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REVISTA ESPAÑOLA DE DEFENSA



FEINDEF
First Edition of the
International Defence
and Security Exhibition

**Future air
combat system**

A EUROPEAN COOPERATION PROGRAMME



BALTOPS 2019

Spain takes part with three vessels and a landing force in NATO's biggest annual manoeuvres in the Baltic Sea



REVISTA ESPAÑOLA DE DEFENSA

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about defense

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Spain's first major exhibition

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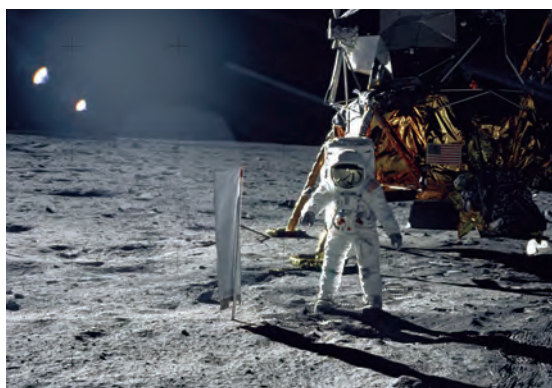
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Itaki Gómez/WDE

The German, French and Spanish Ministers sign the agreement in the presence of French President, Emmanuel Macron.

NGWS, a European cooperation project

Germany, France and Spain join in future fighter aircraft project

THE 53rd edition of the *Paris Air Show* was the venue to stage the official take-off of the European project of a Next Generation Weapon System (NGWS). It is a cooperation initiative between the governments of Berlin, Paris and Madrid, and its goal is to place in service in 2040 a complex manned and unmanned aircraft system that can

replace the current European fighter aircraft fleets, all within the ambitious concept of building a Future Combat Air System (FCAS).

The ceremony took place in the outdoor exhibition area known as the Salon de *Le Bourget*, along with a real size representation of the 6th generation fighter, which will be the cornerstone on which the NGWS will rest. The protagonists were the German, French

and Spanish Ministers, Ursula von der Leyen, Florence Parly and Margarita Robles, respectively, who were accompanied by the President of the French Republic, Emmanuel Macron, who had just inaugurated what is considered to be the largest airspace exhibition worldwide.

With his presence, the French head of state wanted to evidence the strong determination and commitment of Germany, France and Spain to launch an ambitious

European project of utmost relevance to the air forces and aeronautical industry of the three EU nations. The heads of the Departments of Defence signed a Framework Agreement that opens the way for the initial stage of investment in NGWS technological programs. The pillars of which are the future fighter aircraft or NFG (Next Generation Fighter), all kinds of drones and new advanced sensor systems.

Additionally, there will be a new combat system in the cloud that will enable real time integration with other platforms, like communication and observation satellites, early warning aircraft, last generation tanks, warships and submarines, all of which fall within the FCAS concept.

The Franco-German-Spanish agreement activates a series of administrative and consultation mechanisms between the three Ministries aiming to develop a system that will replace in the year 2040 those fighters that are currently in service in the French Armed Forces, *Rafale*, and those of Germany and Spain, the first versions of the *Eurofighter EF-2000*.

HISTORIC OPPORTUNITY

In its official communique after the *Paris Air Show*, the Ministry of Defence claims that the three nation joint initiative is a «unique opportunity to guarantee the capabilities of the Spanish Armed Forces, to bolster the European security and defence policy, and to develop industrial and technological capabilities of the European Industrial Base». All of which will consolidate Spain's and Europe's sovereignty and independence.

According to the interim Defence Minister, Margarita Robles, being in the NGWS «from the beginning, is very important for the modernization of the Air Force, and gives momentum to the development of the defence industry». This is why Spain «like its partners, intends to participate with a 33 per cent in technological projects».

From the point of view of the State Secretary of Defence, Ángel Olivares, this recently launched project «will bring the Spanish industry bene-

fits equal to those resulting from the Eurofighter program».

This recently signed Framework Agreement gives the green light to the start of formal negotiations so that the Spanish industry can become part of the already established Franco-German industrial agreements, as for instance the Joint Concept Study (JCS), which will run until mid-2021. But also in the different work packages of R+D+i activities of the seven technological pillars identified, that are the basis for the future demonstration stage that should enable to establish the specific product lines for the NGWS,

the NGWS life cycle, as well as provide them with new technologies, disruptive in some cases, which will be useful for many industrial sectors, since in most cases «new dual technologies will see the light» and, therefore, will be applicable not only to the defence sector but also to many other key fields of the national industrial fabric, such as energies, airspace, transportation, medical, telecommunications, automotive, etc.

In this sense, the Ministry of Defence considers that the NGWS program is a «State» program in which Spain should be capable of defending its military and



Dassault Aviation

Representation of the 6th generation fighter aircraft, cornerstone of the project on which the future air combat system will rest.

and more particularly, for the NGE, its primary component.

The seven pillars identified are those relating to aerial platform, engine, electro-optical sensors and radar, remote operators (drones), very low observability systems to incorporate into the platform, simulation laboratory and the «system of systems» responsible for ensuring the connectivity of everything, including Command and Control.

The fact that Spanish companies have the opportunity to position themselves as soon as possible in the industrial team will allow them to «be relevant» in all

industrial strategic capabilities and interests in what is considered to be the most ambitious European cooperation program thus far. It is so important that it should be carried out in close collaboration with other Departments, in particular, with the Ministry of Science, Innovation and Universities and with the Ministry of Industry, Trade and Tourism, in order to integrate the domestic industry into the «Joint Concept Study» and into the different work packages of R+D activities.

Therefore, in discussions with the leading companies in the aeronautical

Spain, like its partners, intends to participate with a 33 per cent in the technological projects of the program

Margarita Robles: «Being in the program from the beginning is very important for the Air Force and for the industry»

and defence field and in coordination with other ministries, the General Directorate for Armament and Materiel coordinates the design of an Industrial and Technological Plan specifically for the NGWS. Once it is approved —probably before the end of this year—, the plan will determine the companies and the capabilities that the national industrial fabric is capable of providing to the technological risk reduction stage in order to make the project succeed.

MORE THAN A FIGHTER AIRCRAFT

According to the Air Force, «the NGF will be a twin-engine fighter aircraft of utmost importance to the Spanish Armed Forces, as it ensures the replacement of the current *Eurofighter* fleet by

a substitute that will guarantee its technological superiority around 2040».

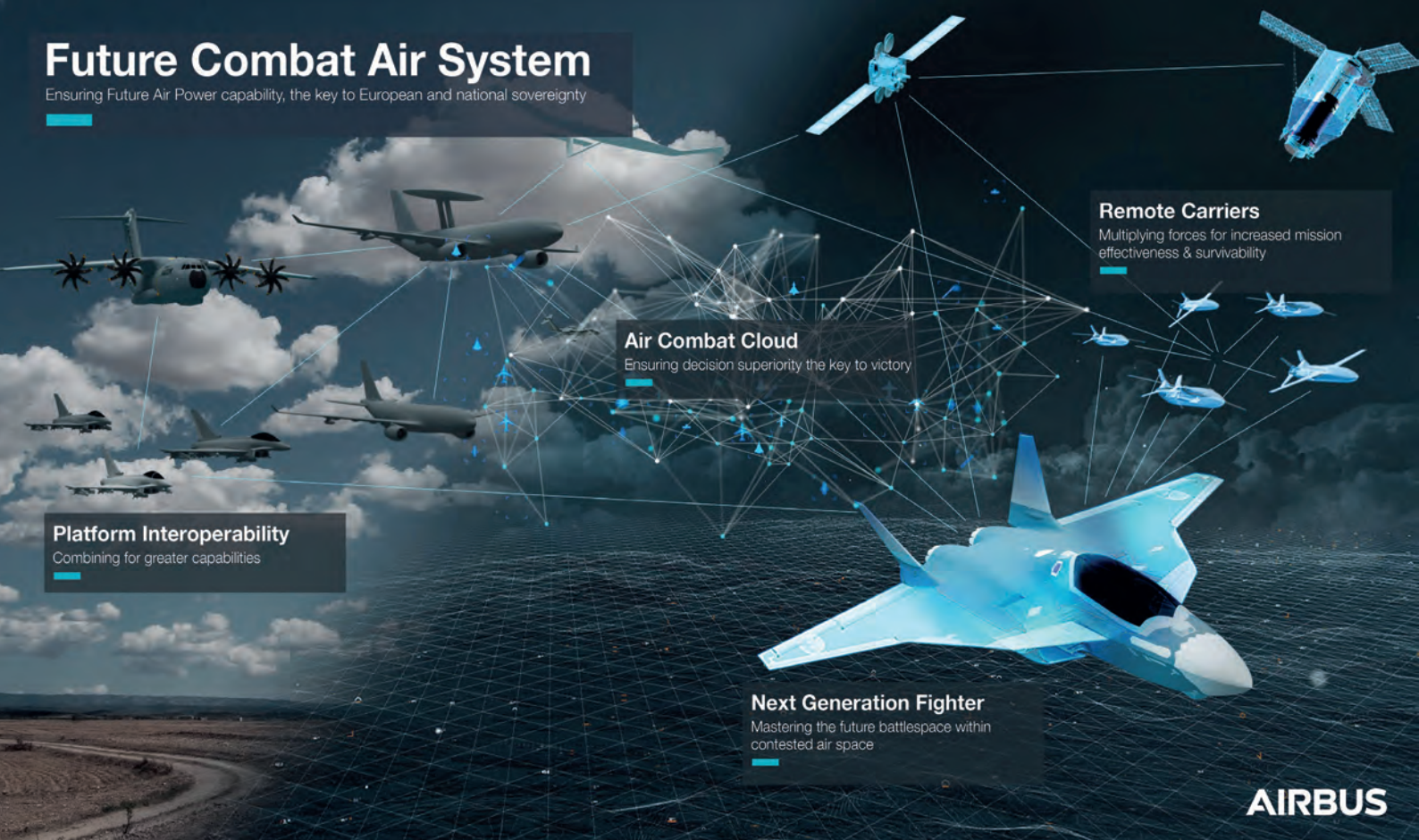
Captain José Luis Nieto, Head of the Planning and Control Department of the Sub-directorate general for Planning, Technology and Innovation in the General Directorate for Armament and Materiel claims that the NGWS project «is more than just an initiative to develop the most advanced fighter aircraft ever flown by a European country». Captain Nieto underlines that although we should underscore that the future fighter aircraft is the core of the project, the real goal is «to guarantee an independent and sovereign European air-power capability bringing great economic, industrial and technological benefits to participating countries».

This Navy officer, an experienced *Harrier AV-8B II Plus* pilot, considers that the NGWS «will be the 21st century air weapon system, since its goal is not only to exceed the capabilities and performance of the traditional fighter aircraft in service today, but also to be a step ahead of any next generation fighter aircraft or development».

Within the timeframe, the main target set by the air forces of the three countries involved is to have a first demonstrator aircraft that can fly in the year 2026, which is a huge challenge for the industry. As a result, it will be possible to start experiencing with the most critical technologies so that the NGWS concept comes into being in the 2040s.

Future Combat Air System

Ensuring Future Air Power capability, the key to European and national sovereignty





Margarita Robles visits the Spanish pavilion at the *Paris Air Show*, where 35 Spanish aeronautical companies showcased their technological developments.

The challenge that European manufacturers face goes beyond the limits of anything existing today and it is close to what some could consider science-fiction. But the exponential growth of Artificial Intelligence (AI) and the massive big data analysis and management is going to enable a 6th generation manned fighter aircraft to interrelate with very different weapon systems required to be hyperconnected and to work in correct synchrony.

