engineering has a whole host of applications: medicine, transport, aeronautics, telecommunications and robotics, etc.

Among other firms GMV was present as an industry representative, talking about the success story in the defense area: "View of system engineering as applied to the dismounted soldier". The paper revolved around the problem posed by dismounted soldier modernization

programs, to do with ergonomics, feature creep, overweight equipment and low autonomy. This set of problems calls for application of system engineering principles in order to meet expectations without compromising the soldier's performance.

The European Defense Agency (EDA) and the European Commission has launched several initiatives for development of a reference dismounted-soldier-system architecture based on said system-engineering principles. GMV is playing a crucial role in the development of this architecture, leading such consortiums as the one set up for EDA's STASS II project or contributing to the European Commission's GOSSRA project.



The CD TEXP training platform plays a key part in the European cyberdefense

■ A new phase has recently kicked off in the development of the Cyberdefense Training and Exercise Coordination Platform (CD TEXP).

The development of this platform started back in 2015, with the purpose of serving as a powerful digital platform for centralized coordination of any type of theoretical and practical cyberdefense course, both at national and European level.

Three years later, in April 2018, as a result of intensive joint activity between GMV, CINAMIL (Portuguese Military Academy R&D) and the European Defence Agency (EDA), the "Cyber defence training & exercise, coordination and support

platform (CD TEXP)" platform was successfully delivered and installed at the Portuguese Armed Forces Military Academy in Lisbon. The CD TEXP platform is already operational, becoming a key element of the European Cyber Defence training framework.

The objectives for the new phase are, on one side, to build-up implementation of the existing platform. This customization will be based on the emerging requirements. At the project level, this will result in an update of the interactive Cyber Competencies and Skills Framework (iCCSF). At the same time, and fundamentally based on the extensive skills of the team in the EU Military Training Group Cyber Defence

Discipline, there will be a task dedicated to the update of the Training Needs Analysis (TNA).

GMV's longstanding experience in the development of technological defense systems allied with CINAMIL's vast experience in cyber defense capabilities and systems, has enabled the GMV-CINAMIL consortium to successfully build the CD TEXP Platform.

By the end of this second phase, CD TEXP will be installable in several EDA Member States, facilitating the sharing of contents and the transversal participation of any member in the different CD TEXP national versions of the platform.



New activities in the European Union's Command and Control Information System

■ After rollout of the upgrades required in the second year of execution of EU's Command and Control Information System (EUCCIS) and the successful participation of this system in the CWIX 2018 exercise, GMV has recently signed a new contract with the European External Action Service (EEAS) for carrying out the activities scheduled from November 2018 to September 2019.

This project comes under the 7-year framework contract for maintenance, support and upgrading of the EU's Command and Control Information System, awarded to GMV as sole contractor.

EUCCIS enables any operation commander to effectively plan, monitor and conduct EU-led crisis management operations in its ongoing quest for increasingly efficient collaboration between civilians and military personnel.

The main activities during this third year include transverse packages of corrective maintenance, support (help desk), training and consultancy services.

As well as these ancillary activities the contract also includes specific packages for improving communications between the various nodes deployed as well as interoperability with other external systems; accreditation of EUCCIS within the new infrastructure of EAAS's secure network; development of the first phase of the new tactical visor and support for the system's participation in the CWIX 2019 interoperability exercises.

Since GMV took over control of the system EEAS has decided to give it the status of full participant (previously acting only as observer) in NATO's CWIX operability exercises. During CWIX 2018 EUCCIS successfully took part in the Multilateral Interoperability Protocol (MIP) areas of interest Maritime and GEOMETOC (Geospatial and

Meteorological and Oceanographic). As a result EEAS now intends to step up this participation, exercising the system's Federated Mission Network (FMN) capability in CWIX 2019.

GMV's experience in the field of communication and information systems (CIS) for command and control enables it to take on this whole range of activities, maintaining a long-term cooperation framework as a tried-and-trusted supplier of EEAS.

GMV is acting as sole contractor for maintenance, support and upgrading of the European Union Command and Control and Information System (EUCCIS)



The European maritime safety and surveillance project MARISA reaches its initial operational capability

MARISA, IS THE INTEGRATION OF BIG DATA WITH THE FUSION OF MULTISENSOR DATA, AN INNOVATIVE TECHNIQUE FOR THE EXPLOITATION OF DATA FROM DIFFERENT SOURCES TO OBTAIN USEFUL AND QUALITY INFORMATION, IN THIS CASE APPLIED TO MARITIME SECURITY ACTIVITIES

■ Between 5 and 9 November, the Spanish Guardia Civil and the Portuguese Navy, in conjunction with GMV, INOV and Inovaworks, carried out the Iberian trial as part of the MARISA project.

The main purpose of MARISA (Maritime Integrated Surveillance Awareness), which kicked off in May 2017, is the integration of Big Data with the Fusion of Multisensor Data, an innovative technique for the exploitation of data from different sources to obtain useful and quality information, in this case applied to maritime security activities. This will be made possible thanks to the development of a series of interoperable tools which will be used to access more easily the data generated by the different technological resources that are currently in operation.

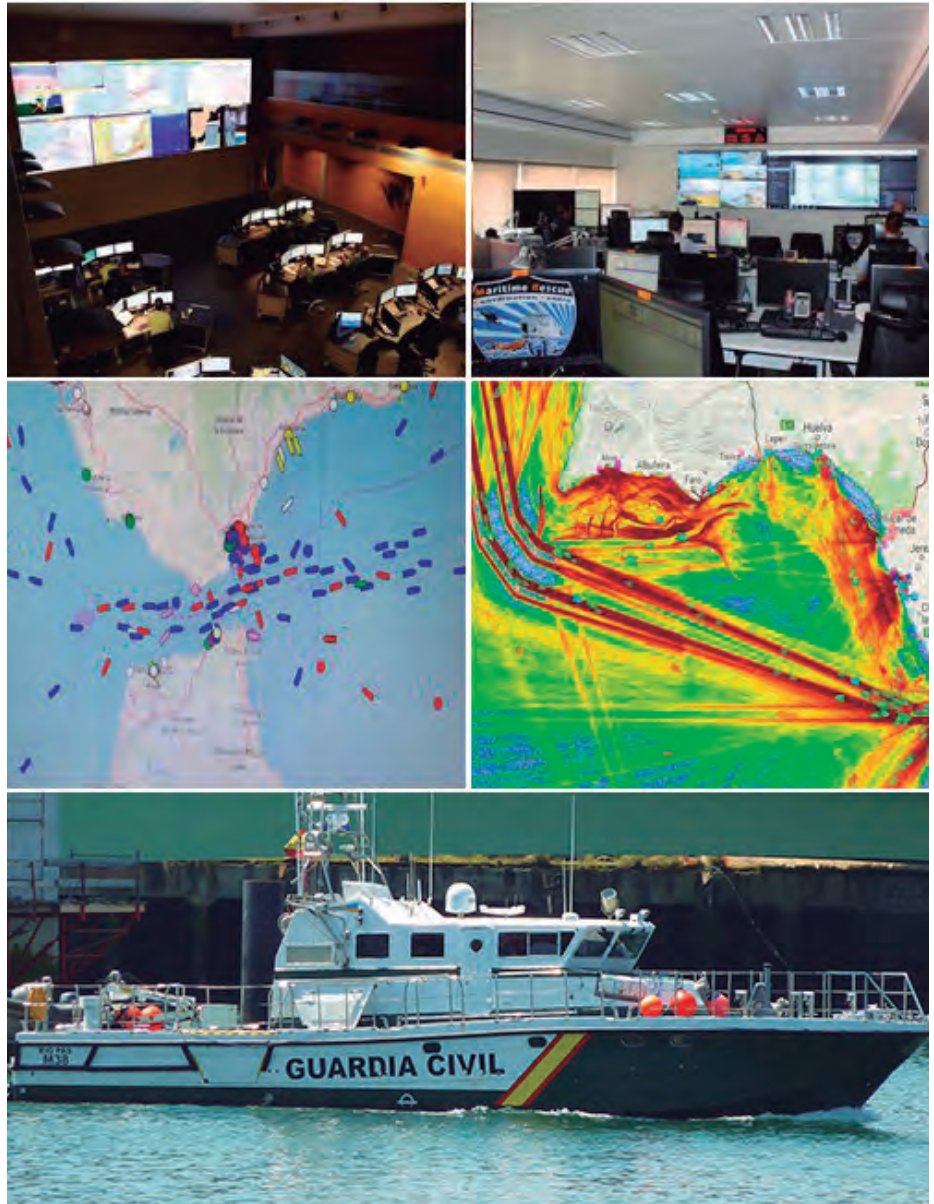
The project is the result of a consortium led by the Italian multinational Leonardo, together with another 21 companies from nine EU Member States. GMV is one of the members and has a significant role in the project. It is in charge of designing the system, developing level-one fusion algorithms and detecting anomalies, together with execution of integration and operational tests.

During this trial, in which two vessels provided by the Guardia Civil and the Portuguese Navy took part, different solutions foreseen within the project were tested, while the capacity of the anomaly detection services and the visualization software was evaluated. GMV, as the party in charge of these trials, coordinated the activities to be executed in the Guardia Civil's facilities

in Madrid and those of the Portuguese Navy in Lisbon, ensuring their success.

The success of this demonstration, together with the rest of the operational trials, has led to the commencement of the project's Phase

2 activities, which will take place throughout 2019. In this second phase, the design and implementation of data and infrastructure fusion services will be updated on the basis of the results of the operational trials. Moreover, extra features will be added.





ATM Cybersecurity, a top priority for the financial sector

Last year saw a 230% rise in ATM malware and cyberattacks in comparison with 2016. Associated losses rose from 0.46 million to 1.52 million euros. These figures, from the report of the European Association for Secure Transactions (EAST), show how the financial sector faces a slew of threats that are growing by the year. Today's criminals tap into unknown vulnerabilities and attack any targets that are not shielded by proper security measures.

In the world as it stands today security can no longer be optional for the financial sector. In this digital era the growing diversity of attacks obliges banks to bring in sophisticated and efficient security solutions that can ward off existing and future threats. For that very reason over 400 banks and security experts from all over the world came together in London to attend two of the world's benchmark conferences dealing with the physical security of ATMs and the latest logical-security and cybernetic threats: namely ATM & Cyber Security and Financial Crime & Security.

For yet another year GMV was present at both events, showcasing the benefits of its inhouse checker ATM Security solution, worldwide leader in end-point protection now fitted in over 150,000 ATMS in 34 countries. "In recent years, after the numerous ATM-emptying Jackpotting attacks in Europe, Asia and the Americas, adding up to losses of several million euros, there is no longer any doubt about the need of safeguarding ATM software from malware attacks" argues Pedro Celis, Product Manager of GMV's Secure e-Solutions sector.

For his part, Juan Jesús León Cobos, Products and New Developments

Manager of **checker**, took part in the Terminal Fraud Seminar of Financial Crime & Security, giving a paper on the latest sector trends under the title: "The evolution of Cash-out / Jackpotting Attacks".

Jackpotting is a technique that has come to be widely used in Latin America, Asia and Europe over recent years. It involves infecting the terminals with malware to exploit vulnerabilities in obsolete or out-of-date systems, giving cybercriminals total control over the ATM and forcing it to spit out all its cash. At the beginning of this year, for example, the USA's secret service detected cash-out attacks with the ATMs

spewing out bills at the rate of 40 every 23 seconds.

As well as Jackpotting there are many other threats to be taken into account by banks nowadays, like bankcard cloning, false devices fitted in ATMs, fraudulent applications, etc. The financial sector should persist in its current efforts to ensure an ever-higher level of security in its infrastructure while also remaining on the lookout for new threats to their sensitive infrastructure, in order to head them off before they can do any harm.



The need of a real integration of the IT and OT worlds

■ The National Critical Infrastructure Protection Center (*Centro Nacional de Protección de Infraestructuras Críticas: CNPIC*) and the *Fundación Borredá* once more came together to successfully organize for the sixth time the Congress on the Protection of Critical Infrastructure and Essential Services, once more bringing cybersecurity to much wider notice. Spain's Ministry of the Interior, Fernando Grande-Marlaska, opened the event by stressing the collaboration of operators and the need of driving cybersecurity further forward.

Javier Zubieta, Marketing and Communication Manager of GMV's Secure e-Solutions sector, took part in the panel debating the integration of the IT (Information Technology) and OT (Operations Technology) worlds, all speakers agreeing on the importance of bringing about a real integration of both worlds, even regarding it as an obligatory need.

From a technical point of view today's IT and OT networks share many protocols, meaning they are exposed to similar threats. Reality shows that industrial networks expose data and services to Internet as well as other input vectors to a world like OT, traditionally isolated but now hyper-connected. It is therefore now crucial to tap into all security management experience built up in



the IT world in order to export the best principles, practices and technologies to the OT world, given that IT/OT convergence is now an established fact.

A good start here would obviously be to set up initiatives enabling organizations "to ascertain the risks of their industrial plant by means of cyber diagnosis work", argued Javier Zubieta. During his speech he gave three concrete examples of how cybersecurity can help in the OT world. Firstly, by bringing risk-based cybersecurity practices to OT. Secondly, encouraging industrial plant to make use of the cloud. And, thirdly, bringing out legislation like the cybersecurity-embedded Critical Infrastructure Protection Law.

