

explore

Exail magazine

October 2022 | Naval defense special issue

U212CD SUBMARINES

Delivering critical
navigation capabilities

MINE COUNTER- MEASURES

Next-generation
stand-off system

POLISH NAVAL ACADEMY

Successful subsea asset
tracking

UNMANNED VEHICLES

Demonstrating
collaborative capabilities
for seabed warfare





FABIEN NAPOLITANO & DOMINIQUE GIANNONI

Exail CEOs

Euronaval 2022 marks a turning point in our history as iXblue and ECA Group join forces and embark on a new journey to become Exail, an industrial high-tech champion that delivers components, sensors, vehicles and integrated systems.

Combining our complementary technological expertise and geographical footprint, with a strong legacy of innovation, Exail will continue to empower nations worldwide with critical capabilities to help them face rising challenges.

Exail provides a unique naval offer ranging from components and products to complex systems. Whether it is to safeguard nations' sovereignty, explore the deep sea, or respond to environmental challenges, we aim to expand your naval capabilities with our cutting-edge technologies. Through unmatched performance, safety and reliability, our comprehensive portfolio will provide you with increased value while our global team will support you as you face the most complex challenges.

As European leaders in naval navigation systems and solutions, we deliver resilient navigation, helping protect surface vessels against spoofing and jamming threats, and powering unrivaled autonomous navigation for submarines and subsea drones.

Our wide range of surface ships and submarines' equipment, ranging from magnetic signature management solutions and steering & diving consoles to energy converters and variable speed drives, further increase operational safety by improving naval platforms' discretion and energy efficiency.

Leaders in the field of maritime autonomy, we are able to push the boundaries of traditional mine warfare by offering a unique approach with our vertically integrated stand-off MCM system. Deploying drones on the minefield, our Mine Countermeasures solution increases the operational effectiveness and speed, while keeping crews and ships out of harm's way.

Finally, we leverage our advanced expertise in autonomous surface and subsea platforms as well as maritime sensors such as subsea acoustic positioning systems and solutions for subsea imagery, to offer a complete ecosystem of data-acquisition solutions, contributing to an effective understanding of the maritime domain.

Our world is facing unprecedented challenges with sovereignties being challenged, and with growing social expectations and concerns about the environment. The naval domain is at the heart of these challenges. At Exail, we are convinced that disruptive technologies brought by innovation will help tackling these issues. Together with our dedicated team of 1,500 people, we see great development opportunities on which we are eager to partner with you.

Whatever your operational challenge or environment, Exail will be by your side every step of the way, expanding your capabilities.

We look forward to meeting you!

**COMBINING OUR
COMPLEMENTARY
TECHNOLOGICAL EXPERTISE
AND GEOGRAPHICAL FOOTPRINT,
WITH A STRONG LEGACY OF
INNOVATION, EXAIL WILL
CONTINUE TO EMPOWER
NATIONS WORLDWIDE WITH
CRITICAL CAPABILITIES TO
HELP THEM FACE RISING
CHALLENGES.**



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POWERING
RESILIENT NAVIGATION
TO SAFEGUARD NAVAL OPERATIONS

The contemporary naval operating environment represents an increasingly complex arena for nations seeking to successfully conduct and complete critical missions at sea. One of the greatest obstacles facing navies worldwide is the ability to operate in contested environments where naval platforms can find themselves suffering from significant disruptions to space-based connectivity including Global Navigation Satellite System (GNSS) technology. GNSS is indeed vulnerable to attacks by adversaries capable of implementing innovative tactics to disrupt, jam or spoof satellite signals, resulting in critical risks for the safety of naval operations.

When operating within these types of demanding environments, it is critical for surface ships, as well as subsea platforms such as submarines and drones, to retain the ability to accurately calculate their positions anywhere and anytime in order to aid navigation but also optimize situation awareness, precision fires and many more combat applications.