The contribution of AI and big data is going to be decisive for the success of the project. It is a disruptive technology that is essential to manage dozens of thousands of data that will allow pilots to have a better knowledge of the tactical situation of the environment and succeed in every mission. But, most of all, the largest contribution of AI will be to allow to understand the enormous data and information flow acquired by numerous sensors, the ultimate aim of which is to present the most efficient options on the pilot's screen.

For instance, the future 6th generation fighter aircraft will be surrounded, physically or digitally, by swarms of reconnaissance drones and rocket launchers, radar surveillance aircraft, strategic projection and air-to-air refuelling aircraft, as well as electronic

warfare equipment. At the same time, it will bay advanced electronic conversations with cruise missiles launched from aircraft, submarines, surface ships, as well as with cutting-edge tanks... and so on.

MULTITASK

The full range of operational tasks now being studied and being assigned to the NGWS concept include tactical and strategic reconnaissance, air superiority and deterrence missions. But also those linked to combat actions in asymmetric conflicts, long distance penetration in enemy territory and attack on ships. And if this were not enough, the NGF meets the requirement of being embarkable. This means that it can per-

The Armed Forces of the three countries involved expect to have a first demonstrator aircraft in 2026

form missions from the flight deck of a great surface ship to replace the Marine version of the *Rafale* fighter aircraft permanently based on the French atomic carrier *Charles De Gaulle*.

As the system's main aerial platform, the technologies that should be incorporated into the NGF are going to require servicemen and engineers to find the maximum balance between furtivity, speed and its combat and strike capability.

In order to achieve this stealth aircraft and make it undetectable to cutting-edge radars, its radar equivalent section must be practically imperceptible. This requires a design without shapes producing echoes on the radar screen, but it also requires eliminating external pylons to secure missiles, bombs and sensors to be housed in interior bays.

Initial studies foresee that NGF squadrons will not conduct assigned missions on their own. The initial forecast is that their strikes will be preceded or accompanied by remotely piloted aircraft, some to carry out reconnaissance missions, others to act as communication relays and others to harass enemy defences and fire missiles against highly protected targets and avoid threatening the lives of the pilots.

Juan Pons

Amphibious landing on a beach in Latvia. Below, *USS Mount Whitney*, command ship of the exercise. A *Harrier* on the deck of the *LHD Juan Carlos I* and a U.S. *Seahawk* launching a *Hellfire* missile.





Erik Kukutis/Latvian Army



Latvian Ministry of Defence



US Navy



Latvian Ministry of Defence

Standing NATO Maritime Group 1 with Danish ships in Baltic Sea waters. (On the right of the picture, frigate *Almirante Juan de Borbón*).

With our allies in the BALTIC SEA

NATO maritime forces test their
readiness in *BALTOPS'19*

TROOPS from the United States and 17 European nations have taken part in NATO's largest annual exercise in Baltic Sea waters and coasts. *BALTOPS* exercise (acronym for *Baltic Operations*) started in Germany's Baltic Sea port of Kiel on 9 June and ran through 21 June, involving maritime, air and ground forces as well as 8,600 troops, 50 ships and submarines and 40 aircraft. The exercise included maritime interdiction, amphibious and air defence operations as well as other domains of sea combat, such as anti-subsurface warfare and mine countermeasures.

«The Baltic is of vital strategic importance to the Alliance and is bordered by 6 NATO countries», said NATO spokesperson Oana Lungescu when presenting the exercise to the press. She pointed out that this exercise «is now in its 47th year and is not directed against anyone». However, she admitted that the security environment in the region has deterio-

rated after Russia's illegal annexation of Crimea. Lungescu insisted that «the only purpose of this exercise is to test how well our forces work together and show that NATO can defend itself against any adversary».

With the aim of further strengthening the joint response capability, *BALTOPS 2019* brought together troops from Belgium, Denmark, Estonia, France, Germany, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Turkey, the United Kingdom and the United States, along with two NATO partners in the region, Finland and Sweden.

This year the maritime exercise was run by the U.S. Navy *2nd Fleet*. This maritime force based in Norfolk, Virginia, had been deactivated in 2011,

but the Pentagon re-established it last year to strengthen the defence of NATO countries in the North Atlantic. Its commander, Vice Admiral Andrew Lewis, ran the allies operations from the U.S.S. *Mount Whitney* command ship.

*Spain has
taken part
with three
ships and a
landing force*



Armada

Once the exercise concluded, *LHD Juan Carlos* and *ESPN Cristóbal Colón* sailing back to Spain.



Joaquín Garat



US Navy

Damage control exercise on *ESPN Cristóbal Colón*. On the right, an armoured AAV-7P goes out to sea from *USS Fort McHenry*.

BALTOPS comprised 389 different activities this year, almost four times more than last year. To add a greater sense of realism to this exercise, a crisis scenario was simulated by rebel forces trying to take control of an island in the Baltic Sea. As a result, allied nations

went there to defend it and helped restore stability in the region.

BALTOPS'19 has also been the first great training opportunity for the Joint Expeditionary Force-Maritime (JEF-M) run by the United Kingdom. This rapid response force, established

in 2014 and made up of 3,000 members from several NATO allies and partners, reached its initial operational capability in 2017. One of the great challenges of this exercise was precisely to coordinate the activities of several pre-formed maritime groups operating

The exercise brought together 50 ships and 40 aircraft from 18 countries, under the command of the United States Second Fleet

under the same command. The Baltic States Naval Squadron (BALTRON) made up of ships from Estonia, Latvia and Lithuania also joined the JEF-M and NATO's standing groups (escorts num. 1 and Mine Countermeasures num. 1 and 2).

Aircraft activities were controlled from the NATO Air Operations Centre in Uedem (Germany). Among others, there were *F-15*, *F-16*, *Harrier* and *MiG-29* jet fighter aircraft, and maritime patrol aircraft as the U.S. *P-8 Poseidon*.

THREE SPANISH SHIPS

The Armada (Spanish Navy) has had a significant representation in this exercise with the deployment of flagship *Juan Carlos I* and *ESPN Cristobal Colón* and *Almirante Juan de Borbón*. The latter was already operating in the scenario and was integrated in the Standing NATO Maritime Group 1 (SNMG).

There were about 1,100 servicemen on board the three ships, most of them on *LHD Juan Carlos I*, which in addition to her 300 crewmembers travelled with an embarked aircraft unit made up of 105 people, seven *AV8B Harrier II Plus*, three *SH5D Sea King* helicopters, a party of the Beach Naval Group made up of 34 members and four *LCM-1Es* (*Landing Craft Mechanized IE*), and a landing force made up of 306 marines and 38 vehicles.

Part of this group, of the Second Landing Battalion of the Fleet of the Armada, was on board the *USS Fort McHenry*, of the US Navy. The Spanish troops, integrated in the 22nd Marine Expeditionary Unit, carried out landing exercises in Latvia, particularly in Daugavgriva and Lilaste, near Adazi, where the Army detachment integrated in the eFP mission (Enhanced Forward Presence) is located.

This U.S. ship, together with the British *HMS Albion* and the *Juan Carlos I*, were responsible for most of the amphibious operations. One of the grea-

test challenges was to find appropriate access points because of the rocky Baltic coasts and the busy vessel traffic.

Among the forces that stood out from the rest of the countries were Royal Navy Frigates *HMS Kent* and *Westminster* or the Norwegian frigate *Roald Amundsen* (built by *Navantia* and similar to the Spanish *F-100*) and the Swedish corvettes *Karlota* and *Nyköping*, with their futuristic stealth design that reduces their visibility. The

mine warfare operations were also an essential part of the exercise. Advanced detection systems were used, as the Littoral Combat Ship, a U.S. program that is now at an experimental stage. More than 15 mine countermeasure ships (MCM) took part in these tasks, as well as 15 unmanned underwater vehicles, five drone aircraft and over 70 divers of different nationalities.

Victor Hernández



Latvian Ministry of Defence

The troops of the II Landing Battalion were trained with the U.S. marines. Below, inspection boarding from *ESPN Cristobal Colón*.



Joaquín Garat

The return

Several *AV-8B Harrier II Plus* overfly the Coast of Cadiz. They approach in formation Rota runway, base of the 9th Aircraft Squadron of the Armada (Spanish Navy). They return home after two intensive weeks of operations in the Baltic skies, forming part of the multinational *BALTOPS'19* exercise.

One of the *Harriers* has a Spanish flag painted on its tail. It is a special decoration for the *Air Tattoo 2019*, the most important aircraft exhibition in the world taking place in the United Kingdom from July 19th to 21th.

Photograph: Armada





High-readiness PARATROOPERS

The Almogávares VI Brigade certifies its operational capability as a NATO manoeuvre unit integrated in VJTF 2020

FIRST at the Chinchilla Training Field (Albacete) at the end of May and subsequently in Drawsko and Orzysz (Poland) from 21 to 25 June during the CPX (command posts) phase of the *Dragón 19* allied drill, the *Almogávares VI* Paratrooper Brigade (BRIPAC) has been evaluated and certified as a manoeuvre unit of the ground element of NATO's 2020

Very High Readiness Joint Task Force (VJTF) which the Atlantic Alliance will keep available for activation if necessary in 2020.

BRIPAC provides VJTF and, therefore, the NATO Response Force (NRF) with a protected light infantry tactical group —a total of 778 troops— formed under the banner of the *Roger de Lauria* infantry unit of the *Naples* Regiment no. 4, reinforced with

a company of the *Ortiz de Zárate* Banner from the *Zaragoza* Regiment no. 5, joined by a Portuguese infantry company. For tactical mobility the Spanish unit incorporates Medium Armoured Vehicles on Wheels (BMR), the *RPG 31* and the *Lince*. A battery of the Campaign Artillery Group equipped with *Light Gun* howitzers and a company from the sappers battalion, both from BRIPAC, will also join the respective

Lince and *RPG 31* armed vehicles in Chinchilla training area (Albacete).



The Roger de Lauria protected light tactical group comprises 778 men and women

VJTF combat support units. The land component of this rapid deployment unit and of the NRF will be led next year by the 21st Mechanised Mountain Brigade of the Polish Army, which will have six Battle Groups: three national, one Scottish, one Czech and the aforementioned Spanish group.

EVALUATION

During the national certification in Chinchilla, the *Roger de Lauria* tactical group carried out an attack/defence operation in a conventional warfare theatre that was evaluated according to NATO criteria by personnel from the General Staff of the *Almogávares* Brigade and verified by two observers from the NATO Land Command Headquarters in Izmir (Turkey). Previously, the units of the tactical group acted separately in companies performing the reconnaissance of itineraries, combat operations in urban terrains and live fire drills. The manoeuvres in the terrain of the Infantry battalion were supported by artillery fire, basically focusing on constant changes to the positioning of the pieces — up to 25 times a day — to reduce the timing from the transport position to the firing position. One of the main activities of the sappers during the certification drill was the arrangement of the positioning of the artillery positions using the moving machinery from the Terrain Organisation section.

POLAND

Almost a month later, from 21 to 25 June, the senior staff of the Spanish battalion participated in Poland in the CPX phase of the *Dragón 19* drill, the aim of which was to evaluate the 21st Mechanised Mountain Brigade Headquarters' combat readiness (CREVAL, *Combat Readiness Evaluation*). Two liaison officers from BRIPAC joined Orzysz, where the unit was located, while 17 others joined the response cell deployed in Draws-



BRIPAC members are trained in urban combat actions.

ko. The tactical group thus completed its certification as a manoeuvre unit of the Polish multinational brigade, specifically in the field of the C2 structure — command and control — between the VJTF 2020 Battle Groups.