Fittingly, the event coincided with publication, in Spain's official journal of

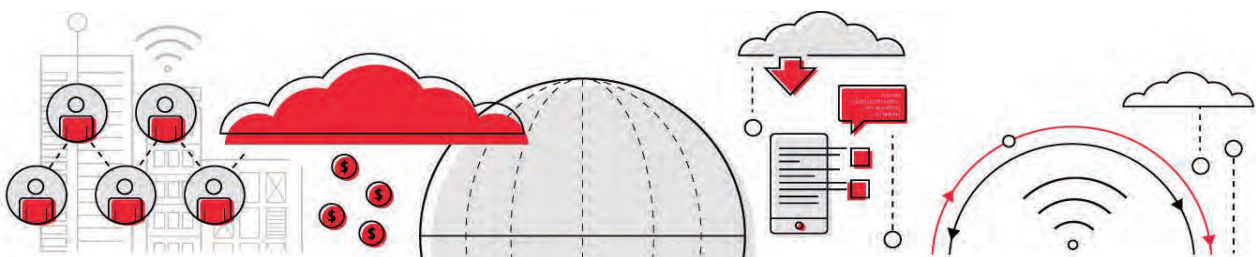
new laws (BOE), of the Royal Decree Law on the security of information systems and networks (NIS Law), which obliges essential-service operators to establish minimum cybersecurity measures and reinforce public-private collaboration in this field.



8th Cloud Security Alliance Spain Congress

■ The Spanish chapter of the Cloud Security Alliance (CSA ES) has held its eighth Annual Congress of Cloud Security Professionals. The keynote theme of this year's congress was management of cyber incidents and how they might be worsened by the inclusion of cloud services.

During the congress Mariano J. Benito, GMV's CISO and Coordinator of the Operational Technical Committee of the Spanish Chapter of the Cloud Security Alliance, presented the 6th State-of-the-Art Cloud Security Study. This latest version of the study is IoT-centered for the first time, looking at how organizations are designing or supporting these services, plus the role being played by the Cloud in this scheme.





PROTECTIVE embarks on the second phase of its cyberdefense-platform

■ The H2020 project PROTECTIVE for proactive risk management through enhanced cyber situational awareness has just set out on the second phase of the operational trials of its cyberdefense platform, to check everything is working properly. Its official unveiling came on 17 September in Krakow during the cybercrime research symposium eCrimeEU 2018, organized each year by APWG (Anti Phishing World Group), an association that pools the various cybercrime-combatting stakeholders.

In this new stage the three National Research and Education Networks (NRENs) taking part in the project - CESNET (Czech Republic), PSNC (Poland) and RoEduNet (Romania) – are now ready to share cybersecurity information. This milestone marks further headway in the project's overall objective, namely improving awareness of cyberattack risks, setting up a cybersecurity-data and information processing and collating

system and sharing information between the cybersecurity teams of the various organizations taking part in the project.

To this end GMV is now working on the definition and development of alert-correlation models and threat-intelligence sharing modules. It is also responsible for integration and testing of PROTECTIVE's various modules. In particular GMV is contributing its expertise and knowledge of correlation modules and intelligent sharing of security threats.

Cybersecurity attacks pose one of the biggest threats to today's society. Governments and industry alike are making a huge effort to thwart these attacks, which are usually international in scope. PROTECTIVE is a three-year collaborative project under the EU's umbrella Horizon 2020 research and innovation framework program, involving the participation of three national research and education



networks, three academic institutions and four commercial partners from eight countries, GMV among them.

GMV awarded the R&D Activity Prize in Security Matters

■ For yet another year over 500 security experts attended the International Security Awards put on for the 32nd time this year by Seguritecnia. These awards publicly recognize outstanding security companies and professionals. This year in particular GMV was awarded the R&D Activity Prize for **VirtualPAC** project, a solution for the deployment, management and secure operation of control systems involved in the control and operational network of an industrial plant.

Miguel Hormigo, Industry Manager of GMV's Secure e-Solutions sector, received the prize, which reflects GMV's ongoing improvement and innovation capacity, making it a beacon in technologies adapted to the digital transformation. During the

award ceremony Hormigo expressed his thanks for this recognition of the imagination and talent of the team that has made this project possible, the exclusive feat of developing something unique in the market and the adaptation of Industry 4.0 to meet an existing need.

VirtualPAC is a game-changing, multivendor solution that enables various control software modules to be deployed in industrial controllers to improve processes or solve any defects, all without needing to shut the plant down. It not only cuts costs but also offers smart solutions to reduce the resource- and energy-demand. At all times it takes into account the cybersecurity of productive processes in their take-up of Industry 4.0.



Security diagnoses in

In an increasingly connected world like ours it is vitally important to ensure that any internet-exposed devices are secure. When it comes to systems with industrial applications this security is, if anything, even more crucial. After all, any attack might shut down the service or alter information, or even cause personal harm or infrastructure damage. It is therefore essential for cybersecurity diagnoses to be built into the lifecycle of connected devices

ushered in by Industry 4.0, a service successfully offered by GMV in diverse industrial environments.

However, cybersecurity diagnoses in connected devices must also take into account the idiosyncrasies of each installation. In other sectors cybersecurity tends towards standardization; in the world of industry, however, there are no two implementations alike. This means that each audit calls for a specific analysis of the environment to be diagnosed, the requirements of the complete system and the various impact indicators to determine the most suitable security measures in a totally customized way.





industrial environments

TECHNOLOGICAL CHALLENGES

The prime challenge stems from the fact that, unlike corporate ICT systems, industrial devices depend crucially on availability, which must be fully ensured. In other settings tests can be carried out at those moments that have least impact on system operation. Industrial systems, however, such as smart electricity grids, are always in use and can therefore withstand neither latencies nor shutdowns. This means that auditors need a detailed knowledge of the impact of each test to ensure this essential availability.

Furthermore, given the unique nature of industrial devices, most of them use systems designed for long periods of operation, from ten to fifteen years in most cases, though even longer operating cycles are not unknown. This means that diagnosis teams need an in-depth knowledge of diverse technologies in their various states of maturity: multivendor components and diverse technologies usually coexist within the same industrial ecosystem. In most cases, moreover, industrial systems use embedded operating systems, which the manufacturer has striven to adapt to its hardware,

and proprietary communication protocols calling for special auditing arrangements. Unlike in the ICT world, protocols and systems are specific for each manufacturer and for each integration. Because of this idiosyncrasy, the same auditor action would have different impacts depending on each particular system.

Finally, another consideration that has to be made here is that industrial systems, despite being designed to work even in the most hostile environments and unsupervised for long periods of time, do not have the same resilience for handling large volumes of messages or errors. If we also factor in the aforementioned availability requirement, it becomes obvious that testing needs to be carried out in a much more prudent way than in non-industrial systems.



By Paula González Muñoz, section head of GMV's Secure e-Solutions sector

«Cybersecurity diagnoses in connected devices must take into account the idiosyncrasies of each installation. In the world of industry there are no two implementations alike»





GMV showcases its cybersecurity solutions at the latest IDC DIRECTIONS®

■ In October, Portugal held its main yearly Digital Transformation and ITC event, IDC DIRECTIONS® 2018, where GMV was once more an official sponsor.

Under the heading “*Becoming Digital-Native: Multiplying Innovation in the DX Economy*”, the 21st IDC DIRECTIONS® took place on October 18 at the Centro Congressos do Estoril. Attendance was the highest ever and the main players in the national and international market were all present.

In the upcoming years the Digital Transformation (DX) will continue to dramatically reshape the global economy as the 3rd Platform's second chapter hits full stride. In this chapter, digital innovation –and IT industry growth– will be fueled by open innovation ecosystems, massive data sharing and monetization, and hyper-agile application deployment technologies. IDC believes that a new IT world is emerging, around changing technologies, new offers, evolving business models, and emerging DX use cases.

The IDC DIRECTIONS® 2018 conference provided the vision and insight needed to navigate the rapidly changing landscape and help you mitigate risk, apply innovation, speed up time to market, and drive business outcomes!.

GMV was present with a dedicated stand that focused on Cybersecurity, which received hundreds of visits during the day.



Presentation of the CISO's White Book



MARIANO J. BENITO
CISO SECURE E-SOLUTIONS GMV



“ORGANIZATIONS ARE CRYSTAL CLEAR ABOUT THE NEED FOR A CISO TO KEEP THE COMPANY'S CYBERSECURITY POLICY IN LINE WITH THE OVERALL BUSINESS STRATEGY”

ISMS Forum has put on the seventh Cybersecurity Forum, with the participation of Mariano J. Benito, CISO of GMV's Secure e-Solutions sector and Coordinator of the Operational Technical Committee of the Spanish Chapter of Cloud Security Alliance.

This forum brought together over 300 information-security professionals to analyze and debate the future of cybersecurity within organizations, maturity models and cybersecurity governance, the importance of cybersecurity for Data Science and data ethics, the integration and orchestration of corporate security ecosystems, among other burning issues such as implementation of the NIS Directive into Spain's body of law.

This event also saw presentation of the CISO's White Book, an initiative of ISMS Forum with the support and collaboration of Spain's National Cybersecurity Institute (Instituto Nacional de Ciberseguridad de España: INCIBE). Over 20 Information Security Managers have worked on the book to take stock of the current state of CISOs in Spain, in terms of the position they hold in their firms, their duties and responsibilities and their training and previous experience, among other factors.



Anonymization, privacy and security in clinical research: HARMONY, a role model to follow

The overall aim of the HARMONY research project is to find more efficient therapies for hematologic malignancies. The Big Data platform rolled out by GMV under this project has risen with notable success to the challenge posed by the coming into force of the European General Data Protection Regulation (GDPR). The system developed by GMV's digital healthcare team, led by Inmaculada Pérez Garro, offers cast-iron data-privacy guarantees, not only for the data subjects themselves (the patients) but also the members of the alliance: clinics, academics, patients' associations, technology assessment agencies, regulators and the pharmaceutical industry.

As pointed out by Doctor Guillermo Hernández, co-chair and member of the Executive Committee of the European public-private alliance, head of the hematology service of Valencia's Hospital Universitari i Politècnic La Fe "the coming into force of Europe's GDPR has added a layer of greater complexity to the project, We have had to strive to obtain a consensus among the 53 members involved in the project, complying not only with

the overarching GDPR itself but its implementation in each participating country's own body of law". Jesús Hernández Rivas, coordinator of the Harmony Alliance, specialist in clinical hematological research and hemotherapy in the Hematological Service of the Hospital Universitario de Salamanca and chair-holding professor of the Universidad de Salamanca, takes up the theme, adding that "GMV, as technological driver of the project, has provided all the necessary cybersecurity and anonymization tools to guarantee data privacy in due compliance with all the legislative frameworks".

For his part, John Butler, leader of HARMONY's legal, ethical and governance unit and vice president of External Innovation and Alliances of Bayer, acknowledged that "the platform, and GMV in particular, has achieved the necessary harmonization for the analysis and drawing of conclusions from the donated data". This calls for "a legal framework but also a technical base. This technical base has been put in place by GMV. In GMV we have a partner who is spearheading healthcare IT". When "we access the HARMONY database we see the presence of certain groups of mutations that, appearing simultaneously, forecast how much benefit the patient will obtain from a given drug". As a result "this data will

enable us to find correlations between the success of the therapy and each patient's idiosyncratic features, finding a perfect match between the two".

The Big Data platform's first intake of data in this initial phase involves over 1,400 people with acute myeloid leukemia and the results of the genetic analyses conducted on about 100 genes from cells of the affected patients. The information drawn from this will facilitate determination of disease-causing mutations in each one of them. More anonymized data will be fed in over time to build up to 100,000 data items from European patients with hematological neoplasia.

HARMONY is an Innovative Medicines Initiative (IMI) project coordinated by the Salamanca Biomedical Research Institute (IBSAL in Spanish initials) together with the La Fe Healthcare Research Institute of Valencia (IIS La Fe, HULaFe). Thanks to cutting-edge processing technology and Big Data, researchers can now draw up a European map of hematological malignancies, which is the fifth most frequent cancer and the third biggest killer. An accurate assessment can now be made of the effectiveness of innovative medicaments brought into the "real world", thus facilitating and speeding up the work of Europe's regulating bodies and their new-technology assessment agencies.



On line recruitment for detection of undiagnosed Alzheimer's disease

A GMV-DEVELOPED RECRUITMENT WEBSITE HAS RECENTLY BEEN SET UP TO FAVOR CITIZEN-DRIVEN EARLY DIAGNOSIS OF THE DISEASE AND TO RAISE PUBLIC AWARENESS OF THE IMPORTANCE OF IDENTIFYING AND INVESTIGATING PREVIOUSLY UNKNOWN CASES. IT HAS BEEN ESPECIALLY DESIGNED TO ATTRACT PEOPLE WHO ARE WORRIED ABOUT THEIR MEMORY BUT CANNOT TAKE THE PLUNGE OF VISITING A SPECIALIST CLINIC

The digital transformation, so beneficial elsewhere, is proving a boon too for scientific-clinical research, not only in terms of being able to draw conclusions from large volumes of data, or Big Data, but also guaranteeing the essential privacy of data collection and processing or even the groundbreaking patient-recruitment models employed for this research. Witness GMV's work under the MOPEAD project (Models of Patient Engagement for Alzheimer's Disease), led by Fundació

ACE - Barcelona Alzheimer Treatment & Research Center (a benchmark Alzheimer's aid, diagnosis, treatment and research center). At the 28th Alzheimer Europe Conference GMV presented the latest technological breakthroughs and developments now being applied for the first time to Alzheimer's studies in Europe, such as the recruitment website <https://www.mopeadstudy.eu/>, designed to draw in persons worried about memory loss but loathe to go to a specialist clinic; the design of a strategy capable of

capturing a significant flow of people (even using Facebook) looking for information on Alzheimer's disease or memory complaints or carrying out online memory tests to give neurologists a first filter of potential sufferers.