In these contested operating environments, Inertial Navigation System (INS) technology represents a critical component for naval forces. In the sub-surface environment, INS will be relied upon to confirm the position and heading of strategic submarines operating underwater for extended periods of time. On the surface, INS will be integrated into wider system of systems approaches to, for instance, provide commanders with redundant position and navigation information to support rapidly changing operational situations.

European leader in naval navigation systems, Exail provides resilient and safe navigation to over 80 navies worldwide. The company's critical navigation sensors and solutions include ITAR-free inertial navigation systems (INS & AHRS), Navigation Data Distribution & Computation Systems (NDDCS), as well as navigation software (WECDIS). They are all designed to address naval platforms' requirements, from smaller coastal and support vessels to aircraft carriers, including main surface combatants, subsea drones and submarines.

› Ensuring resilient navigation within GNSS-denied environments

Exail is recognized throughout the world for its pioneering work on Fiber-Optic Gyroscopes (FOG) that have revolutionized navigation over the past 30 years. Providing highly accurate heading, roll, pitch, speed, and position information in all environments, Exail's Attitude and Heading Reference Systems (AHRS) and Inertial Navigation Systems (INS), already power resilient navigation to over 1,000 naval platforms.

Delivering unlimited autonomous navigation within GNSS-denied environments, Exail's FOG-based AHRS and INS are exempt of all physical drawbacks that may affect other existing technologies and ensure that resilient navigation information is provided at all times. Solely relying on light motion, FOGs are indeed solid-state passive systems that do not involve any movement of mechanical parts that might cause dithers, vibrations, and frictions and that might result in parts' weariness and noise.



› Swedish navies
SB90

Highly performant, robust and stealthy, Exail's navigation systems are able to withstand the most demanding environments of naval warfare, while providing unrivaled reliability and accuracy. Able to limit surface and subsea platforms' drift to 1 nautical mile in 360 hours, whatever the Milspec-defined environmental conditions encountered (shock, vibration, temperature, magnetic field...), they are highly scalable systems. The performance of FOG-based systems can indeed be changed by altering the length and diameter of their coils, making them adaptable to a wide range of performance needs, meeting the requirements of all kinds of naval platforms.

Because Exail has complete mastery over all the components that are integrated into its systems, from its own optical fiber and components to its accelerometers and algorithms, the company can further push the limits of the FOG technology to have it reach unmatched peaks of performance, powering unlimited autonomous navigation for critical long-endurance surface and subsea missions.

Exail equips the Queen Elizabeth-class aircraft carrier

Delivering resilient navigation information through cybersecured multi-sensor data fusion

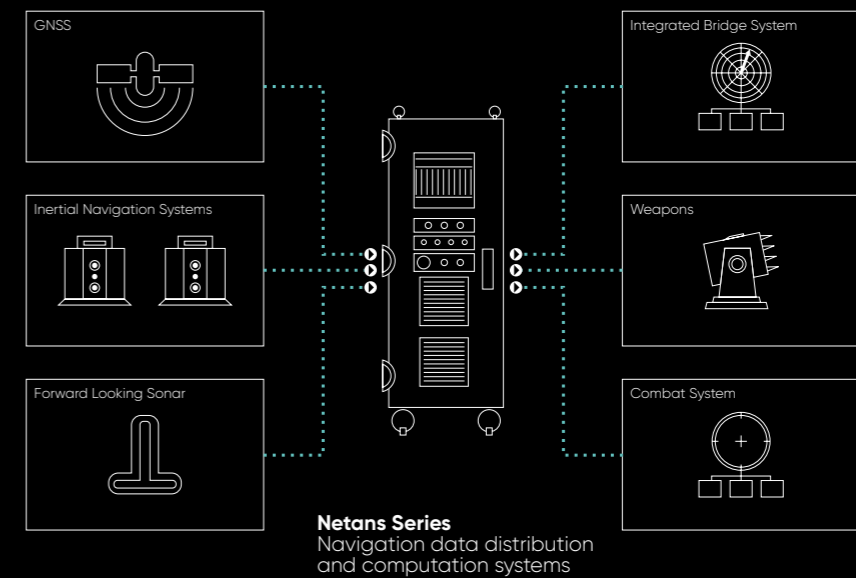
Once all the navigation and positioning data has been collected by the various sensors, including the AHRS and INS, it is then acquired, analyzed, correlated and distributed to all onboard systems by Exail's Netans Navigation Data Distribution & Computation Systems (NDDCS), that directly interfaces with the ship's combat system and platform management.