The *Dragón* drill was preceded by a Livex type phase in which up to 18,000 troops from Germany, Bulgaria, Croa-

tia, Slovakia, Spain, the United States, Italy, Poland, Norway, the United Kingdom, the Czech Republic and Rumania participated, as well as 130 tanks, 225 mechanised vehicles, 32 aircraft, nine ships and 51 artillery pieces. Spain participated in this phase of real forces training with an element of the *Valencia* no. 1 NBC Defence Regiment, also assigned to the NRF 2020 and its VJTF.

The Eurocorps Headquarters will assume the command of the Ground Component of these forces. After satisfactorily passing a series of certification drills throughout 2018 and the current year, its certification will take place this autumn between 26 October and 14 November in Stavanger (Norway) during the *Trident Jupiter 19* drill, programmed to evaluate its combat readiness.

J.L. Expósito

Photos: Jesús de los Reyes/DECET



Light Gun 105 mm towed howitzer live-fire artillery exercise.



The first edition of FEINDEF was attended by institutions, the main companies from the sector and international delegations.

The first large defence EXHIBITION IN SPAIN

Over three days, FEINDEF, with 150 exhibitors and numerous activities, receives more than 10,000 professionals from the sector



The Minister for Defence, Margarita Robles, opened the exhibition, accompanied by the State Secretary of Defence, the Chief of Defence Staff and the Chairmen of TEDAE and AESMIDE.

The attendance of 48 delegations from 32 countries positions FEINDEF as a European reference for the defence and security industry

THE International Defence and Security Exhibition (FEINDEF) has got off to a strong start. More than 10,000 professionals from the sector visited its first edition, held from 29 to 31 May under the slogan *Technologies for a safer society*. There were forums and conferences, product presentations, the signing of agreements and a wide range of Spanish technology on display for the 48 official delegations from 32 countries and the representatives from various European institutions.

Organised by the TEDAE (Defence, Security, Aeronautics and Space companies) and AESMIDE (suppliers of goods and services for the Ministry of Defence) associations, with the support of the Ministry, FEINDEF hosted 150 exhibitors from eleven countries, occupying 14,000 square metres of IFEMA, the Madrid Exhibition Centre. Among them were the stands of the Ministries of Defence and the Interior, the Army, the Air Force and the Navy, the Military Emergencies Unit (UME), other bodies belonging to or attached to Defence, several public

institutions, the main companies of the sector —both Spanish and foreign—, numerous SMEs and the commercial offices of various countries.

«The first but not the last», said the acting Minister for Defence, Margarita Robles, at the opening ceremony, «because we have set the ball rolling». With FEINDEF, the Spanish military industry is endeavouring to create its own showcase, following the model of other large European exhibitions of armament and materiel, such as the French *Eurosatory*, which has been running for more than 25 years, and with



The Army stand (right) was dedicated to Force 35. The Navy (above) and the Air Force (below) showcased their capabilities.



which it will alternate in odd years. Although the first exhibition has been static, it is hoped that the second, in 2021, will include an air show.

In addition to Minister Robles and other senior Defence officials, the event was attended by the acting Minister for Science, Innovation and Universities, Pedro Duque; the Secretary of State for Security, Ana Botella; the Secretary of State for European Affairs, Fernando Valenzuela; the Director of the European Defence Agency (EDA), Jorge Domecq, among others, all of whom were able to see first-hand the main technological advances in the defence and security industry, which on many occasions are dual developments, with characteristics and properties that make them attractive for civilian use.

OPENING

«Europe has to work together on a major issue such as security, and that is why the defence industry is essential, an industry that is fully committed to cooperating with the Armies and creating jobs», said Margarita Robles at the opening of the Exhibition. In her speech, she stressed that our Armed Forces, «modern and

*The event had
an extensive
programme of
forums, conferences
and workshops*

efficient, are a benchmark in Europe», and advocated boosting investment in research, development and innovation (R&D+i) because, she said, «that is the future».

The chairman of TEDAE, Jaime de Rábago, and the chairman of AE-SMIDE, Gerardo Sánchez Revenga, also spoke. «Spain finally has a meeting place for the main players in defence and security», said Rábago, while Sánchez Revenga stressed the contribution of the sector «to the development and wealth of a country».

A video message was from the European Commission Vice-President for Jobs, Growth, Investment and Competitiveness, Jyrki Tapani Katainen, was shown, in which he wished the Exhibition every success.

Together for A SAFER SOCIETY

A FEW weeks ago the first International Exhibition of its kind in Spain, FEINDEF, was held at IFEMA in Madrid. The exhibition was organised and promoted by the two business associations of the sector, TEDAE and AESMIDE, and received institutional support from the Ministry of Defence at all times. The result was highly satisfactory for all involved, particularly for the exhibitors who showcased their products to over 10,000 professional visitors and 48 official delegates from 32 countries.

Spain thus joins the reduced group of countries that regularly hold defence and security exhibitions. The aim was to give the exhibition a Mediterranean flair and a dash of Spanish culture, while also touching on key items of particular importance to Spanish society, such as advanced technology and employment.

The industrial sector of defence and security is going through a series of changes which, as in other industrial sectors, will soon accelerate as a result of corporate restructuring processes at both European and global level due to the speed of technological change, sustainability and the commercial activity the world will experience in the coming years.

The emergence of new threats and risk areas gives rise to the permanent need to adapt as quickly as possible, strengthening operational and industrial capabilities, taking into account the unstoppable process of digitalisation we are experiencing and the unavoidable undertakings we must assume in sustainable development, as a commitment to the future generations of our society.

This cannot be tackled in an isolated manner; it must be done through international agreements and cooperation programmes, in which Spain as a country must do its bit so that society can feel, and be, safer. As the Minister said during her opening speech, «It is not possible to conceive of defence outside the frameworks of the EU and NATO», in which «the role of the defence industry in the creation of employment and in investment in R&D is fundamental. That is the future».

On the other hand, it is impossible to envisage a national defence system that is credible and shows solidarity without a powerful industry that provides and sustains the equipment and systems needed by the Armed Forces for improved and more efficient accomplishment of their missions, thus ensuring peace, freedom and the well-being of our society.

Within the framework of a State policy, such as the defence and security policy, the Ministry of Defence is a crucial actor, fully undertaking to cooperate with other public, private, national

and international entities to make progress in achieving a safer society together. The FEINDEF conference and debate programme has been a good example of this.

Another aspect that should be highlighted is the Chief of Defence Staff's initiative to organise and invite his Latin American counterparts to a seminar on peace-keeping operations which was held at the same time as FEINDEF. The representatives from these countries were thus able to have a look at FEINDEF and learn, in a unique space, of the novelties presented by our companies, from the biggest and best known companies down to the SMEs, which constitute a particularly dynamic and innovative framework of this industrial sector which is a strategic actor of our Defence.



**Ángel Olivares
Ramírez**
State Secretary of
Defence

FEINDEF 2019 has also been a good example of how interaction with universities and research centres has brought about merging in «military» and «civilian» R&D+i developments, in a broad and dual sense. It is necessary to work closely with the civilian sector, encouraging innovation and the dual nature of technology for the benefit of the whole of society. This joint work makes better use of investments, adapting technological developments to multiple applications.

From the Ministry of Defence we wish to thank all those who have participated in any way in the exhibition, in particular the companies and delegations from countries that have visited us, who we invite to accompany us in the second edition, on which we have already started work. We are open to any improvements which, having experienced this first exhibition, you may wish to raise in order to cater for everyone. I wish to extend this gratitude to the General Headquarters of the Army, the Air Force and the Navy, who have made this Exhibition their own, achieving perfect harmony with the companies from the sector.

We want the second edition of FEINDEF, planned for May 2021, to be a leap forward in the internationalisation of companies and with regard to the presence of foreign delegations, making progress in dynamic exhibitions, with an express invitation to set up national exhibition halls and design an extensive programme of forums and conferences in which, as well as dual innovation as a key technological mechanism for the industry and the Armed Forces, matters of security and defence of interest to our society are dealt with.

Spain is a modern, dynamic and welcoming country which, thanks to its size, history and conviction, must be one of the main players called upon to lead a safer and fairer European society. With FEINDEF 2019 we have started to fill an inexplicable void. Our success is everyone's success.

The opening ceremony was followed by a conference by Army General Fernando Alejandro, Chief of Defence Staff (JEMAD), who stressed that FEINDEF «strengthens and promotes» the new Europe of security and defence, of which Spain aims to be «one of the drivers». «What we are experiencing is more of a technological revolution than an evolution», observed the Chief of Defence Staff, and added that the Armed Forces «understand the need for constant renewal». He also explained that the Defence Staff (EMAD) has just published two prospective studies, *Horizon 2040* and *Operating Environment 2035*, which attempt to «adapt what we do and what we have to the future».

On the first day a document entitled *Defence Industry Outlook* was presented; this document aims to be a tool that favours the development of the sector,

The Spanish industry showed its potential to join European consortiums

guides the Ministry of Industry, Commerce and Tourism with regard to the application of defence measures, and assists internationalisation, especially in the EU.

According to this publication, in 2017 our defence industry had a turnover of €6,188 million, 8.8 percent more than in 2016. Of this amount, 18.7 percent corresponded to direct sales to the Ministry (€1,155 million) and the remaining 81.3

percent to exports (€5,033 million). The 373 companies in the sector —9 percent micro, 39 percent small, 25 percent medium and 17 percent large— employ 22,641 people directly. By subsectors, aeronautics leads sales figures with €4,331 million (70 percent of the total), well above naval (€564 million, 9.1 percent) and land (€526 million, 8.5 percent). The other subsectors —electronics, auxiliary, armament, space, missiles, RPAS and simulation— together contribute 12.4 percent.

In the presentation of the document the General Director of Armament and Materiel, Admiral Santiago Ramón González, the General Secretary of Industry and of the SME, Raul Blanco, and the former Minister for Defence, Julián García Vargas, intervened. The State Secretary of Defence, Angel Olivares, who closed the event, recalled the

Military personnel: an asset for all companies

THE entry of military personnel into the civilian labour market was one of the pillars of the Ministry of Defence's outreach activities in IFEMA's Exhibition Hall 8. Taking advantage of the significant presence of companies connected to the industry, on 29 May a specific forum was scheduled on employment with a view to showcasing the human potential on offer to companies from such personnel. «The job market is very demanding but the Armed Forces have the best professionals on offer», assured the Deputy Secretary of Defence, Alejo de la Torre, in his opening speech of the forum. In this regard, he highlighted the Comprehensive Employment Guidance Plan designed by the Ministry.

The more relevant aspects of this plan were developed by the general director of Military Recruitment and Training, Amparo Valcarce. As she explained, the plan implicates all bodies involved in employment guidance processes, providing a comprehensive overview of the activities being implemented in this regard.

Among these activities, the general director highlighted the agreement signed with the State Public Employment Service (SEPE)

to provide troops and seafaring personnel with the professional knowledge and competencies to facilitate their entry into the civilian labour market. She also provided details of other activities in the area of training and in order to acquire qualifications and accreditations, as well as tutorials to evaluate military personnel, in particular those who leave active service at age 45.

Valcarce ended her speech encouraging all of the companies present to join the SAPROMIL 4.0 IT platform, a tool geared toward facilitating the company-candidate relationship through the management and monitoring of all job offers that may be disseminated among the military personnel registered on the platform.

A discussion panel was then opened, moderated by the former secretary-general of CCOO, José María Fidalgo. Juan Carlos

Aparicio, former minister for Employment and Social Affairs, representing Employers, took part, as did major-general José Rodríguez García, deputy Army Command; Juan Antonio Vázquez, from UGT; Pieterella De Jong, Human Resources director from Lockheed Martin, representing the companies; and Juan A. Sánchez Cordero, chairman of the State Association of Large Training Companies.