As explained in the conference by Doctor Mercé Boada, neurologist and medical director of the foundation leading the project, Fundació ACE, MOPEAD, a project driven by the Innovative Medicines Initiative



(IMI) and the European Federation of Pharmaceutical Industries and Associations (EPFIA), responds to a common need in Europe: "to be able to diagnose the disease in time in persons with initial onset or in pre-clinical state who have flown under the radar hitherto". Because "50% of Alzheimer's sufferers have not been properly diagnosed", and technology is proving its efficiency in bringing these patients to light. In fact, in the words of Adrián Rodrigo, GMV smart health specialist "the recruitment website <https://www.mopeadstudy.eu/> has attracted over 24,000 hits in the first five months of being up and running".

Once on the portal, enquirers can carry out a memory test, and the algorithms designed by GMV will shortlist potential patients for being referred to a memory test in the clinics collaborating in the project. When the patient-recruitment round is over, all the diagnosis test results, together with the patients' demographic and clinical data, will be processed in anonymized form with Big Data technology for specialists to draw the pertinent conclusions and open up new research vectors.

As Doctor Boada put it "the current challenge in Alzheimer's research is to work with people in an incipient state of the disease, with the aim of moving

from merely symptomatic treatment to new preventive treatment capable of arresting the disease. This calls for groundbreaking strategies to find these hidden patients and bring them to light". This is where technology comes into its own, helping MOPEAD to meet one of its prime goals: systematizing the early diagnosis procedure". Thanks "to GMV's exemplary work in designing the platform, the data acquisition forms and the acquisition process itself we will now have information, for example, on how many individuals have actually been recruited by each recruitment strategy. We now know that over 1750 people took part in the study in November and of those that have been diagnosed with cognitive impairment, over 185 have passed on to the final memory test in the clinic". Likewise, "MOPEAD's take up of hi-tech measures makes it very special; it is a trailblazing initiative and is going to furnish us with a huge amount of data for answering questions like the following: how to implement more efficient early-detection strategies, which are the best questions to ask in the study and what percentage of the population is concerned about its mental health". This all calls for "a great, high-quality technology input, handled by experts, especially to deal with ethical and legal problems raised by the movement of patient data

through the cloud".

To achieve the early diagnosis, to identify a patient recruitment model and make headway in disease therapies –all project objectives– online recruitment has been rounded out by free memory checks in the various specialist clinics participating in MOPEAD: Stockholm's Karolinska Institutet Alzheimer's research center; Ljubljana University Medical Center; Cologne University Hospital "Uniklinik Köln; and Fundació ACE. The research project intends in the end to work with at least 2000 people aged 65 to 85, including citizens from Germany, Sweden, Slovenia, Spain and the Netherlands", wound up Doctor Boada.

We urge readers to check out the website <https://www.mopeadstudy.eu/> and carry out the memory test and help it to go viral by participating in the "Citizen Science" MOPEAD project.

The algorithms designed by GMV will shortlist potential patients for being referred to a memory test in the clinics collaborating in the project



Doctor Mercé Boada, neurologist and medical director of the foundation ACE, MOPEAD

Adrián Rodrigo, GMV smart health specialist

Antari HomeCare, sensors and algorithms in the remote care of the elderly and pre-frail

■ GMV has developed an upgraded version of its **antari HomeCare** platform for clinical management of the elderly and pre-frail. Javier Téllez, GMV's Smart Health specialist, ran through these new features that have now been phased into the latest version, developed under the European research and innovation



project FACET (FrAilty Care and wELL funcTion): *"personalized interventions and therapy plans (nutritional algorithms, medication, physical exercise plans) for all-round, coordinated, ongoing care involving all stakeholders (physicians and patients)"*.

GMV has likewise developed the necessary technology to safeguard privacy of research data, in due compliance with Europe's General Data Protection Regulation (GDPR) and the corresponding legislation of each participating country. Particularly worthy of note here is that FACET *"is one of the few Randomized Clinical Trials (RCT) on frailty at national and international levels"*.

DATA, SENSORS AND ALERTS

The platform developed by GMV processes data and gives information on the patient's state, not only physiological but also behavioral, nutritional, functional and cognitive. This then allows the clinician to keep up ongoing monitoring constantly brought into line with the findings at each moment. The data is obtained with sensors that allow healthcare

specialists to keep track of the patients' state without these patients leaving their homes.

Téllez takes up the story: *"a system of alerts has been set up combining parameters of all types, both quantitative and qualitative; to tell the monitoring professional when something is not right so that he or she can take the appropriate remedial action as soon as possible"*. For example, a biomarkers panel keeps up precise and objective monitoring of changes in the diet patterns implying risk of frailty.

The research, using **antari HomeCare**, has centered on two groups of patients. The first of them is being monitored by the Madrid Health Service (*Servicio Madrileño de Salud*) in the Hospital of Getafe; this involves a clinical trial due to run until mid-2019. The second group is made up by patients in Aberystwyth (Wales), who are participating in a pilot scheme to prove the platform's efficacy in community medicine, *"in the context of a widely scattered population with no easy access to medical services"*, as the GMV specialist points out.

The role of Digital Transformation in Health

On October 30, GMV organized a gathering with the Portuguese media to talk about the important role of Digital Transformation in the health sector. As a specialist in health services, products and solutions, GMV currently offers a wealth of experience in leading Healthcare Digital Transformation projects. It has a strong offer for industry having already successfully implemented various projects.

Inmaculada Pérez Garro, GMV's Health Director, talked about the

impact clinical data exploration has on the population's health as well as the important role technology has to play in the ongoing development of healthcare. GMV has concentrated on software development without forgetting important questions like security and privacy. Its main focus has been on more personalized medicine and concepts like teleconsultation that digital healthcare makes possible.

Pedro Lopes Vieira from GMV in Portugal gave a local perspective on

how the company is approaching this industry and GMV's offer in terms of solutions, namely **radiance™** and **antari**.

This event featured a special presentation by a local customer, *Centro Hospitalar Universitário Lisboa Norte (CHULN)*, that has been implementing a GMV solution for telemedicine. According to Luis Salavisa from CHULN, *"digital transformation in healthcare is a journey with no turning back"*.



Poland's Medical University of Lublin personalizes IORT treatment of gastric cancer with *radiance*TM

*radiance*TM, together with the Mobetron[®] linear accelerator designed to deliver electron-beam Intraoperative Radiation Therapy (IORT), will be planning the intraoperative radiotherapy dose for gastric cancers treated in Poland's Medical University of Lublin.

Professor Wojciech P. Polkowski, director of the surgical oncology department, points out that, in stage

III gastric cancer, IORT-directed surgery in combination with systemic perioperative therapy could improve the survival rate of patients with gastric tumors. "Our hospital is delighted to be able to work with Mobetron[®], together with in-built *radiance*TM, enabling us to plan IORT treatment in 3D". The expert adds "Promising tests have shown that IORT improves the local control and survival rate in the treatment of rectal cancers and

advanced pancreatic cancers. We now hope to achieve similar results in gastric cancers, which take a worldwide death toll of 700,000 a year".

The parameters and indicators provided by *radiance*TM in planning application of high-energy electron-beam IORT applied with Mobetron[®], will enable the specialists of the Medical University of Lublin to personalize the treatment of locally advanced gastric cancers.

GMV's healthcare privacy solutions are presented in ENISE



The International Information-Security Meeting (*Encuentro Internacional de Seguridad de la Información: ENISE*), organized by Spain's National Cybersecurity Institute (*Instituto Nacional de Ciberseguridad de España: INCIBE*) is one of Spain's benchmark cybersecurity events. In this year's ENISE Javier Zubieta, Marketing and Communications Manager of GMV's Secure e-Solutions sector, gave a paper on the sensitive nature of healthcare data and the strategies GMV is now using to ensure its privacy. He focused on the work the company is carrying out for the HARMONY project (Healthcare Alliance for Resourceful Medicine Offensive against Neoplasms in Hematology). As Zubieta explained, as well as assessing sources to gauge the quality of its clinical data "it also integrates several sources of data offering a varied range of

types and information, using a common data model". The overarching aim is "to obtain responses and conclusions deriving from the joint analysis of diverse data sources".

Furthermore, to guarantee data privacy "an anonymization-driven definition is made of GDPR-compliant data flows, with the support of ethical committees and legal experts, and cooperating with other projects under the BD4BO umbrella". Medical research, as the cybersecurity expert pointed out, "calls for real, truthful, top-quality data. This data is also considered to be especially sensitive, so the data subject's privacy needs to be guaranteed at all times". This means that respondent patients have to be anonymous and "this anonymization process must involve the Cavoukian Privacy-by-design¹ or ISO 29100 principles²".

In the particular case of HARMONY, as Zubieta explained, several privacy-safeguarding activities have been carried out, including "a risk analysis focusing on data privacy, needs to involve all project stakeholders across the board: medics, legal-, ethical- and technical-experts, and taking into account all legislation of Europe's General Data Protection Regulation and Spain's own data protection law (*Ley Orgánica de Protección de Datos:*

LOPD) plus counterpart laws from the other participating countries". Once risks have been identified "all due security controls then need to be implemented to reduce risk and ensure privacy, using all available tools: standards, ISO 27002 etc."

Several data-anonymization options were weighed up for data already uploaded to GMV's Big Data platform and to be uploaded in the future from public institutions and cooperative national and European groups inputting their patient data, plus data originating from clinical trials conducted by the pharmaceutical industry. In light of all this evidence, de facto anonymization was eventually chosen, applying "necessary technical, organizational, contractual and security measures so that any attribution of individual data to the person in question would call for an unreasonable effort in terms of time cost and labor³". The end result is "isolation of the data subject's information without transforming it, achieving irreversibility by means of cybersecurity controls". This ensures "total shielding of the data (and its access) so that, while real, it is impossible to work back to the data subject".

¹ <https://www.ipc.on.ca/wp-content/uploads/Resources/7foundationalprinciples.pdf>

² <https://www.iso.org/standard/45123.html>

³ According to the consortium's own nomenclature



GMV modernizes Pamplona's urban transport in the city and surrounding municipalities

TRANSPORTS CIUTAT COMTAL (TCC) TURNS TO GMV FOR DEPLOYMENT OF THE NEW FLEET-MANAGEMENT AND FARE-COLLECTION SYSTEMS FOR PAMPLONA CITY AND 17 SURROUNDING LOCAL AUTHORITIES. GMV'S SOLUTIONS, COMPLETELY INTEGRATED AND CUTTING EDGE IN TERMS OF CAPABILITY AND INTEROPERABILITY, MAKE THIS PROJECT A TECHNOLOGY DISPLAY CASE FOR PUBLIC TRANSPORT

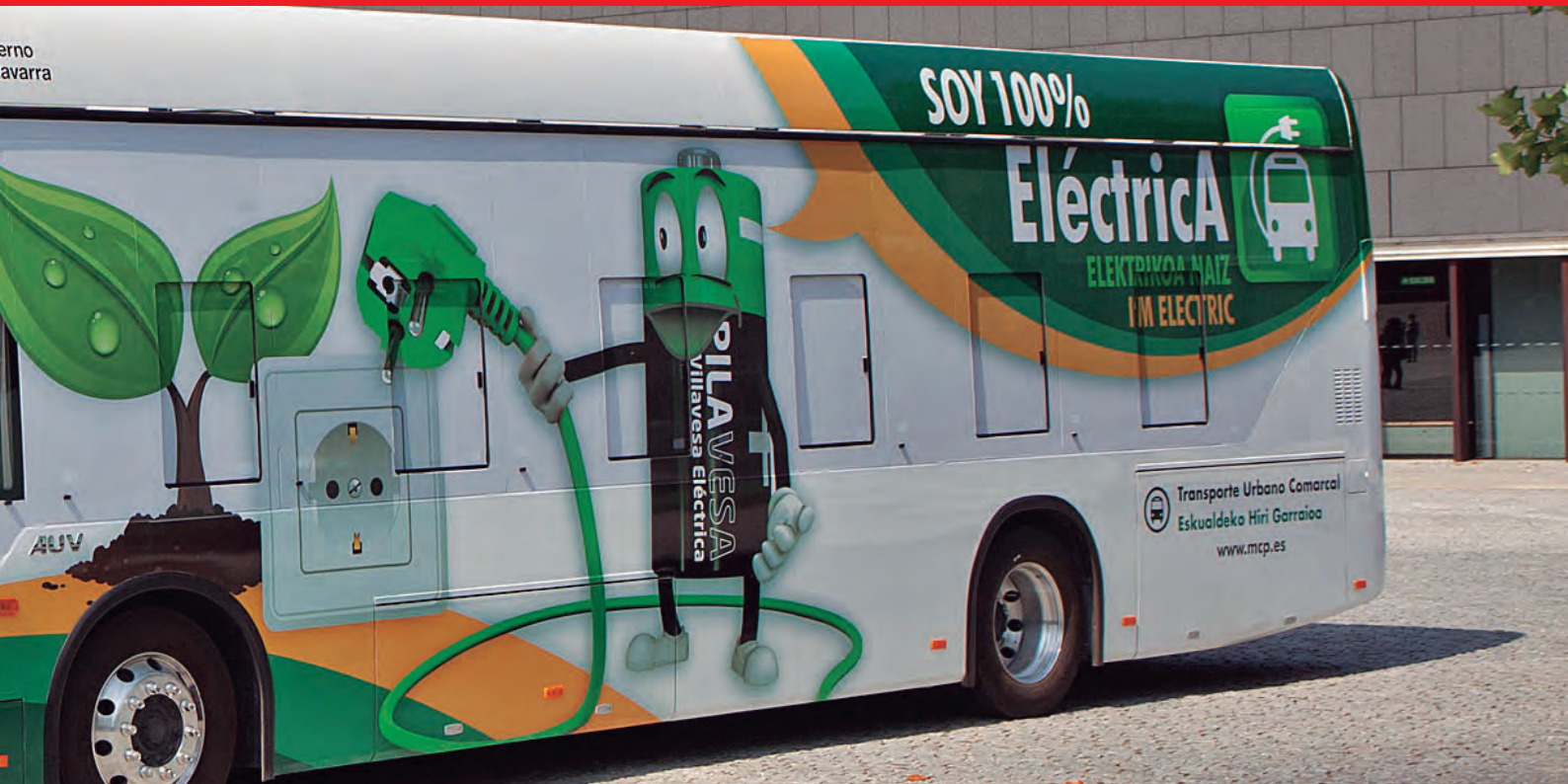
GMV has won the public tender for supply, installation, integration, commissioning and maintenance of the fleet-management and passenger-information system, the communication system and onboard electronic fare-collection system on the buses of Pamplona's district transport system, Transporte Urbano Comarcal (TUC).