Contributing to the vessel operational capabilities, the Netans Series is a real-time system that distributes and processes almost instantaneously the very diverse and highly complex data provided by all navigation sensors. The system will first check the validity of the data provided by the sensors by ensuring

that it is coherent with the previously received values. It will then ensure that the data received from one sensor is plausible by checking its coherency compared to the data received from other sensors. The integrity of the data is finally checked by the system that makes sure that there is no alteration during the data transmission. Besides data distribution, the Netans Series delivers the most complete real-time and cybersecured merged and consolidated navigation information available, ensuring resilient and safe navigation at all times.

Exail's navigation technology not only provides an immediate solution which can be retrofitted on legacy combat platforms operating across the naval warfare domain today. It also provides a future-proof capability which stands ready to be integrated on board the next-generation of combat platforms. The company's navigation technology was incidentally recently selected to equip cutting-edge naval programs such as France future FDI frigates, Norway and Germany newly built U212CD submarines, as well as Spain future F110-class multi-mission frigates. ■

Cybersecured multi-sensor navigation solution





WORLD'S FIRST
NEXT GENERATION **STAND-OFF MMCM**
CAPABILITY

While 80% of the world's trade is carried out by sea, roughly 80% of World War I & World War II naval mines have yet to be neutralised or removed. Naval mines are very easy and cheap to build, making them widely accessible. Yet their potential impact on a nation's security and economy is considerable, especially if they are laid in ports, at choke points. Naval mines can potentially paralyze a nation or even an entire global region for some time.

The current geo-political situation highlights the ever-increasing threat of sea mines, which can be used to seriously compromise a country's shipping, its power and communications lines, as well as its naval and civilian maritime activity.

➤ **Unique stand-off approach - reducing risk and optimizing crew and ship safety**

Exail is playing an important role in pushing forward the boundaries of traditional warfare by offering a unique stand-off approach, enabling navies to safeguard crews and ships by keeping them away from the minefield. At the same time, these unrivaled Maritime Mine Countermeasures (MMCM) solutions increase the effectiveness and speed of mine warfare operations through the parallelization of missions - the possibility to launch and manage multiple drones in parallel to cover several areas simultaneously, with significant savings of time and resources.

Leveraging 80 years of expertise in the field of naval drones, Exail delivers a customized toolbox, UMIS™, comprised of aerial, surface and underwater autonomous and remotely-operated vehicles. The drones can host a wide range of payloads, according to the navies' real-time mission needs.

➤ **Detect - classify - identify - neutralize**

UMIS™ the Unmanned MCM Integrated System is an innovative and complete robotic system dedicated to MMCM, comprised of Exail naval drones (USVs, AUVs, ROVs,) and towed sonars. Operations are conducted thanks to a single interface, using an advanced Command & Control System as well as a dedicated software suite, UMISOFT™.

Carrying, deploying and recovering autonomous underwater vehicles by surface drones significantly increases navies' range and speed of action, which is otherwise limited by their on-board energy.

Sea proven robust, stable and capable of operating in a challenging environment, Exail's USV Inspector 125 is at heart of the UMIS™ system. Inspector 125 enables the transportation, launch & recovery of AUVs and ROVs as well as the deployment of towed sonars and towing sweep systems - formerly reserved for larger crewed vessels.