Deputy Secretary of Defence opens Employment Forum.

Iraki Gómez/ANDE

SPAIN FINALLY HAS ITS OWN EXHIBITION

WE had to wait for it, but at last Spain has its own Defence and Security Exhibition, the launch of which has surpassed even the most optimistic expectations, thanks to several factors in which, in one way or another, we are all involved.



José Conde de Arjona,
Brigadier General
Head of
FEINDEF Core
Institutional
Support

The associations, with the support of the Ministries of Defence and the Interior, knew how to plan properly and in record time and along the way managed to get eight ministerial departments on board, as well as the permanent representation of the European Commission in Madrid, the CEOE (Spanish Confederation of Employers' Organisations), an endless amount of national agencies, NATO, the UN and the European Union. On top of this there was a very attractive programme of forums, with top-level presenters, and the official stands of the Armed Forces, the Guardia Civil, National Police Force and others such the National Cryptologic Centre or the Centre for Industrial Technological Development (CDTI of the Ministry of Science, Innovation and Universities).

But it would have meant nothing if, on the day, the industries had not, as they did, done the rest, with surprising pavilions, if the collaborating ministries had not materialised their commitment with daily visits of high-ranking officials and, above all, if the public in general and the foreign delegations had not responded to the call as enthusiastically and on such a massive scale as they did.

A final thank you, in this case to the media who reported on this event, making society aware of the reality: Spain already has its own Exhibition of Defence and Security, of technology, of duality, of the future. We will see you at FEINDEF 2021.



The Military Emergencies Unit exhibited its new multi-purpose truck at FEINDEF, and INTA showcased the *Diana* air target.



«essential» modernisation projects of the Army, the Air Force and the Navy that have been set in motion in recent months and pointed out that «the companies and the two associations have faced a very challenging crisis situation and have emerged successfully from it, taking the step of organising this Exhibition».

FORUMS AND CONFERENCES

The new Europe of Defence held a preferential space in FEINDEF with a workshop led by the EDA. It was

opened by its director, Jorge Domecq, who stressed the importance of «promoting cross-border partnerships among European industry in order to develop and maintain the EU's defence capabilities and guarantee Europe's strategic autonomy».

The programme also included three forums devoted to current affairs and issues of interest: the Employment Forum, aimed at incorporating the military into the civilian labour market; the Women's Forum, which highlighted the value of the presence of women in

peace processes, institutions and industry in the sector; and the Innovation Forum —also known as Defence & Security Innovation Brokerage (DSiB)— which was conceived as an opportunity for universities and entrepreneurs to present their technological projects to companies, within the parameters of the European Defence Action Plan (EDAP).

A professional board of scholars evaluated the 20 projects submitted and chose the best three. The winner was *Command, Control, Communications*

and Computer for Wireless, from Universidad Politécnica de Madrid.

Likewise, the Exhibition offered round tables on aspects such as financing or dual-use technologies, and on more specific issues such as the European scenario derived from the EDAP. There were also conferences and workshops on new developments and technologies, data protection, the environment, market trends and forecasting the future needs of the Armed Forces.

Cybersecurity was the subject of debate in a round table opened by the director of the National Intelligence Centre (CNI), Félix Sanz Roldán, who assured that Spain's technology is prepared to reduce cyberattacks, but warned that «we cannot do it alone».

EXHIBITION AREA

At the Ministry of Defence stand, visitors were given information on the international missions of the Armed Forces, the

presence of women, R&D+i developments promoted by the Ministry of Defence, etc. The booths also served as a meeting point for military personnel and human resources managers of companies interested in the training and experience of professionals who are finishing their time with the Army, the Air Force and the Navy and seeking work in the civilian sector.

There was a space for the Ministry's publications and cultural heritage in

A POSITIVE OUTCOME



Jaime de Rábago
Chairman of
TEDAE

WHEN the lights went down on FEINDEF 2019, the outcome could not have been more positive for our industry and our companies, FEINDEF has got off to a strong start and, given the magnificent reception it received, we have no doubt that it will take its place among the big international defence and security events.

As the two organising associations (AESMIDE and TEDAE), we are very satisfied with the result obtained, due to both the quality of the technology and products showcased by the exhibiting companies and the number of visitors and the international presence. FEINDEF has managed to bring together the main actors of the national and European scene.

This result was achieved largely thanks to the decisive impetus from the Ministry of Defence, and also from the Ministry of the Interior and other Ministries that supported this initiative, which we consider contributes to making brand Spain a reality.

FEINDEF has also managed to strengthen the relationship between the industry and our Armed Forces and State Security Forces and Corps, of which we feel proud.

All of this confirms that Spain needed its own Exhibition to project our industrial capabilities and technological leadership on an international level. Now we need to get to work, starting today, on FEINDEF 2021, to consolidate it as an international benchmark event.



Picture of the VCZAP Castor with its pushing shovel, plough and anti-mine roller in the foreground.

The Army, the Air Force and the Navy exhibited their most innovative systems and equipment

order to disseminate their information tools, virtual library, databases and journals. Among the publications was the Spanish Defence Industry Catalogue 2019-20, which aims to support this sector. The catalogue has a clear international vocation and presents information about our capabilities, useful to any person or organisation that needs this information.

For their part, the Armed Forces and the State Security Forces and Bodies exhibited their latest equipment. The Army exhibitor focused on Force 2035, dividing the materials into three categories: those that have been provided, those included in the testing plan and those likely to provide a technological advantage. Visitors were able to see one of the new VERT reconnaissance vehicles and drones of different sizes and operational functions. This new horizon of the Army was explained with infographics to facilitate understanding.

The Navy showcased information about its missions, the navigation simulators developed by Navantia for the newest vessels —such as the *LHD Juan Carlos I*— and models of other units (the *S-80* submarine, the future *F-110* frigate, etc.).

The Air Force presented some of the capabilities provided by the industry, including the *Eurofighter* combat aircraft and the *A400M* transport aircraft, the *NH90* helicopter, the *Euromale* drone and the *Lanza* radar. At the stand, special attention was paid to the work of the Logistic Centre for Armament and Experimentation (*Centro Logístico de Armamento y Experimentación (CLAEX)*, a reference unit in R&D+i.

The Military Emergencies Unit (UME) exhibited, among other materials, its multi-purpose truck, which is the result of an R&D+i project of the UME supported by the industry. It is a single platform that can be configured, depending on needs, as a fire truck, snow plough or cargo vehicle.

In addition to the UME, two other main institutions involved in emergency management were present at the Exhibition: Civil Protection and 112, in this case from the Community of Madrid. The National Institute of Aerospace Technology (INTA) showcased the *Diana* high-speed air target (*UAV-Blanco Aéreo de Alta Velocidad*



Women at the heart of Defence

GENDER equality in the Armed Forces and in the Defence industry enjoyed a high profile at the Exhibition. Through a specific forum, stock was taken of the 30 years that have passed since the entry of the first women into military life, and the importance of equal work for men and women was stressed, both in the institutions and in all sectors related to security and defence, including technology and science.

The debates were opened by the former UN Secretary-General's Chef de cabinet, Susana Malcorra, who reflected on female leadership in peace processes. «Women», she said, «who up to now have been used as weapons of war, should be part of the solution and the way out of conflicts».

Next up was the Ministry of Defence's general director of Personnel, Adoración Mateos, who stressed the role of Spain as a country at the forefront of gender policies, highlighting the effort being made by the Ministry to train the expert personnel in this area who join the peace-keeping operations of various international organisations.

The general director outlined the initiatives implemented to facilitate equality and a work-life balance for military personnel without undermining the operability of the units. Among others, she highlighted the measures approved to attend in particular to those with young children and single-parent families, and to the extended families of the partners of military personnel. «In a world in constant flux, our Armed Forces have shown they can adapt to this changing reality, and have constantly sought a balance between tradition and renovation», concluded Adoración Mateos.

The forum was organised in three discussion panels, the first of which focused on matters concerning women, peace and security, the second of which addressed the harnessing of female talent in Defence and Security, and the third of which discussed the challenges and opportunities for women in the industry.

FEINDEF 2021 IS JUST AROUND THE CORNER



**Gerardo
Sánchez
Revenga**
Chairman of
AESMIDE

THE International Defence and Security Exhibition closed its first edition with a very positive result, far beyond all expectations. The success achieved has motivated the organisers even further to set their sights on the future and start work on the 2021 edition.

However, none of this would have been possible without the unconditional support of the Ministries of Defence and the Interior, together with the explicit support of an extensive representation from the Administration, to the associations TEDAE and AESMIDE, organisers of the Exhibition. Thanks to this joint effort it was possible to visualise an exhibition of varied and innovative materials and technologies and an attractive programme of forums and conferences that generated the presence of a large number of national and international authorities and delegations. This presence was further increased by a significant number of visitors, keeping the level of occupancy of the exhibition hall to a maximum at all times, to the satisfaction of the organisation and, above all, the industry.

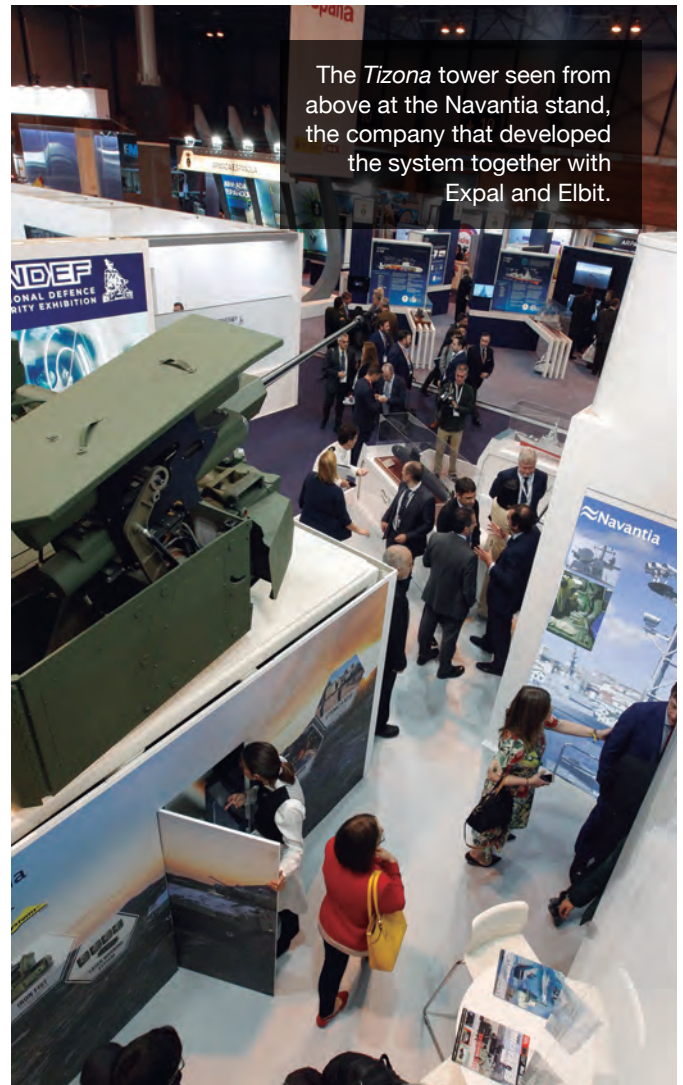
I should like to highlight the satisfaction experienced by our companies, which are dedicated to the quality of life and provision of services to the Armed Forces and Security Corps, all thanks to the success of this first International Defence and Security Exhibition in which they were able to exhibit their products.

I should like to emphasise the effort made by all the institutions and people that have contributed to this success, thanking them sincerely for their contribution and requesting their support for the organisation of the second FEINDEF which, given that the future is today, is already upon us.