TCC, as the firm holding TUC's service concession, has turned to GMV for the new technological supply of a 150-bus and 541-bus-stop public passenger-transport system serving 340,000 residents on 25 day lines and 10 night lines.

Under this recently awarded contract GMV will be rolling out the new fleet-management, communications and

ticketing systems and also providing technical aftersales support during the 4-year warranty period plus maintenance for 5 years thereafter.

The supply scope of this new fleet-management and passenger-information system will include a new Control Center and onboard equipment fitted on 150 buses. This onboard equipment includes new voice-, IP- and data-communication



devices for the driver, all governed by an automatic power management system. The passenger-information setup will connect up to the bus's inside and outside information panels while also catering for driver announcements to passengers, automatic announcements of bus-stop arrivals for the visually impaired plus a groundbreaking system of onboard bluetooth location beacons to inform bus-stop-waiting blind people of the position of the bus upon arrival. Other features are ridership counting devices and an eco-driving system.

The Control Center, for its part, will be fitted with advanced features of fleet management, regulation, efficient-driving analysis and alarm management to make the service easier to run and more interoperable with other systems, using for this purpose an architecture based on open protocols and market standards.

The communications system will include onboard IP communications for 150 buses that deal with all information exchanges with the Control Center as well as providing passengers with onboard Wi-Fi access.

The new electronic fare-collection system will include its own control center and onboard equipment for 150 buses, comprising mainly driver consoles, passenger read-write units and

inspection terminals. All this will not only cater for the current TUC farecard but will also increase integration capacities with EMV contactless bankcards and the reading of QR codes, facilitating future operability with other means of transport. Furthermore, the new system will also be able to phase in compatibility with the future Single Navarre Farecard (*Tarjeta Única de Transportes de Navarra: TUTN*) and the future Spanish Contactless Card (*Tarjeta Española Sin Contacto: TESC*). The equipment will be enabled for all these aforementioned farecards both in physical form and as emulated by cellphones using NFC technology.

The EMV payment standard will allow any bankcard holder, whether physical or virtual in his or her cellphone, to access the means of transport directly without any need for previous registration or ticket purchase and in the certainty that a post-payment system will guarantee him or her the most favorable fare in accordance with the actual use made of the public-transport system. The new system will also harden security in card-terminal transactions, since the EMV card validates transactions on the basis of the information stored in its chip.

With this project the Comarca of Pamplona (the Comarca is Spain's sub-provincial administrative division) and the concessionaire TCC, taking

up GMV's completely integrated, state-of-the-art fleet-management and passenger-information, communications and ticketing system, groundbreaking in its capacity and interoperability, become true public-transport trailblazers in Spain, showcasing the latest technological developments.

In 2018 GMV has also won a far-reaching EMV ticketing contract for running the public transport system of the whole Balearic Isles plus a new EMV ticketing system for the urban transport of Almeria city. This new contract award in the Comarca of Pamplona makes GMV a Spanish leader in the implementation of EMV technology in the public transport sector.

GMV will be rolling out the new fleet-management, communications and ticketing systems and also providing technical aftersales support during 4 years plus maintenance for 5 years thereafter

GMV modernizes Almeria's urban-transport payment systems

■ GMV has been selected by ALSA to modernize the ticketing system of the buses running on Almeria's urban transport system.

To do so GMV will round out this client's current fare-collection system with 64 state-of-the-art onboard EMV-enabled TV10 validators. It will also

take on the necessary adaptations of the current ticketing system to guarantee integrated working of the new EMV solution, updating driver desk firmware and control center software.

GMV will supply and set up the system in stages, collaborating with Redsys,

which will supply the bank payment platform, and with BBVA as the bank acquiring the service.

The EMV payment standard will allow any bankcard holder, whether physical or virtual in his or her cellphone, to access the means of transport directly without any need for previous registration or ticket purchase and in the certainty that a post-payment system will guarantee him or her the most favorable fare in accordance with the actual use made of the public-transport system. The new system will also harden security in card-terminal transactions, since the EMV card validates transactions on the basis of the information stored in its chip.

This new supply contract helps to swell GMV's already bulky portfolio of state-of-the-art ticketing systems. It also represents GMV's first EMV project with the bus operating company ALSA. Almeria itself also stands out as a role model for future extensions of this technology to other cities with this same client.



GMV will contribute to more efficient driving of Reus's fleet of urban transport buses

■ GMV has won the contract for the Eco-Driving System of the public transport fleet of Reus, including supply and rollout of the system in the 13-bus fleet and maintenance during the first year of operation.

GMV's Eco-Driving System seeks to improve results on an ongoing and dynamic basis. With this purpose in mind the solution proposes real-time driving correction actions plus driving improvement procedures after an analysis of actual driving performance.

The Eco-Driving System tools are based on an onboard platform and the control center backoffice. The onboard solution, via connection to the CANBus of each vehicle with FMS connector, analyzes the

driving performance to propose to the driver corrective action by means of graphical and acoustic warnings on an onboard touchscreen. Real time vehicle technical alarms are also passed on to the driver and maintenance technicians. The backoffice solution takes in a notifications module and another driving-analysis module.

The eco-driving system is a very valuable tool for the diverse stakeholders of the transport company. Drivers will be given real-time warnings of any inefficient, risky or passenger-discomforting driving, with the additional possibility of consulting personal performance reports. Garage managers will be able to access mechanical alarms reported by the

system. And the various managerial levels, such as operations and human-resource managers, will be able to make comparisons or weigh up the performance of diverse drivers or the services carried out, measuring typical eco-driving parameters with a special emphasis on fuel consumption, safety and comfort.

The eco-driving system is a very valuable tool for the diverse stakeholders of the transport company



GMV provides Braganza with a single transport management platform

GMV'S INTEGRATED TRANSPORT MANAGEMENT SYSTEM WILL ENDOW BRAGANZA WITH A SINGLE TRANSPORT AND MOBILITY MANAGEMENT PLATFORM, BOTH AT THE LEVEL OF ONBOARD EQUIPMENT ON THE BUSES AND CONTROL CENTER OPERATION. ITS RANGE WILL TAKE IN NOT ONLY THE CITY OF BRAGANZA ITSELF BUT ALL THE SURROUNDING LOCAL AUTHORITIES BELONGING TO THE BRAGANZA MUNICIPAL CHAMBER

G MV has won the contract for the Integrated Management System of the Municipal Transport of Braganza in Portugal. This turnkey contract includes supply and maintenance of the advanced fleet management system, fare-collection system and the demand-response transport system.

This project represents GMV's first ever combined fleet-management and fare-collection contract in Portugal. Its scope of operation will be Braganza itself and the surrounding municipalities belonging to Braganza's Municipal Chamber.

GMV's Integrated Transport Management system will endow Braganza with a single transport and mobility management platform in the region, both at the level of onboard

equipment on the buses and control center operation.

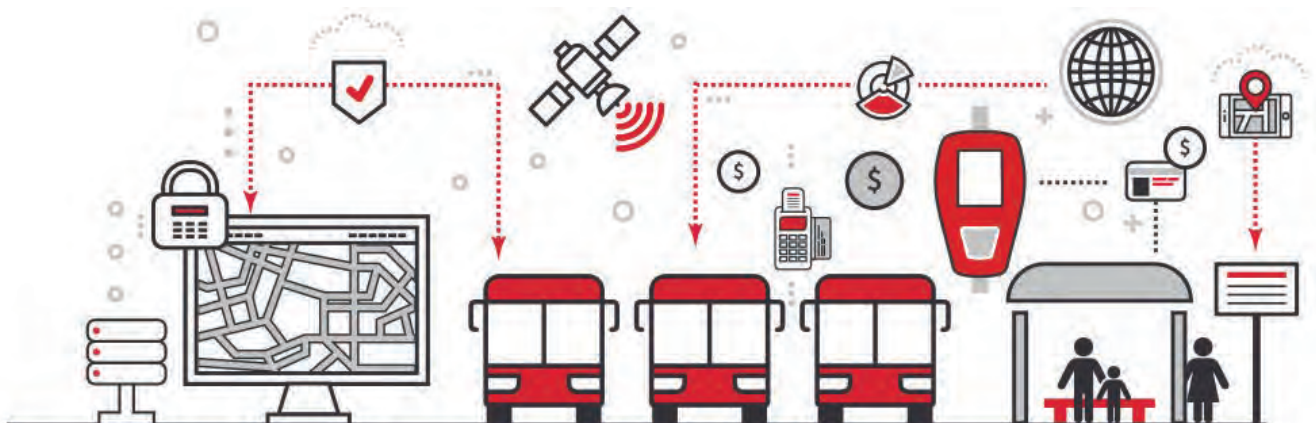
The fleet management system will consist of 18 buses with onboard management/tracking solutions, passenger information and onboard video surveillance with two cameras per bus. Passenger information is guaranteed by means of a web portal and handheld apps (Android and iOS). It is further underpinned by interoperability based on international standards that allow use of the system's information by third parties.

The ticketing system, comprising vending and validation machines fitted on the buses and integrated with the BackOffice management system, will cater for the use of single tickets onboard the bus and contactless farecards. GMV will also prepare these

contactless farecards for phasing in other municipal utilities and services in the future and for the payment of cultural, sporting and social services.

The demand-response solution will allow Braganza's mobility authority to optimize its transport management procedures, adapting them to suit the needs of a sparsely populated region with low transport demand and currently with few public transport options.

GMV will also roll out 10 roadside information panels, one farecard recharging terminal plus two client attention points. The system also includes implementation of the respective control centers, which will include the necessary backoffice tools for the best possible use of the proposed solutions.



CAF turns to GMV for the CCTV of Barcelona Metro's new trains

■ CAF, a leading multinational in the railway sector, has turned to GMV for supply of the onboard video surveillance and video information system for the new 5000 and 6000 series trains to be built for its client TMB (*Transportes Metropolitanos de Barcelona*).

The project takes in the engineering, design and supply of these two systems, which CAF will phase into the manufacture of the 10 new trains for Barcelona Metro.

The core of the video surveillance system is made up by the EGRU digital recording equipment, designed and manufactured by GMV. This equipment will make Full HD video recordings and export them simultaneously. This system also allows recording of onboard intercom audio in the event of any emergency.

Each metro train will carry onboard two recorders working in redundant mode, thus ensuring a high-availability system. Each driving cab will be fitted with two real-time display monitors for the driver, showing all cameras of each train unit.

The video surveillance system is made up by a central video broadcasting

server to generate at all times service-related contents, information of general interest and publicity, plus real-time messages sent from the Metro's control center. The system is rounded out by a set of IP monitors distributed throughout the train, showing the generated information to passengers.

For the purpose of providing these two new systems with suitable connectivity, each train will also be fitted with an onboard ring-redundancy multiservice Ethernet. This network will also be enabled for train-to-ground communications based on two communication nodes in redundant architecture, which will concentrate the information of the new systems supplied

and of the other already existing systems, then passing it onto TMB's operations center through a wireless link.

The train-to-ground link will use Wi-Fi and 4G/LTE technology, choosing the most appropriate channel at each moment to suit the train's location, thus guaranteeing unbroken, quick and robust communication.

With this integrated, purely digital solution, CAF will provide TMB's new trains with a totally renewed system architecture integrated with Barcelona Metro's video surveillance system to be supplied by GMV for TMB.



GMV to supply Seville Metro's video surveillance system

■ GMV has recently won the tender for supply of an onboard video surveillance (CCTV) system for Seville Metro's 21-train fleet.

This project will entail a renewal of the operator's current purely analog video surveillance system, which now suffers from certain obsolescence problems, moving on to a mainly digital system. GMV will be supplying new digital equipment including network electronics for rollout of a multiservice Ethernet, digital video recording equipment, video coders for digitalization of the existing camera's analog signal, IP

screens for the driver interface and antennas for Wi-Fi/4G communications with the control center.