➤ **Advanced, intuitive mission management**

UMISOFT™ is a fully integrated software system for the management of MMCM missions, developed by Exail. As the group owns the intellectual property rights to UMISOFT™, it is not dependent on a third-party developer. This reassures our customers that their sovereign control will not be compromised.

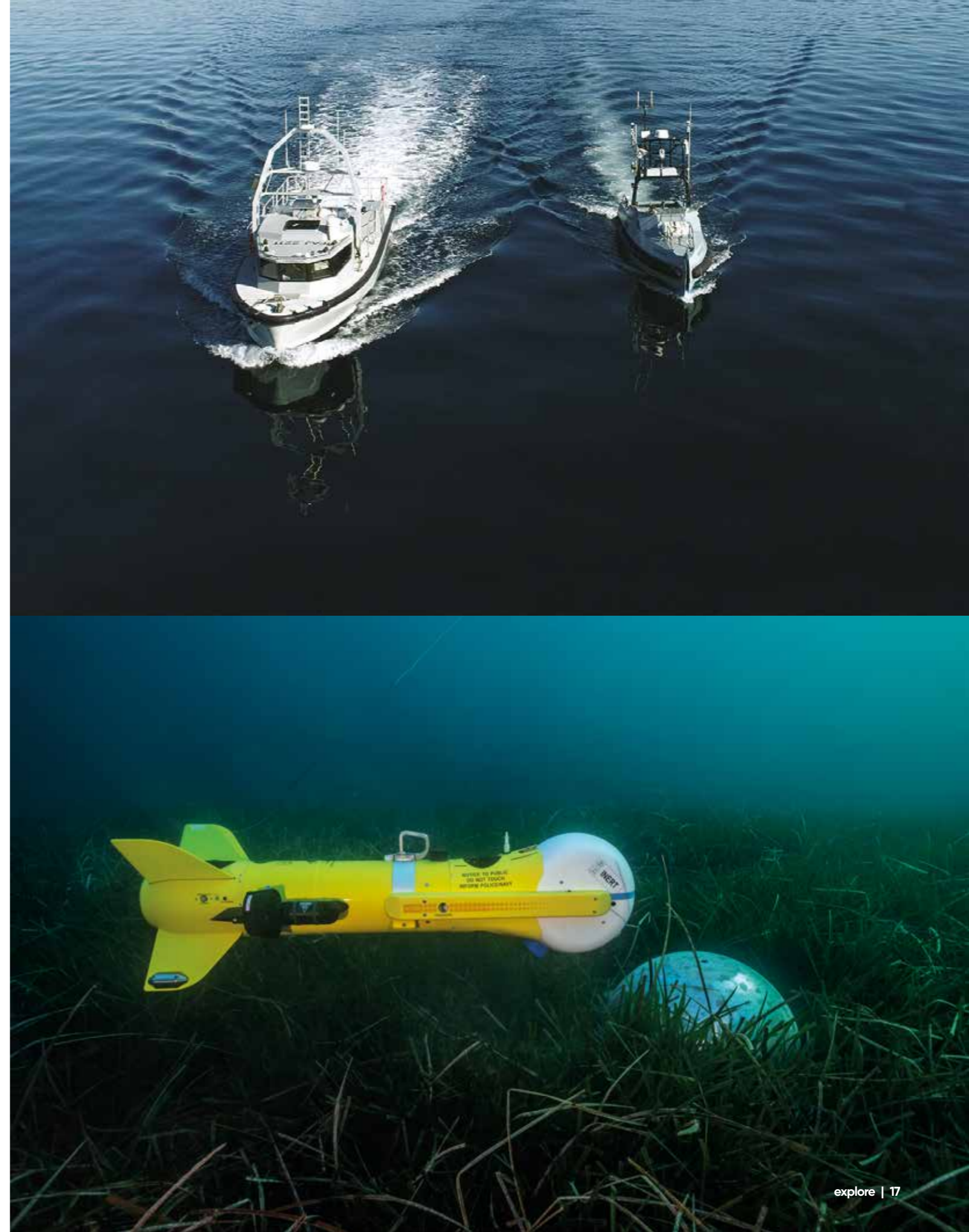
UMISOFT™, and its functionality, is derived from Exail's 20 years of experience in the development of control and management systems for autonomous naval vehicles. The result is a system that is more than just fit for purpose - it incorporates 2 decades of knowledge, lessons learned and expertise from frontline naval operators. This fully integrated system manages the entire mission including preparation, planning and supervision, drone control, data acquisition, data processing, mission management and post-mission analysis and reporting, for all MMCM drones. It provides a unique and consistent interface which greatly improves the operators' efficiency and training.