'Diana') and provided information on its other drones. The Security Corps, such as the Guardia Civil and National Police, the National Cryptologic Centre (CCN) and the National Security Office (ONS), also participated with other stands.

The GOVSATCOM stand was the showcase to exhibit the Ministry of Defence's space capabilities, such as secure communications or developments

in the field of navigation or Earth observation and space surveillance. The SPAINSAT NG Programme was presented, comprising two satellites, which will provide coverage of a vast world area, facilitating the international deployments of the allied countries. Also present were Hisdesat's *Paz* satellite, which has been operational since 2018, and *Galileo*, Europe's global satellite navigation system.



The *Tizona* tower seen from above at the Navantia stand, the company that developed the system together with Expal and Elbit.

The national industry has the capacity to meet the demand of the Armed Forces

LATEST DEVELOPMENTS IN THE INDUSTRY

During the three days of the exhibition, Spanish companies from the sector took the opportunity to present some of their most innovative products and technologies, many of which are being evaluated by the Armed Forces. In the land sector, General Dynamics European Land Systems-Santa Bárbara Sistemas officially presented the

The military units are already evaluating a lot of the systems and equipment presented at IFEMA

first unit of the 36 Combat Engineer Vehicles (VCZAP) that were contracted for acquisition by the Army. This prototype, which will be tested between September and October by the *Guzmán el Bueno X* Brigade, offers the same improvements as phase II of the *Pizarro* armoured programme, the difference being that, due to its tasks, the VCZAP includes a plough, a pushing shovel, an anti-mine roller and a gap-signalling device at the rear. Named *Cawtor*, it offers greater interior space and maximum protection to its crew, as well as ample mobility, necessary to act as part of a *Pizarro* Infantry unit.

Eurovesa's High Tactical Mobility Vehicle (VAMTAC) *ST5* also showed its capabilities in FEINDEF, which are adapted to the needs of Explosives Deactivation Equipment. The Army has acquired three units of this type, the prototype of which has been tested by the Company of Deactivators of the Regiment of Pontoon Bridges and Engineering Specialties no. 12 (*Regimiento de Pontoneros y Especialidades de Ingenieros n° 12*).

For its part, Everis ADS also presented the *Alakran* light mortar carrier installed on VAMTAC, as well as its *Aunav* explosives deactivation robots. In addition, the Spanish company Technology & Security Developments (TSD) presented its development *Shelter* ISTAR (intelligence, surveillance, target acquisition and reconnaissance) mounted on a *Mercedes Zetro* truck, while Iveco presented its new *4x4 MUV* (Military Utility Vehicle), designed to perform various functions, configured as an ambulance, loading or personnel platform.

Escribano Mechanical & Engineering, platinum sponsor of FEINDEF, presented its *Guardian 2.0* remote control weapon system at this event. The tower has been developed to be installed on platforms such as the Army's *Dragon 8x8* Wheeled Combat Vehicle (VCR). Escribano's star product at the fair was the Advanced Combat and Observation System (SCOA), incorporating the

Guardian 2.0 and the OTEOS camera, which has a 360° field of vision and a laser rangefinder (LRF).

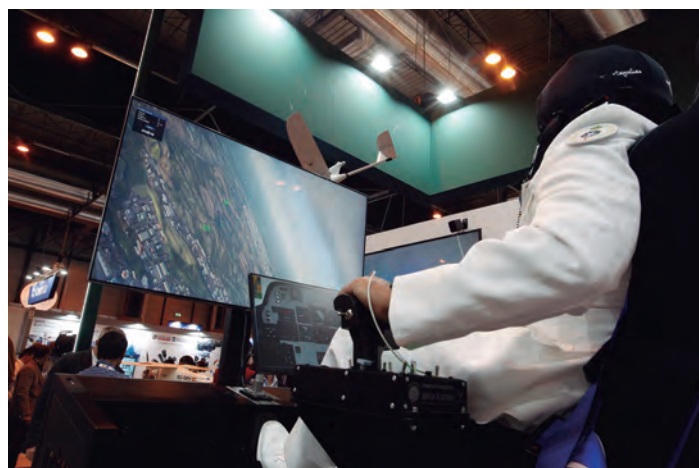
The company also displayed its 30 mm *Sentinel* naval remote control towers —already operational in the Peruvian Navy—, the 27 mm-calibre *Door Gun System* developed in collaboration with Airbus to be installed in the C-295 transport plane and the 12.7 mm *Sentinel* which, together with the OTEOS system, was mounted on board the *USV Victoria*, the first remotely manned surface maritime platform designed and built entirely in Spain by the national company Ferry. This semi-rigid boat, 12 metres long and powered by two 300 horsepower engines, can be manufactured in various sizes according to different configurations. The Navy has acquired 34 units for its frigates, including the future *F-110*, and its off-shore patrol (BAM) and amphibious vessels.

As in the case of Escribano, other companies have taken advantage of their presence at FEINDEF to offer the Army a weapon system with which to equip the future *Dragon 8x8*. The Navantia, Expal and Elbit consortium offers a level 2 ballistic protection tower, called *Tizona*, which can be operated remotely or not, equipped, among other elements, with a 30 mm calibre firing barrel and laser threat detection and active missile protection systems. Between September and October of this year, the Spanish Legion will test the *Tizona*, a weapon system already in service in the *Piranha V* vehicles. Other proposals to «equip» the *Dragon* are those offered by the company Rafael, the Trium-DRS consortium —formed by the Spanish companies Escribano and Indra and the



Above, the eight models of women's jackets by FECSA. Below, the combat backpack with back ergonomics for women by Yuma-Altos.





Above, the remotely manned air platform *Tarsis 75* by AERTEC. Below, in the picture on the left, the *Vuelo-Hipoxia Normobárica Controlada* flight simulator by Indra and, on the right, the model of the *Aermacchi M-345* trainer by Leonardo.

Italian company Leonardo— and the John Cockerill Company.

Thales is also working on the *Dragon & VCR* programme in collaboration with Indra for the development of a battlefield management system. In FEINDEF, Thales also presented its new combat radius defined by *Synaps* software. This project, already a reality in the armies of Belgium, the United States and the United Kingdom, makes it possible to maintain permanent, constant and secure communication during the deployment of a brigade between its different ranks, from its command post, through the different battalions, detachments, convoys and patrols in vehicles or on foot. The use of the *Synaps* radio, which would be installed in the future *Spanish & VCR*, is perfectly compatible with the command and control systems of the Army (SIMA-CET), the BMS LINCE of battle tanks at battalion level and the radio *Rpg4*. The system would be completed with the new

soldier *Squadnet* radio, also from Thales, the size of a smartphone or a tablet.

In relation to the Army's *Tiger HAD* helicopters, at IFEMA ITP Air announced the certification of its Albacete plant as the second of its subsidiaries in the world devoted to the maintenance, repair and overhaul of the Tiger's improved *MTR390* engine.

NAVAL SECTOR

In the field of technological solutions for the Navy presented at FEINDEF, it is worth highlighting the completion of the *AB-212* helicopter modernisation and life extension programme under-

taken by SENER and Babcock Spain, which will allow them to operate for another 15 years, thanks to their advances in equipment and avionics, not only in frigates, as up to now, but also in offshore patrol vessels.

From a helicopter, the *NH-90*, for example, the *Flash Dipping* immersion Sonar can be launched and operated deep in the sea for the detection and tracking of submarines, which is one of the offers presented by Thales to the Navy. This sensor can also be used from surface vessels such as the future *F-110*. The United States has already acquired 200 such systems for the Navy.

In the aerospace sector, Airbus exhibited two European projects at IFEMA in which the company participates —the future FACS combat aircraft system and the EUROMALE RPAS— and a genuinely Spanish one, the new Part Task Trainer of the *NH-90* Helicopters entirely built at its Albacete plant. The Army has already

*Spanish
companies cover
all defence and
security sectors*

The Dragon 8x8 VCR is one of the Army's programmes in which the industry has been most involved

acquired four simulators. Two of them are operational in Agoncillo, headquarters of the Manoeuvre III Helicopter Battalion.

Airbus also presented the maritime surveillance version of the C-295 as a possible alternative to the old CN-235. In order to save maintenance costs for this type of aircraft, the Air Force and Airbus signed a Research and Development agreement at IFEMA for the external inspection of their military aircraft through the use of drones equipped with high-definition cameras and sensors.

SECURITY AND TRAINING AREAS

The Air Force also needs to refurbish the basic training aircraft of its combat pilots. As an alternative to the old C-101s, the Italian company Leonardo presented the model of its *Aermacchi M-345 Jet Trainer* at the event. Another novelty of the first edition of FEINDEF was the presentation by Tecno-bit-Grupo Oesía of the new generation of *Visiónica* aeronautical displays, which will be installed in the F-18s, offering greater performance and information processing capability and control of critical mission instruments, such as holographic images, thereby reducing pilots' workload. *Visiónica* also has a land dimension through the *Comte* family, whose displays may be installed in the future 8x8, and a naval dimension, currently being developed, in order to implement a passive Infrared Search and Track (IRST) System.

Indra presented the *Vuelo-Hipoxia Normobárica Controlada (EV-NHC)* flight simulator, of great interest to visitors, which is already in service in the Medical Aerospace Training Centre (CIMA) of the Air Force. This trainer enables pilots to improve their resistance capacity in extreme situations.

In the space domain, Airbus also showcased its participation as a main contractor in the Spanish programmes of the Earth observation satellites *Paz* and *Ingenio* and the future *Spain NG I* and *II*, while Indra offered the Armed

Forces its S3T radar, considered to be one of the most powerful in the world in the field of space surveillance —detecting objects up to 1,000 kilometres high— and which is currently being tested at the Morón air base in Seville.

Leonardo presented its Unmanned Anti-Aircraft Systems technologies for the DGAM *Cóndor* programme to FEINDEF. Another proposal in this area was put forward by Indra with its *Anti RPAS Multisensor System* anti-drone shield, capable of operating

bit has offered the Armed Forces a Security Operations Centre, whose technicians and specialists will take part in exercises of EMAD's Cyber Defence Joint Command after the summer to recognise attack patterns, identifying weaknesses and analysing communications, networks and systems for defence against any threats and even anticipating such threats.

In the field of military equipment, among the products on show at the Exhibition were the new women's



The USV *Victoria* remote control naval platform by Ferry configured with the *Sentinel* 12.7 mm remote control tower and the OTEOS camera, both by Escribano.

autonomously and independently, or in an integrated manner, with defence anti-aircraft systems. Thales is also working on the *Cóndor* project. Its *Horus Captor* system covers all phases of the anti-drone mission: detection, identification, tracking and neutralisation. AERTEC showcased its two *Tarsis 25* and *75* remotely manned fixed-wing aircraft models and its innovations in drone guidance, navigation and control systems.

Several technological and service proposals were made at FEINDEF in connection with cybersecurity. Tecno-

jackets from FECSA and its storm suits made of recycled polyester; the combat backpack with back ergonomics for women and another with an incorporated airbag, especially designed for the mountain units as a protection measure against avalanches, both from Yuma-Altos; or the *Quad* night vision glasses with four 4G tubes from Nightvision Lasers Spain, conceived, above all, for the special operation units.

J.L. Expósito/ Santiago F. del Vado/
Víctor Hernández
Photos: Hélène Gicquel/ Pepe Díaz

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Spanish defence industry 2019-2020

Publication of the third official catalogue for the knowledge and promotion of the capabilities of Spanish companies in the international environment

TO coincide with the holding in Madrid of the first International Defence and Security Exhibition (FEINDEF), the Ministry of Defence has published the Spanish Defence Industry Catalogue 2019-2020.