The purpose of GMV's new CCTV solution will be continual onboard surveillance of passenger spaces and the nearby vicinity outside the bus. This will involve carrying out such functions as recording the video signal of all the train's cameras, cabin display of all camera images (automatic and manual mode), control center display of onboard cameras, display of recordings and wireless downloading of all the video tracks upon returning to base.

The onboard equipment will be rounded out with the control center's back-office software for offline use of the recordings. This software allows display of recordings in various screen configurations (square, asymmetric...), recordings of technical alarms, real time video display and configuration of the main system parameters.

This project cements GMV's position as a leading supplier of CCTV systems for railway operators, after winning notable national contracts with operators like Barcelona Metro (TMB), Euskotren and FGV.



GMV ups its profile in Cyprus

■ GMV has reached an agreement with the Limassol Tourism Development and Promotion Company Ltd (ETAL) for installment of intelligent systems in Limassol District's urban and interurban transport network.

The new systems to be fitted on this coastal region's buses include passenger information systems, both in street panels and onboard the buses. The signed contract comprises 40 intelligent urban bus-stops with solar-panel-powered, low-consumption information panels showing ETAs plus messages and announcements sent from the control center. There will also be 40 onboard information panels with multimedia contents and information on the bus-line in question. Also to be delivered under this agreement is content-management software for system configuration, including cartographic management of the content to be displayed on panels and buses.

Present at the agreement-signing ceremony were Vassiliki Anastasiadou, Minister of Communications, Transport and Works; Tony Antoniou, President of the Limassol Tourism Development and Promotion Company Ltd; and

Fermín Catalán, deputy general manager of intelligent transportation systems.

The Minister of Communications, Transport and Works of the Republic of Cyprus, as a partner of the Civitas project (Clty-VITAlity-Sustainability) of

the H2020 framework R&D program, embarked on a renewal plan of Limassol's transport network with the aim of bringing in a more sustainable model. Under this new contract GMV's new solutions will ensure full compatibility with the formerly implemented systems.



GMV consolidates its demand-response business in Portugal

■ GMV has won the tender for a demand-response transport system for the Intermunicipal Communities of the Regions of Coimbra and Leiria and the Intermunicipal Community of Ave. These contracts, together with those previously won in the regions of Médio Tejo and Braganza, consolidate GMV's Portuguese demand-response business in intelligent transportation systems.

With the twofold aim of implementing new public transport systems to suit sparsely populated areas while also promoting an all-round right to mobility for all citizens, GMV has developed a

flexible transport system which was a trailblazer in the region of Castilla y León as Europe's most extensive demand-response system. This is now being brought to Portugal. GMV is thus helping to bring the supply and demand sides closer together in the abovementioned regions, cutting operation costs and streamlining the whole transport service.

GMV's demand-response systems are based on web solutions accessible from diverse locations according to different user profiles such as control center operators, transport operators and system users.

The service is run as follows: timetables and stops are predefined to meet the particular population's objectives (factoring in such variables as market days, availability of healthcare services, etc.). According to the number of passengers requesting various services, the routes are calculated dynamically in terms of stops, timetables, available vehicles and number of passengers. The platform also provides the system administrator with a set of operation reports and calculates the income corresponding to each transport operator on the basis of fixed costs, bookings made and routes actually run.

Onboard systems for the new buses of the Polish operator MPK

■ GMV will supply a set of onboard equipment for 30 brand new MAN city buses for the MPK (Municipal Transport Company) in Nowy Sącz (Poland).

The passenger information system will consist of three external, energy-saving LED displays and one internal LCD display. In addition, there will be voice announcements of the stops, dual validators and a modern driver's touch console informing the bus driver about punctuality and the transport task being carried out.

The operation of the onboard systems will be controlled by efficient on-board computers (**REC30**), which enable the Purchaser to expand further the systems. They will also be responsible

for communication with the central system that operates in the MPK dispatching room, providing real-time information on the current position of the vehicle as well as a number of technical information from the vehicle.

The electronic systems for passengers and public transport managers have been operating since 2012 in Nowy Sącz. Thanks to the system, the inhabitants of Nowy Sącz (and of the neighboring communities included in the Nowy Sącz transport system) are informed by means of electronic displays and of a webpage. The data from the management system processed by fleet managers are also used to improve the punctuality of the entire bus network.

Nowy Sącz also has a ticketing system based on GMV software and equipment, which allows the centralized configuration of the ticket fare, the passenger profiles and the reduced fares applicable to them.

The replacement of the buses will contribute to a significant rejuvenation of the Nowy Sącz carrier's fleet as well as to the modernization and expansion of the ITS system that has been operating in the city for years.

The new onboard passenger information system helps to improve the quality of the trip with multimedia information and advice about upcoming stops, current route and connections with other lines.

Transexpo once more setting trends in Poland

The 14th International Fair of Public Transport, Transexpo, was held this year from 23 to 25 October. Transexpo, a biennial event, is Poland's top public-transport fair, specializing in public transport vehicles, on-board equipment, passenger information

systems, ticketing systems and means of payment, among others.

GMV ran its own stand to display its inhouse developments in fare-collection, passenger-information and fleet-management systems for

any means of urban road transport. It also held demos of various solutions such as **GMV Planner** for the public transport sector and its integrated payment and e-ticketing systems plus its advanced fleet management system, which makes any public-transport enterprise slicker and more efficient.

Lectures dealt with such issues as how to manage public transport, good practices for development of the industry, low emissions and clean energy. This year's fair was held in line with the electromobility development program, laid down in the responsible development strategy of the 2017-2020 budgets approved by the Polish government.

This year's fair, always a must to keep in touch with the very latest public-transport technology, attracted a turnout of 172 exhibitors from various countries like Germany, France, Sweden, the UK, Switzerland, Turkey and China.





GMV supplies new onboard equipment for the Polish transport authority ZTM

■ The Municipal Transport Authority (ZTM) in Gdańsk is one of GMV's oldest customers in Poland. It is a unit dealing with the organization and management of public transport in this city. Together with GMV, it has introduced the SAE Fleet Management and Passenger Information System as well as the Traffic Lights Priority for public transport vehicles in a fleet of nearly 500 vehicles. In July 2018, the ZTM in Gdańsk concluded a contract with GMV Innovating Solutions Sp. z o.o. for the delivery of 50 new sets of onboard equipment including radio modems for the travel priorities,

driver's touch consoles and M20 onboard computers. In the near future, these devices will be delivered to new vehicles of the carriers providing transport services for the ZTM in Gdańsk, allowing them to be incorporated into the ITS system functioning in the city.

In addition, as part of the contract, GMV will supply 100 driver's touch TFT consoles, which will replace some of the C11 consoles that have been operating in the system for years. Thanks to this modernization, drivers will gain access to further functionalities in the system, as

well as the possibility of working with the system in a more ergonomic way.

The ZTM is an entity that continuously invests in the maintenance and development of the system. As part of separate orders, GMV has recently implemented new functionalities that automate the process of the driver's logout, which makes it possible to eliminate inconveniences related to the mistakes made by drivers or, for example, to launch a service of access to the data with the vehicle position for the needs of the municipal Open Data platform.



ZTM turns to GMV anew for maintenance of its advanced fleet management system

■ GMV started its cooperation with the Municipal Transport Authority (ZTM) in Gdańsk in 2008 from the signing of a contract for the implementation of the first Fleet Management and Dynamic Passenger Information System. Then, in 2012, GMV undertook a thorough modernization of the system in Gdańsk and extended it to Gdynia, covering by one system over 750 public transport vehicles, including buses, trolleybuses and trams operating within the Tricity agglomeration (Gdańsk, Gdynia, Sopot).

Until December 2018, GMV ensured that the system was maintained under an ongoing warranty, also performing supplementary orders related to the supplies of new sets of onboard equipment, the expansion of the stop displays network and the provision of new functionalities in the software.

Under the contract concluded in October with the ZTM in Gdańsk, GMV will be responsible for supporting and maintaining the system for the city of Gdańsk for the next 3 years, i.e. until the end of 2021. GMV's responsibilities will include the maintenance of the SAE software installed on the central server and on the dispatcher positions of the ZTM and the carriers, as well as of the onboard equipment in almost 470 public transport vehicles, including onboard computers, driver's consoles, TLP radio modems and 45 city information panels installed at the stops.

Within its scope, GMV will also maintain communication interfaces issued for the integration with other subsystems functioning within ITS TRISTAR, for example the system of travel priorities for public transport, passenger portal,

interfaces and mechanisms of data exchange with the twin system in the neighboring Gdynia, interfaces for the needs of the municipal Open Data platform.

Apart from the maintenance works, the contract also provides for a package of development hours for the expansion of new functionalities in the system.

GMV will be responsible for supporting and maintaining the system for the city of Gdańsk for the next 3 years



ITS solutions for the Californian operator Santa Cruz Metro

■ GMV SYNCROMATICS has won a contract to provide various ITS solutions for Santa Cruz Metro (California). This agreement represents the company's second biggest fixed route contract in terms of fleet size.



Awarded in October, the project covers a comprehensive ITS deployment for Santa Cruz Metropolitan Transit District (SCMTD), the public transit operator for the famous California surfing town and surrounding county.

The 94-bus project scope is valued at up to \$2.2M USD (including options). Main system components include: passenger information system (mobile app, web, and digital signs), CAD/AVL, next-stop annunciator, automatic passenger counting, and headsign integration. The agency will also have GMV SYNCROMATICS equipment factory installed on ten new buses to be delivered in the coming year.

This contract was four years in the making. Initial conversations around Santa Cruz Metro's needs first developed during the 2014 American Public Transit Association Expo. Several years later, Santa Cruz released a formal RFP that attracted bids from seven U.S.-based CAD/AVL firms. Client staff praised GMV SYNCROMATICS' open software

architecture and modern dispatch user interface in making their selection. They also leaned heavily on favorable references from other California transit agencies.

Santa Cruz Metro provides transit services for local trips within Santa Cruz County as well as commuter services into San Jose – the heart of Silicon Valley. The tech-savvy commuters have high expectations for their bus service, and Santa Cruz Metro has big ambitions to provide a highly connected passenger experience.

This contract bolsters GMV SYNCROMATICS' position as a leading provider of ITS for small- and medium-sized transit agencies in California.

GMV presents its new inhouse solutions at InnoTrans

Nearly 160,000 visitors and over 3000 exhibitors from more than 110 countries came together at InnoTrans 2018, the leading international railway-technology tradefair held this year from 18 to 21 September in Messe Berlin, Germany.

GMV took part as exhibitor in the intelligent-transportation-technology pavilion, showcasing its various technological innovations, including most notably the EMV (Europay, Mastercard and VISA) application in the various onboard ticketing hardware. This new equipment caters for direct bankcard payment, whether with a

physical or virtualized bankcard. After recently winning a public tender GMV is now implementing this new payment standard in the Balearic Islands' public transport network, incorporating all the advantages of a cloud ticketing system.

GMV's stand also carried out demos of various solutions, such as **GMV Planner** for the railway sector, which helps operators to manage services, working shifts, service hours and quadrants in their daily operations, or the advanced railway and tram fleet-management system set up by GMV in cities like Sydney.





The sustainable and autonomous transport project CITIES kicks off

THIS TRAILBLAZING R&D PROJECT WILL MAKE THE ISLAND OF LANZAROTE A WORLDWIDE BEACON IN TOP-QUALITY TOURISM, OPERATING AT THE CUTTING EDGE OF TECHNOLOGY AND OFFERING A UNIQUE TOURISM EXPERIENCE

The CITIES project, led by Madrid's *Universidad Carlos III* and the Spanish Road Association (*Asociación Española de la Carretera*) has recently been launched. Its purpose is to bring in autonomous, electric and multimedia buses to run on Lanzarote's tourist route around the *Montañas del Fuego* volcanic landscape in the National Park of Timanfaya.

This trailblazing, 18-month, million-euro R&D project is backed and driven by a consortium of ten Spanish organizations of acknowledged renown in the intelligent transportation

sector and financed by the Canary Islands Development Fund (*Fondo de Desarrollo de Canarias: FDCAN*), run by Lanzarote Council and the regional environment ministry.

The project officially kicked off in mid-November after administrative formalization of the contract between the Art, Culture and Tourism Centers (*Centros de Arte, Cultura y Turismo: CACT*) of Lanzarote Council and the



Asociación Española de la Carretera, which is acting as the coordinating organization. Besides these two organizations the research team is completed by the consultancy 2RK, specializing in intelligent transportation systems, plus other specialists in all the following: vehicle and fleet management, communication and tracking systems (GMV), certification (SGS), the automotive sector (VTI), testing (INTA), electric batteries (*Albufera*) and insurance (*Mapfre*). This consortium is already working with autonomous-vehicle prototypes.

GMV's particular responsibility in this project is the communication system, which will keep a track of the GNSS position at all times and pass on information from the various autonomous-vehicle subsystems to a control center that will run the whole monitoring system, also supported up by GMV's inhouse solutions. This will enable the bus's exact position to be pinpointed at all times, as well as monitoring its operation, detecting any incidents swiftly and coming up with the appropriate response. The hilly and mountainous landscape posed another stiff challenge, successfully met, in terms of guaranteeing unbroken communication between the autonomous bus's onboard equipment and the control center.

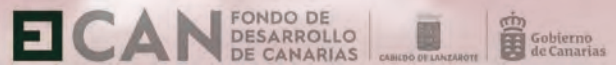
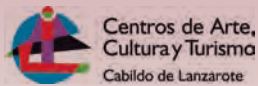
The vehicles to be used on this project will offer greater safety for bus occupants. Moreover, although the lie of the land is tricky the site is otherwise ideal for vehicles of this type, the route running from one volcano to another on 30-minute trips without any other type of traffic. It is also reckoned that these electric and autonomous buses will cut CO2 emissions by up to 469 tons a year while also eliminating the costs associated with the consumption of fossil fuels.