➤ **Sea-proven, customer-driven innovation**

In 2019, the Belgian and Royal Netherlands Navies signed a contract with Belgian Naval & Robotics, the consortium comprised of Naval Group and Exail, to acquire a total of 12 minehunter ships and a toolbox composed of around 100 drones. This solution is the first third-generation MMCM system and the only fully integrated MMCM toolbox of similar complexity designed and optimized to be deployed and operated from a mothership remaining outside the minefield. Of course, UMIS™ can also be deployed directly from the shore in a containerized version.

➤ Inspector 90 & 125 multipurpose unmanned surface vehicles

➤ K-STER is the first fully automated underwater robot demining system



➤ **Modernization program for Latvian Navy**

Exail's MMCM solution UMIS™ can be installed not only on newly commissioned ships but also on existing vessels. The group won a contract with the Latvian Naval Forces to modernize the mine hunting systems of their three mine countermeasure vessels. This modernization program gives the navy state-of-the-art MMCM performance, greater operational efficiency and reduced human and material risk, without the cost of acquiring brand new vessels.



➤ **Interoperable & third-party friendly**

Exail's maritime mine countermeasure toolbox is based on an open architecture, meaning it can integrate third-party products and systems, ensuring the customer has the optimum choice of tools from various suppliers and can also integrate the drones it may already have in service.

Using our UMISOFT™ software, Exail became the first company to integrate a UAV (unmanned aerial vehicle), the SKELDAR V-200, into an MMCM stand-off system.

➤ **Robust and operationally ready-to-go**

Exail's MMCM solutions are rigorously tried and tested, to ensure they are seaworthy and effective even in the harshest environments. These sea proven solutions are already trusted by several navies around the world.

➤ **Adaptable – deployable from ships and from the shore**

Exail's remote MMCM solution is unique in that it can be installed and operated from shore, onboard a specialist naval vessel and on a ship of opportunity, giving the navy increased flexibility and reducing costs by utilising existing resources. A containerised version, UMIS™ in the Box, can be deployed from ships or directly from the shore. Comprising a dedicated Command & Control container as well as containers for the robots, UMIS™ in the Box is designed for easy storage and transportation, and fast deployment.