The publication opens with a presentation by the State Secretary for Defence, Ángel Olivares (SEDEF). «In recent years», he said, «our industry has shown that it is capable of coming up with efficient and innovative solutions to meet the various and ever-changing challenges that we and our allies are facing in this globalised world».

Published every two years since 2016, the aim of this catalogue since its first edition has been «to provide a basic tool to disseminate and promote the capabilities of our defence industry on an international level», according to the General Director for Armament and Materiel (DIGAM), Admiral Santiago Ramón González.

In particular, one of the tasks of this General Directorate is the promotion of institutional support to the internationalisation of the Spanish defence industry by supporting its export endeavours.

The catalogue has become a calling card to showcase this commitment, as publications of this kind are not frequent in neighbouring countries.

Focusing on Europe, and more specifically on the various international programmes in force, the catalogue

provides European companies with the information necessary to find partners with which to carry out feasible industrial cooperation projects.

All the companies in this new directory meet at least three requirements as follows: registration in the DGAM's Companies Registry –a total of 528

companies are registered-; ownership of the product or service offered as a Spanish Company; and a minimum turnover in the defence sector.

OFFICIAL PUBLICATION

The publication of the catalogue is the result of close collaboration between the Deputy General Directorates of International Relations (REIN), Inspection, Regulation and Defence Industrial Strategy (INREID) and Publications, as well as with the companies in the sector, highly committed to the publication of this catalogue. It is, therefore, an official publication of the Ministry of Defence as it endorses the data provided by the companies and forms part of the Ministry's publishing programme.

The document includes, listed by sector/subsector, a data sheet for each company including general data, a brief description of its activity and a selection of its more representative products or capabilities for export. It also offers an alphabetical listing of the companies and a directory of Defence attachés and their contact details.

The 2019-2020 edition has been widely distributed amongst the various interested parties: the Ministries of Defence, Presidency, Relations with the Parliament and Equality, Interior, Foreign Affairs, European Union and Cooperation, Industry, Commerce and Tourism and Economy and Enterprise; the Defence Staff, the General Headquarters of the Army, Air Force and Navy; Spanish defence attachés and advisors; Foreign defence attachés; Global Spain; Associations such as TEDAE and AESMIDE and Fundación Círculo (Foundation for Defence and Security technologies), and the participating companies.

The catalogue has been published in Spanish and English, in both print and digital format, and may be freely read and downloaded at <https://publicaciones.defensa.gob.es/catalogue-spanish-defence-industry-2019-2026.html>.





First on the right, engineer Carlos González Pintado in Fresnedillas tracking station, in 1969.

THE GIANT LEAP for mankind

INTA's tracking station in Fresnedillas (Madrid) was the first to know, fifty years ago, that *Apollo 11* had landed on the Moon

HOUSTON, *Tranquillity* base here, the *Eagle* has landed». Neil Armstrong confirmed with these words, that man had landed on the Moon aboard *Apollo 11*. It was 9:18 PM of July 20th, 1969, 50 years ago now, and the first to hear them were the technicians working on the station established by NASA and INTA for manned flights in the Madrid town of Fresnedillas de la Oliva, dependent on Robledo de Chavela. The images of Armstrong descending the lunar module and

his famous sentence «this is one small step for man but a giant leap for mankind» would be received six hours later.

The message had taken 1.3 seconds to reach Fresnedillas, which is 0.3 seconds before Houston (Texas-USA) where the control centre was located. A 21 year old Spanish engineer, Carlos Gonzalez Pintado, was in charge of the receiving and transmitting equipment. He had started to work on the station a year earlier, as a result of the launching of the first manned flight. Those were times of great expectation «but we never feared it could

go wrong». They had full confidence in his preparation. «Between *Apollo* and *Apollo*, we modified the equipment to be more efficient and we ran many simulations to maintain a high operational level. This was absolutely essential because we were dealing with people's lives».

Due to the heavy workload, the team in Fresnedillas was not able to thoroughly enjoy the event. «The responsibility for maintaining the receiver in good working order, with a good frequency and with the least possible noise, as well as making sure that our transmitter

worked with the appropriate power made me forget about what was really happening on the Moon and which was the really exciting event».

Fresnedillas, along with the Tracking Stations in Goldstone (California-USA) and Honeysuckle Creek (Canberra-Australia), had become one of the key elements of the *Apollo* Program. This was a U.S. project fostered by President Kennedy in response to Soviet supremacy in space. In 1961, he said: «I believe that this Nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to earth», but he didn't get to see it. It was Richard Nixon who called Neil Armstrong, Edwin Aldrin and Michael Collins and told them: «Because of what you have done, the heavens have become a part of man's world». Everything was planned, even the speech that Nixon would deliver if the mission failed. «Fate has ordained that men who went to the Moon to explore in peace will stay on the moon to rest in peace. These brave men know that there is no hope for their recovery. But they also know that there is hope for mankind in their sacrifice...».

LANDING ON THE MOON

The spacecraft lifted off from Cape Canaveral on July 16th and reached the lunar orbit without any setbacks. However, when descending to the Moon, there were critical moments and, the technicians in Fresnedillas were able to hear what was happening 400,000 kilometres away. The first incident occurred when the *Columbia* command modules —where the astronauts made their trip— undocked from the *Eagle* Lunar module. González Pintado remembers that «the component that kept them together was not correctly depressurised and the result was almost like when you open a bottle of champagne. The lunar module was ejected further away than expected, which altered the landing site». When Collins verified that the *Eagle* was not damaged, his colleagues went on. He was the only one who did not step on the moon. He piloted the *Columbia* and remained there orbiting the Moon until Armstrong and Aldrin came back.



Astronaut Edwin Aldrin, walking on the moon after descending from the *Eagle*.
Below, lift-off of *Apollo 11* from Cape Canaveral.



Armstrong managed to land the Eagle on the lunar surface when there were only 17 seconds of fuel left

When they started the descent there was another setback: the signal that should have reached the Earth from the lunar module was lost. «In seconds we thought all sorts of things —explains González Pintado—. First, that the receiver wasn't working, but had those from the other stations failed as well and at the same time? This was not very likely to happen. There was probably a problem with the *Eagle's* automatic

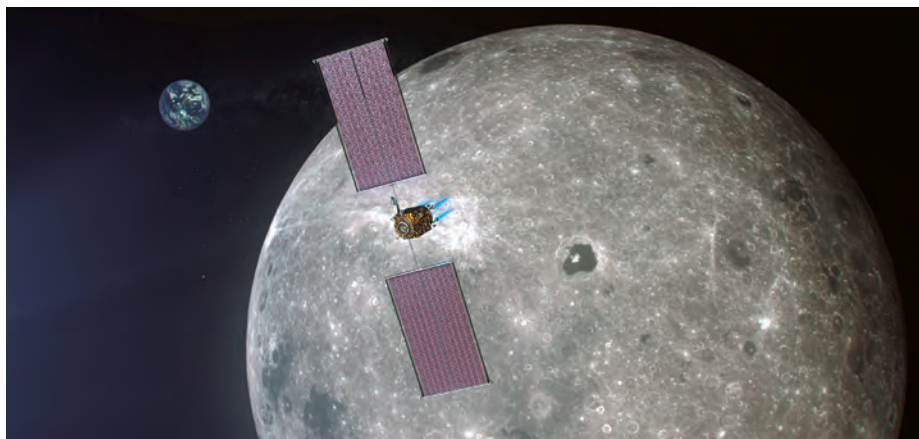
antenna». In fact this is what really happened, and Armstrong passed all communications to ambidirectional antennas to be able to speak with Houston through the *Columbia*.

The astronauts also realized that the lunar module was going much further than expected. Houston confirmed it and warned them that the area where they were going to land was not on the map. On top of that, in the last stage of

the descent to the Moon, the computer was signalling several alarms and Armstrong decided to take the controls and pilot manually. First, he found a very sloping area and decided to rule it out; later on, a surface with too many rocks that was not appropriate for the landing of the module. González Pintado remembers that «Armstrong was informed that he had 60 seconds of fuel left and, a little while later, that he only had 30 left». He then discovered a place he believed to be suitable and landed the spacecraft seven kilometres away from the area that was previously planned. He only had 17 seconds of fuel left. «It was the first trip to the Moon and they had to make it exciting», jokes the engineer.

There were still six hours to go before the astronauts descended from the lunar module. «They told them to sleep for a while and we all started to laugh because after two years of training, the journey and the landing, how could they possibly sleep? Well, they didn't let them». Houston told them to wait because they wanted to broadcast the descent on the lunar surface at a reasonable hour in all the U.S. territory.

When it was time, Armstrong took longer than expected to get out because the module's manufacturer had made the hatch a little smaller to reduce weight, however, he didn't realize that the astronauts survival backpack had remained unchanged. His very bulky suit also prevented him from seeing where the steps of the short ladder were and he jumped down. «When he finally set foot on the Moon, we all heard how he defined the experience: *magnificent desolation*,» points out González Pintado who planned to stay in Fresnedillas for only two years but says «that it was impossible. After a manned flight you feel a great sense of responsibility, and you consider the astronauts as part of your own family. I couldn't quit», he says. And after the *Apollo* program, came the *Skylab*, the *Apollo-Soyuz*, the space shuttle, the *Mariner*, *Vikings*, *Voyager*, *Galileo*... After 43 years of work,

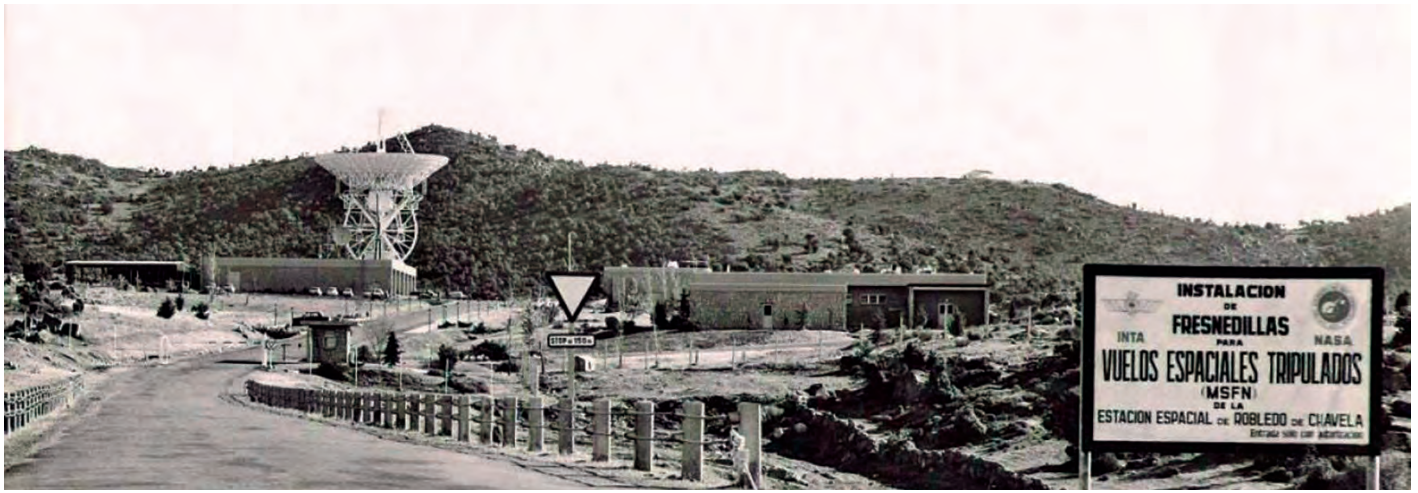


Return to the Moon

MAN could return to the Moon in the next decade. NASA has announced the construction of *Gateway* station, which will be located in orbit around the moon as a base for manned missions to the lunar surface and Mars. «We are going to go back to the Moon in a sustainable way and we are going to stay there», said Jim Bridenstine, NASA's administrator, who has stated that the project will be carried out «with commercial partners» unlike the *Apollo* program 50 years ago. One of the tasks of the *Gateway* will be to support the *Artemisa* program with which man will once again set foot on the moon before the end of 2014. Astronauts will first arrive at the station, and from there, aboard reusable spaceships, will land on the moon.