This project will make the island of Lanzarote a worldwide beacon in top-quality tourism, operating at the cutting edge of technology and offering a unique tourism experience. The project has other knock-on advantages. Subsequent applications will benefit Lanzarote's residents and its industrial and business sector (bus fleets and hire vehicles, vehicle components, telephony, technological suppliers, power companies, financial services, transport services, healthcare, etc).

GMV's participation in this project and others of similar characteristics cements its role in the development of autonomous-driving solutions, tapping into its wealth of experience in automotive projects, working with several OEMs, and also in GNSS-based tracking and fleet management systems.

This project paves the way for the future in which the autonomous vehicle will favor greater transport efficiency while also achieving the targets of clean, ecodriving parameters.

GMV's system will enable the bus's exact position to be pinpointed at all times, as well as monitoring its operation, detecting any incidents swiftly and coming up with the appropriate response





Rollout of onboard units under the C-Roads project

C-ROADS BRINGS TOGETHER EU COUNTRIES TO TEST, HARMONIZE AND IMPLEMENT C-ITS SERVICES ACROSS EUROPE. THROUGH ITS SPANISH AND PORTUGUESE OFFICES GMV IS PARTICIPATING IN THE PLATFORMS OF BOTH COUNTRIES

■ C-Roads project is a joint initiative of European Member States and road operators for testing and implementing C-ITS services in light of cross-border harmonisation and interoperability throughout the European Union. Cooperative ITS encompass a group of technologies and applications that allow an effective data exchange through wireless communication technologies between components and actors of the transport system, namely, between vehicles (vehicle to vehicle or V2V) or between vehicles and infrastructure (vehicle to infrastructure or V2I).

C-Roads brings together EU countries and each participating member state builds up a team of national industry partners, including technology providers, such as GMV, but also road operators, local authorities and public road-transport institutions. Through its Spanish and Portuguese offices GMV is participating in the platforms of both countries.

GMV's role in the project involves the development and deployment of harmonised and interoperable end-

to-end C-ITS services, following an evolutionary process starting with "Day 1" Services (the less complex use cases), encompassing messages about traffic jams, hazardous locations, road works and slow or stationary vehicles, as well as weather information and speed alerts to harmonise traffic. At a second stage, deployment of "Day 1.5" Services related to smart routing and traffic information will occur as well.

Coordination with several relevant partners, such as public authorities, is ongoing in order to assure proper integration with existing traffic and infrastructure data provisioning systems for the 3 pilot sites where GMV is involved.

On Madrid's M-30, GMV is deploying On Board Units in test vehicles alongside an Android App running on a smartphone provided for the tests. On Lisbon's 2nd Ring Road (*Circular*), GMV is deploying similar in-vehicle solutions alongside Road Side Units (RSU) providing infrastructure connectivity. On the Portuguese A25 highway, RSUs will be deployed in order to cover the highway with V2I connectivity, plus the

same in-vehicle solutions used in the other pilots.

After one year of developments, GMV is now getting ready for the full deployment of Day 1 services, which means installation in all test vehicles and pilot sites. All pilot sites are expected to be fully functional before the end of the Q1 2019.

In parallel with the development activities, it should be noted the role of w in the C-Roads European Platform, as a coordinator of the activities related to evaluation and assessment works. These activities are needed to obtain conclusions about the impact of the introduction of C-ITS Services in Europe, through the measurement of a set of KPIs in safety, traffic efficiency, environment and user acceptance areas.

Latest C-Roads events include the General Assembly of C-Roads Spain on November 15th, that took place at the "Dirección General de Tráfico", in which, in addition to dealing with management and economic aspects, each of the Spanish sub-pilots presented the general status of the project.



ESCAPE conducts a new test campaign

■ From 15 to 19 October the labs of *Université de Technologie de Compiègne (UTC)* in France hosted a new integration test campaign of the ESCAPE project (European Safety Critical Applications Positioning Engine).

ESCAPE, funded by the European GNSS Agency (GSA), aims to exploit the services offered by Galileo, Europe's satellite-navigation system, for the purposes of autonomous driving. Led by the Spanish company FICOSA,

ESCAPE brings together some of Europe's top industrial and research institutions to create a positioning engine for automotive safety-critical applications, i.e., applications involved in highly automated driving.

GMV is playing an important technical role in the ESCAPE project. It not only holds responsibility for technical project management but also, as part of the development of the ESCAPE GNSS Engine (EGE), GMV will be supplying the algorithms to process the readings

of the vehicle sensors, the cameras and GNSS receiver, in order to provide the positioning service together with the integrity required by the connected autonomous vehicle. It will also be providing the intermediate data-fusion layer software, in charge of binding all the communication components together into a synchronized, well-oiled system.

During the 5-day campaign the teams of FICOSA, GMV and Renault put their heads together with UTC scientists to conduct a new and comprehensive series of tests on the platform's new algorithm versions, while also trying out the new camera model to be used on the final platform and also the final vehicle sensors.

Both this campaign and the earlier July campaign are crucial in the development and upgrading of the project, exposing the prototype EGE to diverse real operational conditions, including static and dynamic vehicle, open sky, suburban and urban scenarios.

At the moment, after the functional tests, project engineers are now making a complete analysis of results and the performance obtained with the test vehicle.



Present and Future of Connected Vehicles

GMV promoted in Portugal a press conference dedicated to "The Present and The Future of Connected Vehicles" focusing on the several projects the company is running in different segments such as connected vehicles, cybersecurity, 5G communications or tolling solutions.

The opening speech in the event, held in the Lisbon offices in December 5th, was given by Alberto de Pedro Crespo, General Manager of GMV in

Portugal. De Pedro took stock of GMV's performance on a global level, focusing on the Portuguese market that is increasing its activity in the Automotive and Transport sector.

The presentation featured Ricardo Tiago, from Instituto da Mobilidade e dos Transportes (IMT) who talked about the challenges of smart mobility and the work developed by this Portuguese organization on a national and international level.

Bruno Gonçalves from GMV detailed some of the company's most important current connected vehicle projects. He argued that the future will depend heavily on investments in automotive security, cooperative ITS solutions, 5G communications and toll systems with the goal of optimizing traffic, improving mobility for all, and the communication based on integrated and cooperative solutions.



European REMOURBAN Project Review meeting

■ From 17 to 19 September Valladolid hosted the periodic review meeting of the REMOURBAN project (REgeneration MOdel for accelerating the Smart URBAN transformation) to present before the European Commission (EC) the progress made over the last year and a half.

REMOURBAN is a large-scale European Horizon 2020 R&D demonstration project that aims to speed up the smart urban transformation, taking onboard all the sustainability aspects and setting up groundbreaking energy, transport and ICT technology in the demonstration cities.

REMOURBAN is being led by the CARTIF Technology Center and is being driven by a wide-ranging international consortium of 22 partners. In Spain the City Council (*Ayuntamiento*) of Valladolid and the companies GMV, Acciona, Iberdrola, Xeridia and Veolia will be responsible

for setting up and carrying out various activities in the lighthouse city of Valladolid, designed to improve energy efficiency and favor smart mobility.

On 20 and 21 September Valladolid then hosted BY&FORCITIZENS, an event investigating the best ways to work towards a "Smart Regeneration of Cities and Regions". Its remit is to provide an exhaustive source of information on the opportunities and challenges involved in the future development of smart cities and communities throughout Europe. The general aim of the meeting was to checkmark and better understand the steps to be taken by city leaders, delegates, lawmakers and other stakeholders in Europe to transform their cities into open, attractive spaces to live and work in, creating strong local ecosystems.

The event brought together local and national authorities, representatives

of the EC and the Innovation and Networks Executive Agency (INEA), project coordinators and experts involved in smart city projects co-funded by the EU's Horizon 2020 and 7th framework programs. Several European projects are collaborating in BY&FORCITIZENS, including REMOURBAN and URBANGREENUP, of which GMV is a member.

GMV gave a paper in the SERNAUTO-chaired Connected and Sustainable Mobility session. GMV's personal also accompanied conference attendees on technical visits to the sites where various REMOURBAN sustainable mobility activities are being carried out.

All this added up to five days of lectures, encounters, demos and working meetings that helped to take stock of REMOURBAN's progress and work onwards to its successful completion.

TU Automotive Europe, the latest trends in the automotive sector

■ On 30 and 31 October Munich hosted the sixteenth TU Automotive Europe, Europe's flagship automotive event.

As Europe's biggest and most influential auto tech event, its approach is twofold. Firstly it puts on a series of lectures to delve into the sector in depth and come up with many insights. Secondly it sets up an exhibition space to showcase the game-changing mobility and telematics trends.

During the event Sara Gutiérrez, manager of GMV's automotive business unit, took part in the panel "A holistic approach to cybersecurity & safety in connected autonomous vehicles", debating the crucial cybersecurity and security aspects

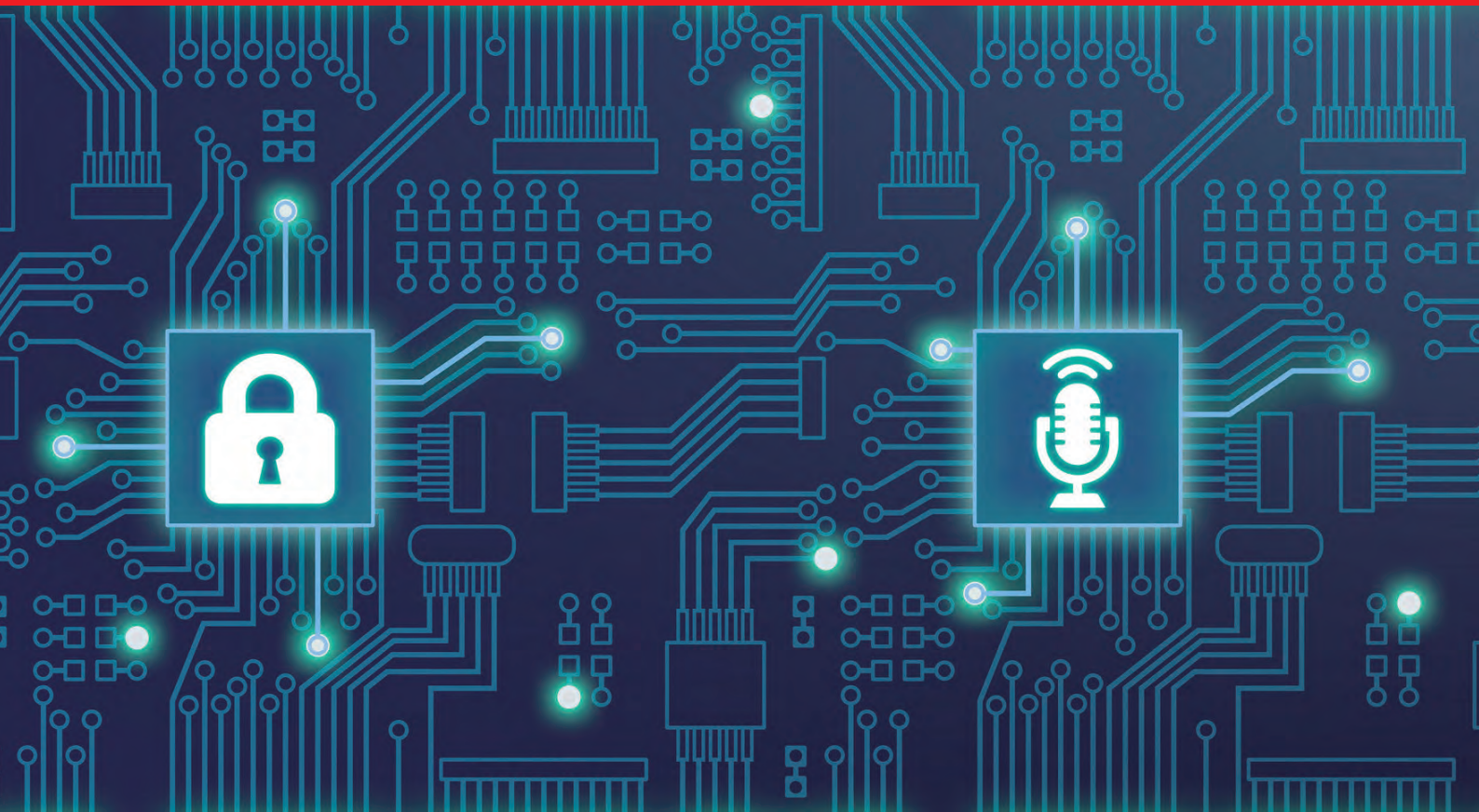
for occupants of connected and autonomous vehicles. The presence of key players like BMW, SEAT and Auto ISAC ensured a fascinating session.

GMV also exhibited some of its automotive services: advanced telematics units and electronic automotive platforms; cybersecurity solutions for the autonomous and connected vehicle; services and applications for the autonomous and connected car; a precision, high-integrity positioning service and advanced mobility services, among other inhouse developments.

GMV, offering a wide range of software and hardware engineering services, is a key player in the supply of solutions and services for the automotive industry. Its firmware has by now been

fitted in over 3 million Telematics Control Units (TCUs) all around the world.