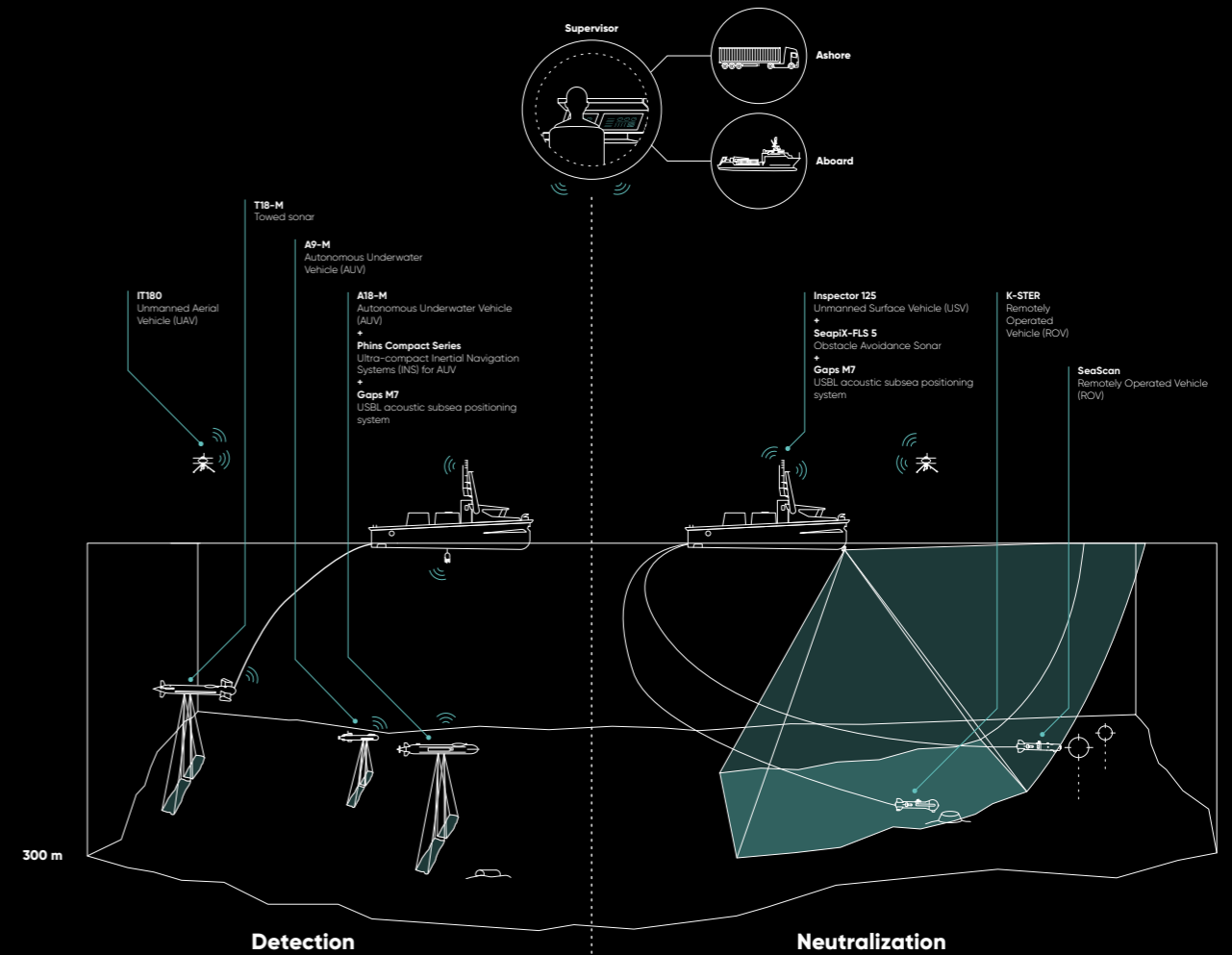
➤ **Scalable and evolutive**


Depending on the navy's requirements, Exail can provide a light, standalone solution up to a complete, fully integrated system. As the navy's requirements evolve over time, it can add capabilities to ensure that the equipment is best adapted to their needs at the time, and that it always benefits from the latest advances.

➤ **Support and training**

Integral to Exail's MMCM solution, alongside the equipment and software, are the associated support and training. These essential and fundamental elements ensure optimum efficiency, crew safety and continuous operability, whilst enabling navies to fully capitalize on the solutions they have acquired. ■

UMIS™ Integrated Stand-off MCM System





The background image shows a man with a beard and glasses, wearing a dark jacket, pointing at a computer monitor in a control room. The room is filled with multiple monitors displaying various data, including maps and charts. The lighting is dim, with a blue tint from the screens.