The *Gateway* is led by the U.S. Space Agency and is supported by the European

Space Agency (ESA) —which has committed itself to providing the service module for the new *Orion* spacecraft—; Russia; Japan and Canada, in charge of the robotic arm. The project was analysed in Paris Air Show. The forum was inaugurated by Pedro Duque, President of the ESA Council and interim Minister of Science, Innovation and Universities, who highlighted «Spain's increasing role in space research». Mr. Duque met with NASA's administrator to explore future lines of collaboration between Spain and the U.S., including possible contributions to *Gateway* and *Artemisa*. They also reviewed those cooperation programs that INTA, the Astrobiology Centre and the CDTI (Centre for the Development of Industrial Technology) have with NASA, which may result in missions to the Red Planet: *Mars Science Laboratory*, *Insight* and *Mars2020*.



Facilities in Fresnedillas de la Oliva, with its 26 metre diameter antenna, in the time of the lift-off of *Apollo 11*.

this Spanish engineer retired as Head of Operations and Deputy Director of the Space Communications Complex in Robledo de Chavela.

SPANISH STATIONS

When the United States decided to send a man to the Moon, NASA implemented a plan that included three projects: *Mercury*, to test human beings' resistance and adaptability to microgravity; *Gemini* as a training platform for the docking of two different aircraft in space; and *Apollo* that should take a human being to the moon and bring him or her back to Earth.

It was necessary to map the Moon and find the best spot for landing. Robotic spacecraft were launched to take pictures from the surface. Those were the *Ranger*, the *Lunar Orbiter* and the *Lunar Surveyor* projects. Launchings were made from Cape Canaveral, towards the east and with low elevation. That is why it was necessary to establish a tracking station on the east of Florida.

Maspalomas, on the south of Gran Canaria, was the chosen site. That is where Spain's participation in Project *Mercury* started in 1961 with a nine meter diameter antenna. Later on, and considering *Gemini's* requirements, the station was enlarged and was subsequently moved four kilometres away from its original site to keep it away from the interferences caused by tourism.

In 1964, NASA and Spain agreed to build a new antenna with a diameter of 26 metres in Robledo de Chavela, 65 km away from Madrid. It was

inaugurated with *Mariner 4* mission in July 1965, on time to receive the first images from Mars. There are currently four operational antennas in service for NASA projects. One dedicated to the educational PARTNeR (Academic Project with NASA's Radio Telescope in Robledo), managed by the Astrobiology Centre and with its coordination centre in Villafranca del Castillo and another one with a 26 meter diameter, which is deactivated.

That same year, 1965, NASA signed another agreement to build two new antennas, one in Cebreros (Ávila) —12 km away from Robledo— to complement Network resources for the Deep Space. The U.S. agency decided to deactivate it in 1981 and transferred it to INTA. It is now a Satellite Tracking Station of the European Space Agency's Deep Space. The other antenna was installed in Fresnedillas and started to work in 1967 participating in every *Apollo* manned flight, from the 7th to the 17th. Once this project concluded in 1972, it was trans-

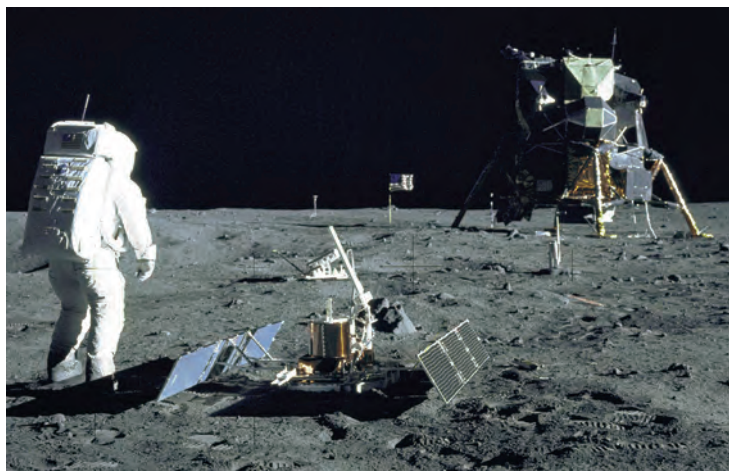
ferred to INTA and was integrated into the Satellite Tracking and Data Acquisition Network. In March 1985, the station was closed down and its premises and buildings were transferred to the Spanish government. INTA was in charge of them and, subsequently, they were assigned to the Ministry of Defence. It now houses de Moon Museum.

OTHER FLIGHTS

Apollo 11 is the best known mission, but man had set foot on the Moon five times before: *Apollo 12*, also in 1969; *Apollo 14* y *15*, in 1971; and *Apollo 16* and *17*, in 1972. *Apollo 13* did not manage to land on the moon. The famous sentence «Houston, we have a problem» or, more specifically, «We've had a problem here» was echoed by the members of the crew after an oxygen tank exploded and left them with only a 12 percent chance of returning to the Earth alive. But they succeeded.

Five decades later, some people raise doubts about man's landing on the Moon. «I would tell them exactly the same thing as to those who believe that the Earth is flat: Nothing», says González Pintado. «Besides, in a time where the relations between the United States and the USSR are at the height of the Cold War... If it were all a lie....don't you think that the Soviet Union would have already said so?». But its newspapers published the news of the event on the front page, which 50 years later, is still epic: The first walk of man on the lunar surface.

Elena Tarilonte
Photos: NASA



Aldrin walks towards the *Eagle* lunar module before returning to the Earth aboard the *Columbia* command module.

A necessary AND EFFICIENT ALLIANCE

In Toledo the seminar of the Association of European Journalists brings together politicians, military personnel and journalists to analyse the future of NATO



Acting Defence Minister, Margarita Robles, next to Miguel Ángel Aguilar (left) and Diego Carcedo.

NATO is turning 70 and it does so while immersed in a very complex situation. We live in a fast-paced world where change is overturning everything we thought was established — including the concept of threat — obliging us to redefine leadership, the values we wish to defend and the pillars we wish to stand on to do this. After two days of intense debate and exchanges of opinions, the main conclusion is that multilateralism —with NATO as its main expression in the field of security and defence, complemented by a strong Europe— is more necessary today than ever.

This was, essentially, the prevailing idea at the 31st edition of the International seminar on Security and Defence of the Association of European Journalists that took place in Toledo on 11 and 12 June, another being that the best way to respond to challenges such as illegal immigration, the economic crisis, the political see-sawing from the other side of the Atlantic, Russia's attitude, Brexit, or misinformation, is to stay united, to hold on to universal values and to foster defence as a binding force.

During the closing ceremony, acting Defence Minister, Margarita Robles, said: «We must bid for defence and security policies. Nothing works

without them: there is no democracy, no freedom, no economic security, no development and no R&D+i». In addition, and after insisting on the fact that «all international organisations are necessary in a geostrategic reality in which there are still many conflicts of many kinds», Robles reiterated that Spain is a «serious, rigorous and compliant» country, where both NATO and the EU are concerned.

Presented under the suggestive title of *NATO: the vertigo of the American withdrawal*, the meeting was the perfect occasion for policy makers, national and international Armed Forces, and reputable professionals from the media to listen, analyse and reflect together on the *raison d'être* of the Atlantic Alliance. In addition to the Minister for Defence, participants included the Secretary General for Defence Policy, Admiral Juan Francisco Martínez Nuñez; the General Director for Defence Policy, Elena Gómez Castro; the National Intelligence Centre Director, General Félix Sanz Roldán; the Chief of Staff of the Eurocorps, General Fernando García Blázquez; and the Deputy Director for Security Policy of Poland, Lucyna Golc-Kozak. Also present were journalists such as Diego Carcedo, Miguel Ángel Aguilar, Georgina Higuera and Lucía Abellán, as well as persons key to gaining an un-

derstanding of NATO's recent past and its essence, such as Javier Solana, former NATO Secretary-General 1995-1999; General Petr Pavel, Chairman of NATO's Military Committee 2015-2018; and Janusz Onyszkiewicz, Poland's Minister for Defence 1992-1993 and 1997-2000.

MULTILATERALISM

The debate took place in various sessions which included a reflection on what the accession to the Alliance by the countries from the Warsaw Pact has meant, both from an organic and functional viewpoint —this year marks two decades of the accession of the first three countries: Poland, Hungary and the Czech Republic— to a debate on the US leadership within the Alliance, the necessary cooperation between the EU and NATO and Spain's commitment to multilateralism. On this last idea, Admiral Martínez Nuñez said that, following the economic crisis and the resulting mistrust, particularistic messages have arisen «and have destroyed a great deal of the hope generated by multilateralism», but was categorical when saying that «there is no other alternative model capable of managing the complex security challenges that we face today». In this regard, he said that «the European Union partners in particular have to act as a beacon of



Ricardo Pérez / MDE

internationalisation and we are already taking the first steps».

He also recalled the transcendent role that NATO has played —and will continue to play— within the concept of multilateralism itself. «The Atlantic Alliance», he said, «is the best proof of the results that can be obtained through collective commitment: it facilitates a beneficial common effort and assimilates the leadership of a power such as the USA, although always taking into account the opinions of the other States». Reaffirming this idea, the Secretary General for Defence Policy explained that NATO «treasures a wonderful term: consensus, and as a result, not only does it achieve interoperability among its members, but this policy —which means respect for all— has been exported to many other international organisations. NATO breathes multilateralism».

As far as Spain was concerned, Elena Gómez Castro pointed out that «Spain has always been a committed partner, convinced that any of our ally's security is also our security. Furthermore, NATO is a bridge to keep contacts and share concerns with other associated countries with which we also share common interests. It builds trust with third countries, necessary in a world in which we all face risks and threats».

After an overview of the evolution of NATO over the past 70 years and how it has managed to adapt to the various challenges and threats that have arisen, the General Director for Defence Policy underlined its current role in the fight against terrorism and for stabilisation. «Only a military intervention can create a stable environment for the population and the distribution of humanitarian aid and also be capable of establishing an area to train local forces so that they can progressively assume this responsibility». She also recalled that NATO's role and limits are clearly established: «Our approach is always based on legality, bearing in mind added value and complementing the efforts of the international community. It is not about replacing, but playing a role that only the Armed Forces can play in extreme situations, such as terrorism in its current forms».

With regard to the debate prompted by the US Administration's de-

*The EU's bid for
defence strengthens
NATO, according
to experts*

mand that the allies spend 2 % of their GDP on defence, Elena Gómez explained that «a figure should never be a reference. NATO is based, and this is one of its greatest assets, on cohesion and solidarity. Each of us must have the appropriate Armed Forces and we must ensure that they have the necessary capabilities to be used whenever and wherever necessary. We are referring to what is called the three Cs (cash, capabilities and commitments): cash is required in order to have better capabilities and be committed to deploying them whenever and wherever necessary. If these elements are not interconnected, figures are useless». She reiterated that, although Spain does not meet this figure, «we are an absolutely exemplary ally when it comes to making all our resources available to NATO».