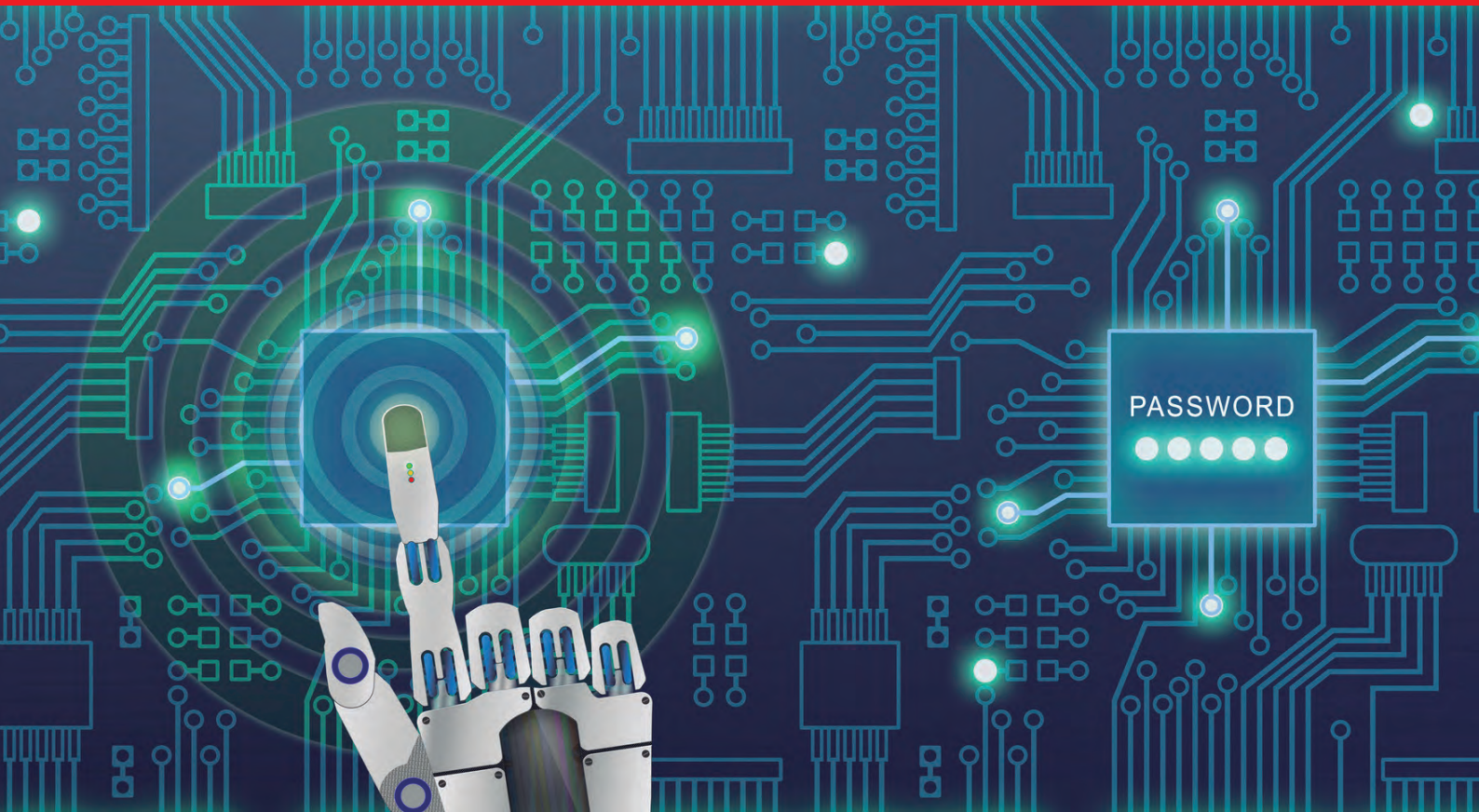


GMV analyzes the impact of Industry 4.0 throughout the value chain

WITHIN FORUM 4.0, THE SPANISH ASSOCIATION OF ELECTRONIC, INFORMATION-TECHNOLOGY, TELECOMMUNICATIONS AND DIGITAL-CONTENTS FIRMS, AMETIC, HELD A DEBATE ON "THE IMPACT OF INDUSTRY 4.0 THROUGHOUT THE VALUE CHAIN", WITH THE PARTICIPATION OF GMV

Buying a vehicle nowadays is a very different proposition from a few decades ago. We have now moved on from a situation of almost informationless and optionless consumers to one of connected, environmentally-conscious users with clear ideas of the levels of safety and efficiency they want. Companies have had to bring their businesses into line

with these changing habits and the plethora of technological changes, bringing the client right into the center of its strategy. This in turn leads to the need to make productive processes more dynamic, versatile and highly modular, to be able to keep up with market trends. This era of digital transformation is ushering in what has come to be called the fourth industrial revolution and it served as the focus of



debate between various experts during Matelec Industry.

In November and within Forum 4.0, the Spanish Association of electronic, information-technology, telecommunications and digital-content firms (*Asociación de Empresas de Electrónica, Tecnologías de la Información, Telecomunicaciones y Contenidos Digitales: AMETIC*) held a debate on “*The impact of Industry 4.0 throughout the value chain*”, with the participation of Ángel C. Lázaro, Business Partner of GMV’s Secure e-Solutions sector. The debate addressed all the following themes: industrial assets in the digitalization era; IoT traceability; new business models in connected industry; boosting productivity or saving costs by dint of real-time management and the challenge posed by the demand for professional skillsets.

It is clear that today’s production lines have to adapt to this new situation; this need then impinges on all assets and levels making up these processes. In this digital era, taking in the whole process from sensors and activators to

the production management system, we see that sensors in the first place have to send and receive process information to and from a PLC (Programmable Logic Controller) capable of swiftly modifying its control process and, above all, doing so remotely. These devices have to provide much more analyzable information to head off shutdowns or problems. Only a few years ago this was unthinkable. The necessary processing capacity was too high for any programmable controller; nowadays, however, groundbreaking cloud-linked technology like Fog Computing has made this possible.

PLC control processes nowadays have to be much more fleet-footed to keep up with changes in production processes. For this purpose there are game-changing solutions like **VirtualPAC**, developed by GMV, which allows PLC-deployed control processes to be virtualized so they can be changed dynamically and operated remotely from control centers that may well be located in other countries.

At the level of machines and production phases, collaborative robotics, used

in combination with artificial vision, represent another one of the great advances permitting modularization and adaptability of the production phases. Robots of this type offer great advantages over industrial robots. They can be programmed by their own plant operators; they weigh little and can be easily relocated throughout the factory to carry out other processes. These cobots, run with artificial vision systems, offer the necessary versatility for carrying out highly modular and agile processing tasks that can help us improve product quality, boost productivity, cut production costs and meet the stringent quality standards.

VirtualPAC which allows PLC-deployed control processes to be virtualized so they can be changed dynamically and operated remotely from control centers that may well be located in other countries

Algorithmic bias



José Carlos Baquero, Director of Artificial Intelligence and Big Data at GMV's Secure e-Solutions sector

For decades we have been witness to the great benefits of algorithms in decision taking. In the real world, their application ranges from medical diagnoses and court judgments to professional recruitment and the detection of criminals. However, as their use has spread, driven by ongoing technological advances, many voices have been raised demanding greater responsibility in their implementation, with particular concern being expressed about the transparency and fairness of machine learning. Specifically, this uncertainty arises from the possibility of recreating historical prejudices which normalize and increase social inequality through algorithmic bias. This subject has been analyzed by José Carlos Baquero, Director of Artificial Intelligence and

Big Data at GMV's Secure e-Solutions sector, at Codemotion Madrid. His intervention certainly gave the audience pause for thought.

As machine learning advances, companies and society tend to see its data as more trustworthy, on the basis that its correct analysis gives rise to more efficient and impartial decisions than those taken by humans. Yet despite the fact that a decision taken by an algorithm is arrived at on the basis of objective criteria, it may still result in unintentional discrimination. Machines learn from our prejudices and stereotypes, and if the algorithms they use are becoming the key part of our daily activities, we urgently need to understand their impact on society. This is why we must insist on a systematic analysis of the algorithmic processes and the generation of new



GMV & VLCTesting, committed to software quality

conceptual, legal and regulatory frameworks to guarantee human rights and fairness in a hyper-connected and globalized society. A task that obviously must be done jointly by organizations and governments.

However algorithms are adjusted, they all have biases. In the last analysis, forecasts are based on general statistics, not somebody's individual situation. But we can use them to take wiser and fairer decisions than those made by individual humans. To do so we need to look urgently for new ways to mitigate the models' discrimination. Moreover, we must be sure that the predictions do not unfairly prejudice those groups with certain sensitive characteristics (gender, ethnicity, etc.). In short, building impartial forecasting models is not simply a question of removing certain sensitive attributes

from the data set. We clearly need ingenious techniques to correct the profound bias in the data and force models to make more impartial predictions. All of this involves a reduction in the performance of our models, but this is a small price to pay in order to leave behind the biased world of yesterday and build a fairer tomorrow.

«We must insist on a systematic analysis of the algorithmic processes and the generation of new conceptual, legal and regulatory frameworks to guarantee human rights and fairness in a hyper-connected and globalized society»

■ Each year the *Instituto Tecnológico de Informática (ITI)* organizes the *#VLCTesting* meeting which is attended by professionals and companies with a thirst for knowledge and the desire to improve their processes, methodologies and tools, the aim being to improve software development quality. GMV will attend again this year, showing its support for ITI's event by sponsorship and active involvement, sharing its knowledge and experience in this field.

There was a full house at *#VLCTesting18* where Miguel Peiró, from GMV's quality department, gave an interesting seminar entitled "*How to handle the challenge of automating GUI testing*", in which he explained how to set up a project to automate the testing of the graphic interface and the factors to be considered to ensure the project's success. Miguel looked at the complete cycle of development of automated testing of the interface using Selenium. And after a theoretical section in which he gave an introduction to good development practices with Selenium, he moved on to a practical section in which he started with the generation of a simple project to be incorporated into the continuous integration process, which is executed by using the Selenium grid.



GMV and the *Foro de Empresas Innovadoras* explain the keys of Re-Industrialization in Spain

■ The book *"Re-industrialization in Spain: Industry 4.0 and innovation ecosystems"*, co-led by Luis Fernando Álvarez-Gascón, General Manager of GMV's Secure e-Solutions sector, author also of two chapters, has been presented

by its editor, the Innovating Companies Forum (*Foro de Empresas Innovadoras: FEI*).

The book presentation was combined with the forum's yearly innovation awards

ceremony, the whole event brought to a close by Galo Gutiérrez Monzonís, Director General of Industry and SMEs. It served as the stage for a publication that meets one of FEI's founding remits, namely, coming up with ideas for driving the country's development in a sustainable direction, with companies as the star features, innovation as their main argument and science as their staunch ally.

Pedro Carreño, journalist of Spain's public television channel, TVE, led an interview and subsequent debate with GMV's executive, who is also FEI Vice-President, together with José Molero, FEI President, talking about the key features and main purpose of the publication. As Álvarez-Gascón argued *"we cannot afford to arrive late at the Fourth Industrial Revolution because what is at stake here is Spain's right to remain among the richest countries with the highest welfare levels"*. To avoid this calamity we need to drive *"a series of cohesive policies and close the science and technology gap, bringing out the full value of the former"*.



Technological expertise in Open Government projects

■ Government authorities' remit of providing their governees with various services mean they have to generate, keep and handle vast amounts of top-quality information. Properly reused, this information can then be tapped into for improving these citizens' quality of life. In 2009, with this aim in mind, Spain's government brokered the Aporta initiative to encourage the culture of reusing public-sector information and bringing its social and economic value to much wider notice.

Under the banner *"Emprendiendo con datos públicos"* (Doing business with public data), in November the 8th Aporta's encounter was put on by the State Secretariat for Digital Progress (*Secretaría de Estado para el Avance Digital*) of the Ministry of Economics and Entrepreneurship (*Ministerio de Economía y Empresa*). Participants at

the event swapped notes on the power of public data to drive innovation and entrepreneurship. GMV was invited to tell its experience in this eighth get-together. Patricia Tejado, Public Digital Services Manager of GMV's Secure e-Solutions sector, took part in the discussion panel *"Public data and business development"*, chaired by the State Secretary for Digital Progress, which debated cases of public data being used to improve products or services, bringing businesses into line with new markets and widening industry's radius of influence. GMV presented its experience in drawing up the open data catalogue and the portal datos.gob.es, among other projects.

As GMV's manager points out, now that the content has been created, together with the necessary wherewithal for processing it, the pooling of all this data in a common repository will be favorable



to a *"forward-looking government with greater capacity for developing data-supported business by a more innovation-intensive industry"*.

Significant GMV representation in AMETIC's new governing board

IN THE NEW GOVERNING BOARD THE SPANISH ASSOCIATION OF ELECTRONICS, DIGITAL CONTENTS AND ICT COMPANIES (*ASOCIACIÓN DE EMPRESAS DE ELECTRÓNICA, TECNOLOGÍAS DE LA INFORMACIÓN, TELECOMUNICACIONES Y CONTENIDOS DIGITALES: AMETIC*) GMV HOLDS THE POSTS OF AMETIC VICE-PRESIDENCY, VICE-PRESIDENCY OF ITS CYBERSECURITY COMMITTEE AND PRESIDENCY OF ITS DIGITAL HEALTHCARE COMMITTEE

■ The Spanish Association of Electronics, Digital Contents and ICT Companies (*Asociación de Empresas de Electrónica, Tecnologías de la Información, Telecomunicaciones y Contenidos Digitales: AMETIC*) has set up a new governing board, re-electing Pedro Mier as president and newly appointing Luis Fernando Álvarez-Gascón, General Manager of GMV's Secure e-Solutions sector, as vice president of Spain's digital industry employers' association.