SAFEGUARDING NAVIGATION THROUGH UNMATCHED ENVIRONMENTAL AWARENESS

THE SEAPIX-FLS SERIES IS A RANGE OF SCALABLE 3D MULTI-BEAM FORWARD LOOKING SONARS THAT ARE PARTICULARLY SUITED FOR OBSTACLE AVOIDANCE, REAL-TIME SEABED MAPPING AND RAPID ENVIRONMENTAL ASSESSMENT (REA) APPLICATIONS. OFFERING OBSTACLE DETECTION FROM THE SEABED TO THE SURFACE, THEY OFFER UNMATCHED SITUATIONAL AWARENESS FOR INCREASED SAFETY OF NAVIGATION.



SeapiX-FLS detection process

A UNIQUE DESIGN FOR REAL-TIME OBSTACLE DETECTION

The SeapiX-FLS Series, which embeds its own Inertial Measurement Unit (IMU), provides a clear and precisely georeferenced picture of the surrounding environment. Thanks to its unique, three-dimensional coverage of the water column and bathymetric profile, the SeapiX-FLS Series offers extremely accurate, real-time mine and obstacle detection, as well as object analysis (based on position and kinematic, target strength index, acoustic measurements, etc.), ensuring vessels safe navigation.

Mine and obstacle detection from the surface to the seabed

Thanks to its innovative electronically steerable Mills Cross antennas, the SeapiX-FLS Series provides unrivaled coverage of the entire water column, from surface to sea bottom. Each detection is then mapped in real-time within the surrounding environment, and autonomously provided to external systems, or is displayed in 2D/3D within Exail's operator oriented MMI. This ultimately provides crews with a clear picture of what lies ahead, both at the surface and subsea.

Having a long detection range and high accuracy is one thing. But SeapiX-FLS goes even further by providing a detailed scan of everything within its range using four different types of swaths. It can even track identified targets for confirmation.

A fully autonomous detection process

No need to be a sonar expert to operate SeapiX-FLS. Fully dynamic, the detection, tracking, classification, and avoidance capabilities can run in the background in full autonomy. Should you need it, the process can also be set manually, case by case, allowing for maximum flexibility (see above figure).

AN INTUITIVE AND EFFICIENT USER INTERFACE



SeapiX-FLS 5 mounted on the DriX USV during an operation off the Coast of La Ciotat (South of France)

Providing real-time obstacle detection probability map

Another key feature of the SeapiX-FLS Series is the ability to generate a real-time obstacle detection probability map. This information is crucial for crew decision making, allowing them to adapt their speed according to their underwater environment, and thus navigate with more safety both for the crew and the platform.

One single interface for efficient multiple FLS operations

Increased detection coverage can be reached by combining multiple SeapiX-FLS on the same vessel, with no further hassle for the operator thanks to the SeapiX-FLS user-

friendly MMI. This MMI can centralize and simultaneously display information gathered by the multiple SeapiX sonars.

A FLS for all vessels and drones

The SeapiX-FLS Series offers a scalable solution that can be mounted on all crewed and unmanned surface and subsea vehicles. It can be integrated on hulls, hoisting systems or within gondolas. Specific integration can be discussed between integrator, ship builder and Exail.

The SeapiX-FLS Series can also be installed on fixed platforms (buoys, tripods on the seabed...) for port and subsea infrastructure monitoring operations. ■