Another interesting debate that took place in Toledo was entitled *EU and NATO: doomed to understand each other*. The Eurocorps Chief of Staff assured that rather than a condemnation it was a «reward» because «as both organisations' strategies and threats are rather similar, they need to reach an understanding through effective and optimum cooperation that reduces everybody's defence bill». In this regard, he pointed out that the Eurocorps «has been a clear example that a purely European unit can lead both NATO and EU multinational units» and that this simultaneity «is beneficial and diminishes costs, but requires significant political will in order to promote, improve and optimise it».

Pursuing this idea further, Javier Solana suggested that one way of putting an end to the current vertigo in NATO «is to recognise that it comprises not only the Atlantic Nations but also European nations, and that claims that the EU can weaken NATO are nonsense».

What is certainly the case is that duplicity is huge in Europe. We must do everything in our hand to increase the integration of European security, because it is in everybody's interest. Europe must stand united and strong where defence is concerned. Doubting this is taking ideology, and not reality, into account».

R. R.

[culture]

«Probably, TO ETERNITY»

The Naval Museum of San Fernando remembers the ill-fated *San Telmo* in an exhibition opened until August 31st

Model of the
San Telmo ship.





Map of the area where the ship disappeared and a British work that already mentions her uncertain fate (1825), remains of the footwear found in the Antarctic and tribute to their 644 men, on the glass there is water from the frozen continent.



SIX hundred exhibits, including documents, pictures, photographs... and archaeological remains are the heart of the exhibition *In memory of the San Telmo: the ship that disappeared in the ice (1819-2019)*.

Organized by the Naval Museum of San Fernando (Cadiz), the exhibition is opened to the public until August 31st at the institution's temporary exhibition hall, and 2,500 people have already visited it from its inauguration in April to last June 21st.

Its main goal is to «remember the trip of the first ship that might have reached the Antarctic with a crew of 644 men, who also disappeared, and

who are, therefore, possible pioneers of setting foot on the frozen continent.

The *San Telmo* was the flagship of the so-called South Sea Division, consisting of 4 ships and bound for Callao (Peru) to reinforce the troops stationed there. They were sent there to try to counter the first attempts of insurrection of Spanish America, which resulted in the first emancipations.

TWO CENTURIES LATER

The curator of the exhibition, Alicia Vallina, also Technical Director of the institution and with a Ph. D. in History, explained last June to the reporters of the *Revista Española de Defensa* (*Spanish Defense Magazine*) as soon as we ente-

red the museum, in front of reception that «To rescue this story from oblivion, we thought that the bicentenary of the ship's departure from Cadiz —on May 11th, 1819— was a great opportunity».

AN UNFINISHED CHRONICLE

«And, since it is still an incomplete story —she continued— we would also like the exhibition to raise awareness and encourage new investigations to shed light on the uncertain fate of the *San Telmo* ship».

The curator also outlined the three areas addressed by the exposition: historical background of the endeavour, the voyage and tribute. Each area has its own colour: red, in the introduction,



Wedge to raise an artillery gun, wood with a fastening with copper nails, barrel lid, remains of footwear and other vestiges found in the expedition in the 1990s in search of the *San Telmo* and that could have belonged to the ship.

refers to the turbulent years; white, of the Antarctic, describes the journey and its possible final destination; and black, which opens a parenthesis —the tragedy and tribute— between the disappearance of the ship in the 19th century and the news about her afterwards.

This exhibition «began to take shape last year when, around this date, we inaugurated the exhibition about Guinea», said Vallina.

TIMES OF TURMOIL

The white letters in the title and its corresponding explanation stand out on the red of the historical framework. Next to them, are the portraits of King Ferdinando VII and his wife Isabel de Braganza, which stand out and are present there as if they were the hosts of this encounter with the *San Telmo*.

Moreover, this area is a kind of platform a few centimetres higher than the rest of the hall, just as if it were a stage or where one would find the royal thrones of a palace. Both pictures belong to the National Museum of Romanticism (Madrid), one of the institutions participating in this exhibition.

There are other collaborating institutions as the Naval Museum of Madrid; *Álvaro de Bazán* General Navy Archives (El Viso del Marqués, Ciudad Real) and the University of Saragossa. The exhibition has also benefited from the particular contribution of Marine Colonel Miguel Aragón, who gave a lecture last May.

The portraits take spectators back to the years of turmoil following the War of Independence with France (1808-1814), the return of King Ferdinando VII and the restoration of absolutism, the King's rejection of the Cadiz Cortes, the first independent aspirations of Hispanic America...

This introduction also recalls the war material Spain bought from Imperial Russia once the war with Napoleon was over. In just a few decades, the Army and the Navy had lived the disaster of Trafalgar, an invasion, a war...

They were in a complicated situation and decided to buy Russian material, like the gun belonging to the museum, decorated with the imperial two-headed eagle displayed in this area of the exhibition, but not on the platform with the sovereigns.

The artillery gun also introduces us into the area dedicated to the journey of the *San Telmo*, for one of the four ships of the South Sea Division, the *Alejandro I*, was another of those purchases.

The model of the missing ship is the centerpiece of the first stages of the expedition, which —as Alicia Vallina pointed out— «had problems from the beginning».

Among other difficulties, they couldn't find a commander. Several people refused to lead the expedition, probably because of the poor state of the ships available. In addition, once in Callao, he would have to relieve the commander in the port of the Peruvian capital, Brigadier Antonio Vacaro.

Finally, the person chosen was Brigadier Rosendo Porlier, born in Lima. But not even he was sure, although he accepted the position. When he was bidding farewell to Commander Francisco Espelius, he said: «Goodbye Francisco, probably to eternity».

In this area of the exhibition, there are documents about the South Sea Division, the *San Telmo* blueprints, —a warship with 74 guns, built in Ferrol in 1788—, a picture of the patron saint

The archaeological remains found in the Antarctic are displayed for the first time

of seamen, and we may read the names of other people taking part in the expedition, like the second in command, Joaquín de Toledo, from Tarifa, Cadiz.

This is also the place to recall the other ships of the fleet, war frigate *Prueba* and merchant frigate *Primorosa Mariana*, transporting the troops. They both completed their journey and announced rough sea in Cape Horn and informed about their last contact with the *San Telmo*.

They reached Callao at the beginning of October, with a seven day difference. The transport ship was the last to reach port and also the last to have contact with the flagship. Vallina reminds us that «the *Primorosa Mariana* informed of having seen the *San Telmo* for the last time on September 2nd in position 62 ° latitude south and 70 degrees west longitude, and that she was seriously damaged, with rudder failure and faults in the cutwater and main yard.

The fourth ship of the expedition, the *Alejandro I*, didn't complete the trip either. She first had to delay her departure because she had problems with her main capstan and, later on, returned from Ecuador.

According to the curator, the large amount of sailors aboard the *San Telmo*, above the average of that kind of ships in those days, might be due to the fact that the *Alejandro's* crew was transferred to our protagonist ship.

THE FACE OF TRAGEDY

Vallina also highlighted the presence of Polier's portrait in the exhibition. First, because it is the «only face of the tragedy that has survived to this day» and also because this picture has now become another exhibit of the Naval Museum of San Fernando.



At the back, the space dedicated to the tribute. Appearing in the foreground, narratives about the journey, among others, the book by Antonio San Martín (Madrid, 1883).



«The Marquis of Bajamar, a descendant of the Captain, lent it to us for the exposition and in the end decided to donate it».

Among several documents, other exhibits of the journey and those relating to the possible end of the ship, there is an open circle of black walls, like a tomb, devoted to tribute those that disappeared in the *San Telmo*.

Unlike the usual practice in those days of giving missing sailors up for dead after a year without any news, they had to wait for almost three years. The

ship was officially deregistered and the crew officially declared dead on May 6th, 1922, after the widows of the officers demanded to receive their pensions.

We can read some of these letters in this exhibition, as for instance the one written by María Rita Michalena, wife of Lieutenant Francisco Javier Chacón.

However, the main exhibits in this area, are the archaeological remains found in the Antarctic in 1993 and 1995 —RED num 70— by the expedition led by Professor Manuel Martín-Bueno of the University of Saragossa.

The San Telmo led the South Sea division bound for Lima

Vallina pointed out that «they are samples of wood and footwear that might have belonged to the *San Telmo* given the references of where the ship disappeared and that do not seem to be related to seal hunters».

«It is the first time they are displayed» and, therefore, a unique opportunity to see them. Neither will it be easy to see the following exhibits together. Again, surrounded by the white of the Antarctic and that refers to the Spaniard's possible arrival in the frozen continent.

REFERENCES TO THE JOURNEY

The first exhibits refer to the years in which the *San Telmo* disappeared and to the British who named one of the capes of Livingston Island after this ship. A new acquisition of the museum is also displayed in this exhibition: the book by Antonio San Martín (1883), which includes the story of the *Journey to eternity* about the *San Telmo*.

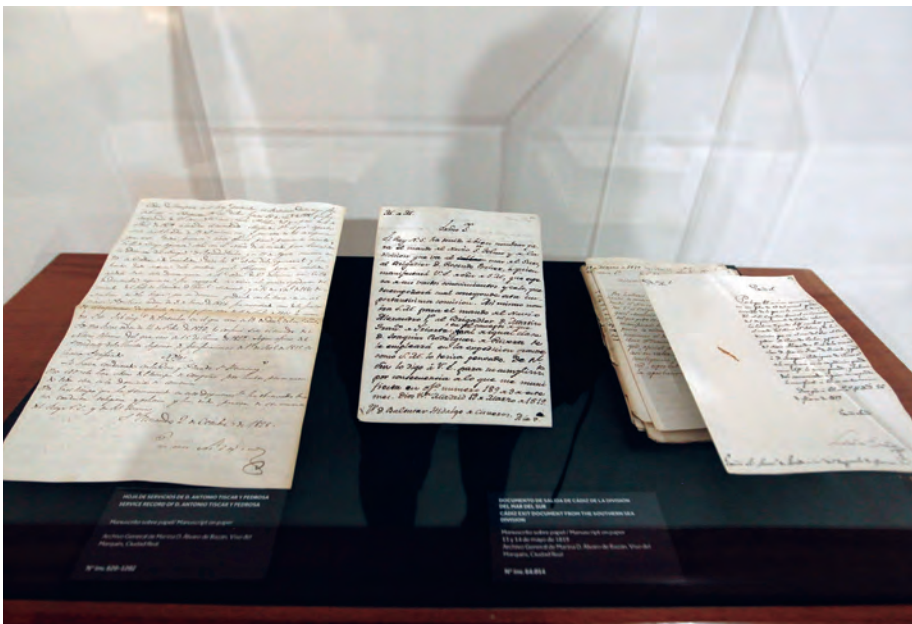
An audio-visual presentation and a glass case with snapshots of expeditions in the 1990s are the last important stops of the visit. They have been organized by the University of Saragossa, with the support of the CSIC (Higher Council for Scientific Research) and the participation of a group of Spanish-Chilean archaeologists and Navy seamen, among other, the above-mentioned M. Aragón, who searched evidence of the disappearance of the ship.

They found the remains displayed and they catalogued «several underwater magnetic anomalies, which could be guns and anchors still to be recovered from the bottom of the sea», explains the technical director of the museum. She also points out that «the *San Telmo* might have reached the coast of the Antarctic, but like in other stories, the mystery continues».

Esther P. Martínez
Photos: Hélène Gicquel



Anonymous portrait (1800) of Rosendo Polier, head of the expedition and commander of the *San Telmo*, donated to the Naval Museum of San Fernando by a descendent of the seaman.



Antonio Tiscar y Pedrosa's service record, commander of the *Alejandro I* (left) and documents about the departure of the South Sea Division from Cadiz.

LOS MARES RELATADOS. COMO SE CUENTAN LAS COSAS DE LA MAR

Beatriz Sanz Alonso y Eduardo Bernal González-Villegas

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