The new governing board is made up by 39 companies and 19 presidents of AMETIC's committees. GMV forms part

of de AMETIC within the major firm category. In turn, Mariano J. Benito, CISO of GMV's Secure e-Solutions sector, is vice president of the Cybersecurity Committee and Carlos Royo, the company's strategy manager, is president of AMETIC's digital healthcare committee.

Featuring large among the AMETIC governing team's priorities for this new stage is the development and growth of the association, modernization and internationalization of its activities and across-the-board reinforcement of its role as the voice and representative of Spain's digital technology industry.

Fundamental for this purpose is strengthening of the public role of defense and voice of the enabling technology industry's interests, digitalization support, both of the software and hardware equipment and electronic components, all digitalization mainstays.



GMV and Dynatrace, a positive union

■ Some years ago Dynatrace took on the task of systematically helping organizations in their digital transformation process. The challenge was to be able to make headway in the third generation of its platform, built from scratch, so that it could switch from the provision of application performance management (APM) solutions to acting as an intelligent software specialist that offers full-stack monitoring solutions for all applications, both on-premise and cloud.

For the fifth time, Dynatrace has organized its Dynatrace Perform event in Madrid, where it explained how to speed up innovation and unveiled the new capabilities that will soon be included in this "new" platform. GMV, client and partner of Dynatrace, was one of the participants at this event. Also featuring in the program was Pablo Iglesias, GMV's Solutions Architect. During his presentation, Iglesias analyzed how GMV is migrating from AppMon to Dynatrace, with its

respective advantages, and outlined the reasons for the change. Without doubt, this change has been a complete success, offering an unequalled simplicity and intelligence, leaving more time to innovate and accelerate the digital transformation, with less time spent on analyzing and resolving problems.

GMV's experience with the Dynatrace platform is a clear example of a positive experience, taking advantage of the better quality of data, the organization of multiple applications (Host Groups, Management Zones, Tags VS System Profiles and Agent Groups), the detection of problems (root cause and impact on users and services) and specific decisions with deterministic Artificial Intelligence (dependency maps and multidimensional baselining), among other advantages. This change is still in process, with the next step focusing on automation, exploiting the use of the API: design of automatic E2E tests based on users' real use of the

applications, integration of alerts into service desks, reporting with external tools, etc.

In order to tackle the challenges and opportunities thrown up by the digital era, all companies without exception must opt to either lead digitalization or



GMV joins Fundación Adecco's #JobsForEveryone initiative



■ The full integration of disabled persons into society calls for projects that favor greater knowledge of the current situation and raise the awareness of the public at large and employers in particular. Mindful of this fact, GMV has signed a collaboration agreement with *Fundación Adecco* to help disabled persons find their rightful place in the job market.

Under this agreement GMV's Human Resources strategy will include an integration plan to favor the hiring of disabled persons and improve accessibility conditions in their workstations.

GMV and *Fundación Adecco* will jointly draw up a strategic activity plan, working together to achieve a more inclusive world, doing so by setting up a series of initiatives designed to boost the autonomy and employability of disabled persons and ensure they can play their full part in the job of their choice.

Towards a New 200 Horizon

■ Under the banner "*Towards a New Horizon*", the City of Toledo hosted the 10th Conference of the European Union's Framework Programme for Research and Innovation in Spain, held by the Spanish Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial: CDTI*) and the European Commission, with the collaboration of the Regional Council of *Castilla La Mancha*.

The opening address was given by the Minister of Science, Innovation and Universities, Pedro Duque, who highlighted Spain's fine results in the European R&D financing program, Horizon 2020, winning Spain fourth place in the funding ranking.

Pedro Duque underlined the success of Spain's participation in the European Union's Framework Programme and urged authorities to continue backing Europe for the next two years the program is due to run. Figures were then quoted to vouch for Spanish companies' involvement, such as the 3.302 billion euro grant received to date, adding up to a Spanish R&D investment of at least 3.9 billion euros. The return obtained is 10.1% of the EU-28. In Duque's opinion these results show the high expertise and capability of Spanish companies.

Luis Fernando Álvarez-Gascón, Director General of GMV's Secure e-Solutions sector, was one of the invited expert speakers, representing the Spanish Confederation of Business Organizations (*Confederación*

Española de Organizaciones Empresariales: CEOE) in his capacity of Vicepresident of the R&D Committee.

Álvarez-Gascón kicked off his speech by congratulating the CDTI on its 40-year track record and called for a rethink of innovation promotion in Spain, with merely 10,000 companies carrying out R&D in the country. He also announced that CEOE is now working on a "*Decalogue of urgent R&D-driving measures*", proposing, among other measures, a "*State Pact for Science and Innovation*". Finally, he put forward some issues that should be taken up by the new Europe Horizon framework programme, such as more generous funding for pillar 2 and its structuring in a greater number of clusters. He also put forward a defense of the SME Instrument, in which Spain has chalked up great results. He finally stressed the importance of the proper treatment of industrial property.



On 13 November 2018 Javier Romañach Cabrero passed away. Javier, a former GMV colleague, was a bioethics scholar, inventor, writer, entrepreneur and champion of the rights of people with functional diversity. Furthermore, for all of us lucky enough to be his friends, he was the most exceptional person we've ever known. R.I.P.

ESTEVE MIR ESPÀRRECH

«Work is always a 'Quid pro quo'»

My story here begins with an email I saw by pure chance saying that a firm called GMV might be interested in my joining its staff. This email told me that GMV had received a recommendation from one of my university professors; this surprised me because my degree had been a distance course and I never actually came to know any professor face to face.

They called me soon afterwards and I had an in-depth interview with a line manager called Julio Vivero plus a human resources manager hooking up remotely from Madrid (Alejandro Caballero)! All very professional in an office building in the Barcelona district

of Balmes, in an office dominated by an imposing wooden desk and the walls lined with posters of space projects, satellites and other things GMV was up to at the time. This was obviously a firm on the way up, reaching a new level. Where had it been beforehand?

Truth to tell, everything went very well. I was obviously on edge, but I also felt unexpectedly comfortable; Julio and Alejandro were both friendly and, above all, reassuring. But the most important thing for me was their friendliness. That said, it was all businesslike: What would you do to secure a Linux user's password? What would you do if a project proved impossible to finish by the delivery deadline? What would you say to the

client? When did the Ming dynasty begin to decline? Typical cybersecurity questions, in other words. N.B: if they ask you the latest IT thing you've read, don't answer an article on quantum computing (even if it's true) unless you're Neil deGrasse Tyson. Bear in mind that the follow-on question will be to ask you to explain it in English. But, anyway, here's how it panned out: in a few days they called me up asking me to join the firm.

In Barcelona I met many of the people who are my current-day colleagues and made some good friends that are unfortunately no longer with GMV. If you look for work in the sector you'll see that everyone boasts about the working environment, using buzz words



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UNIT

CIN

DOB

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QUALIFICATION

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START DATE

January 01, 2016

OFFICE

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HOBBIES

Guitar, music, reading, trekking

DEFINES HIMSELF AS

I don't usually define myself.



«THERE ARE PROJECTS ABROAD, CHANCES TO LEARN NEW THINGS, TO MEET OTHER PEOPLE, CHANGE MY POSITION, GO TO FRANCE, THE NETHERLANDS, ITALY, UK»

and phrases like multidisciplinary, young and dynamic and other even more recherché epithets. But to work closely with people on a daily basis you need friendliness, expertise, thoroughgoingness and laughter but above all support and kindness, and I'm grateful for the fact that this is exactly what I found. Not for free, obviously; work is always a quid pro quo, but here it's a pleasant tradeoff. You know you're lucky when you sometimes get up and you don't mind going in to work. And what good has all this been to me?

During the first year and a half I was posted to a client; I learnt loads (forgive me, I'm trying to eschew this expression but it's currently my maxim), but it was a very hard, bureaucratic environment, a complicated post. I ended up wanting to leave but GMV's Barcelona office persuaded me to hang

in there; they gave me facilities, time to think (a month off), a change and finally I stayed. I value all this attention and care highly. I for one have never found it elsewhere in the working world. From that moment I've worked on infrastructure in Barcelona, carrying out all sorts of different projects. And that's just what I most like. One day you're in the Netherlands mending a broken server; the next you're in Madrid giving a technical presentation for a client, if they don't call you to design a security architecture for another European client. It's not always like that, of course; some projects are more interesting than others, but in general I've enjoyed my work, a lot. And the most important of all, as I never tire of saying, is the relationship with my colleagues.

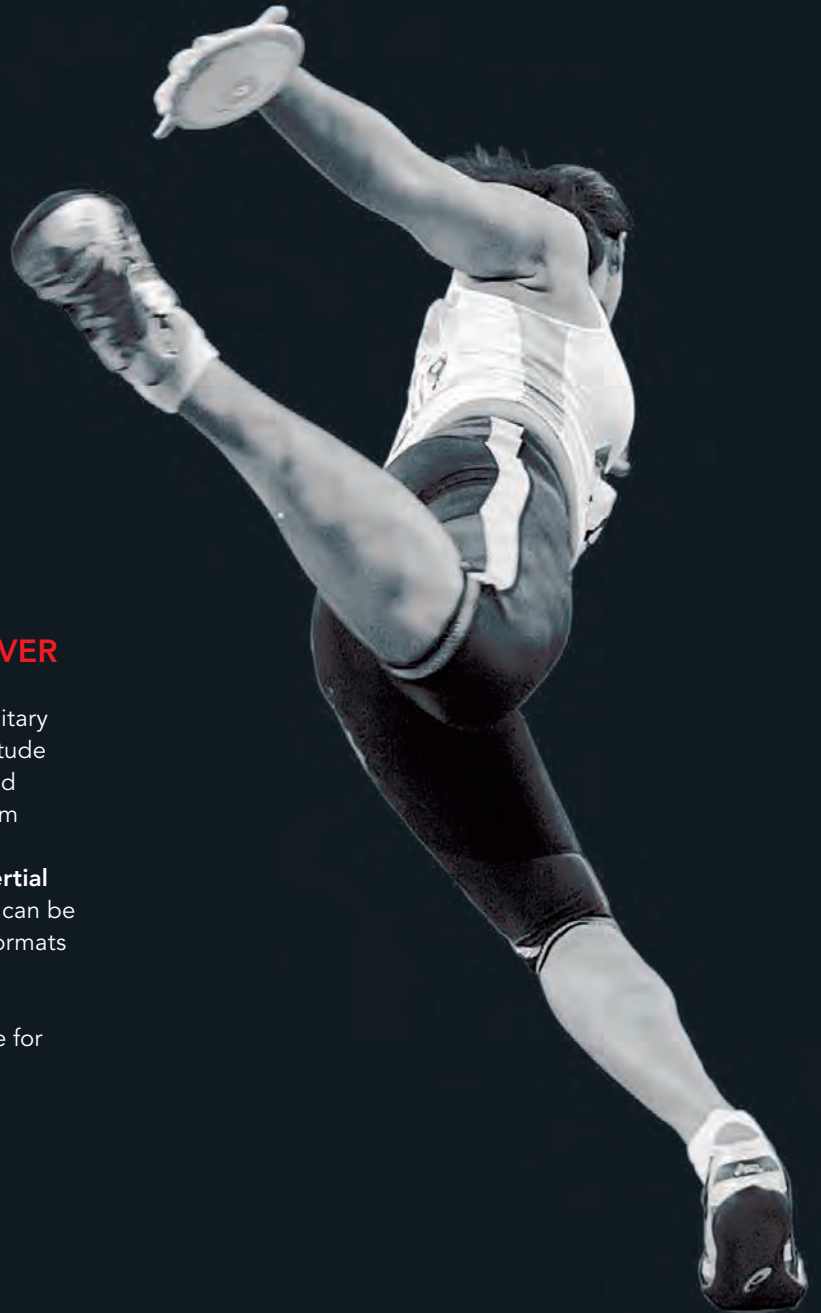
Later on a teleworking option cropped up, making my working arrangements

even more convenient, and I opted in. This was another good reason for me to stick with GMV. Not only the convenience, avoiding all the commuting, but also because it reflected confidence in my work and a trust that I would correspond to this confidence. Another facet of "*Quid pro quo*": peace of mind.

Now comes another impasse, but a good one. There are projects abroad, chances to learn new things, to meet other people, change my position, go to France, the Netherlands, Italy, UK ... And the most important? I don't need to tread on anyone to make my way upwards and I'm not going to exploit anyone. I'm simply going to do a job I love and see what other things my colleagues come up with. The worst? The level of jokes. You've been warned. Greetings.

isnav

NAVIGATOR AND TIME SERVER



VEHICULAR NAVIGATOR AND TIME SERVER

The *isnav* vehicular navigation system is the **advanced navigation and time reference solution of GMV** for military vehicles. *isnav* provides data about position, speed, attitude and time in various formats in order to offer an integrated navigation and synchronization solution. The *isnav* system is ready to include the **PRESENCE 2 Public Regulated Service (PRS) Galileo receiver** and may integrate an **Inertial Navigation System (INS)**. The **time server** unit of *isnav* can be extended to provide synchronization signals in various formats such as IRG-B or HQ.

isnav has been chosen by the Spanish Ministry of Defense for the VCR 8x8 program.



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