SeapiX-FLS Series

FORWARD LOOKING SONARS



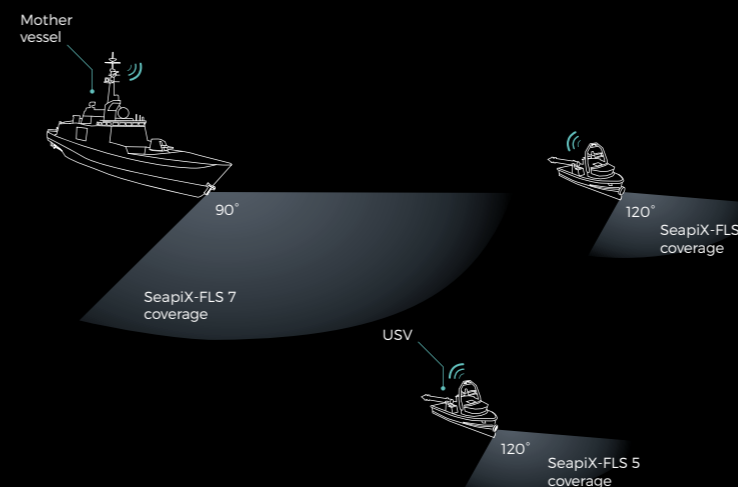
SeapiX-FLS 5



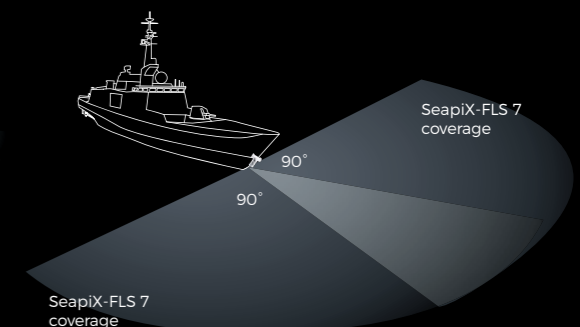
SeapiX-FLS 7

Volume coverage	120°x120°	90°x90°
Object in the water column (-15dB)	>300m	>600m
Drifting object (-15dB)	>300m	>450m
Object on the bottom (-15dB)	>200m	>350m
Low target strength object in the water column (-25dB)	>250m	>520m

Combination of a warship equipped with a SeapiX-FLS 7 and USVs equipped with SeapiX-FLS 5



Warship equipped with a pair of SeapiX-FLS 7 for maximum coverage



NAVAL EQUIPMENT
HELPING NAVIES
REDUCE RISK
AND **INCREASE**
EFFICIENCY



EXAIL OFFERS A VARIED RANGE OF SOLUTIONS TO IMPROVE THE DISCRETION, CREW SAFETY, ENERGY EFFICIENCY AND OPERATOR COMFORT OF SURFACE SHIPS AND SUBMARINES: FROM MAGNETIC SIGNATURE MANAGEMENT TO STEERING & DIVING CONSOLES, AND FROM ENERGY CONVERTERS TO VARIABLE SPEED DRIVES.

Exail's naval equipment meets the highest engineering specifications and most demanding military requirements, and has been ruggedized and sea-proven to operate in the most restrictive and harshest conditions.

➤ **Signature management for surface ships and submarines**

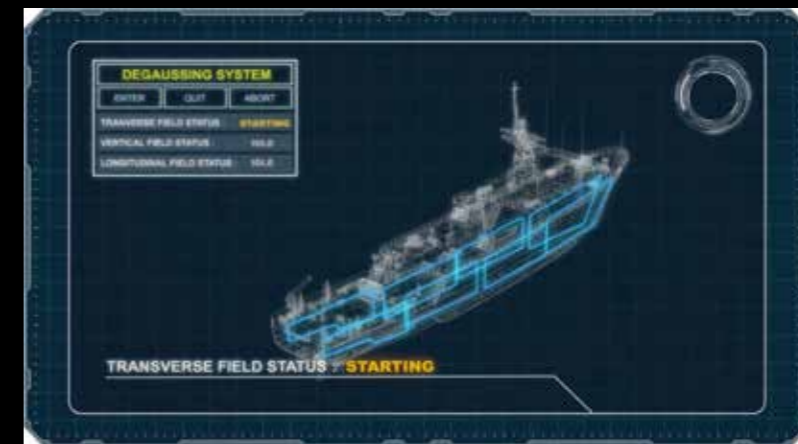
A submarine's efficiency is only as good as its signature. Submarine and surface ship stealth, or low magnetic and acoustic signature, is among the prime concerns of navies worldwide. Exail offers a range of solutions for use by naval forces around the world, to reduce the magnetic and acoustic signatures of submarines and surface ships.

➤ **A versatile degaussing solution**

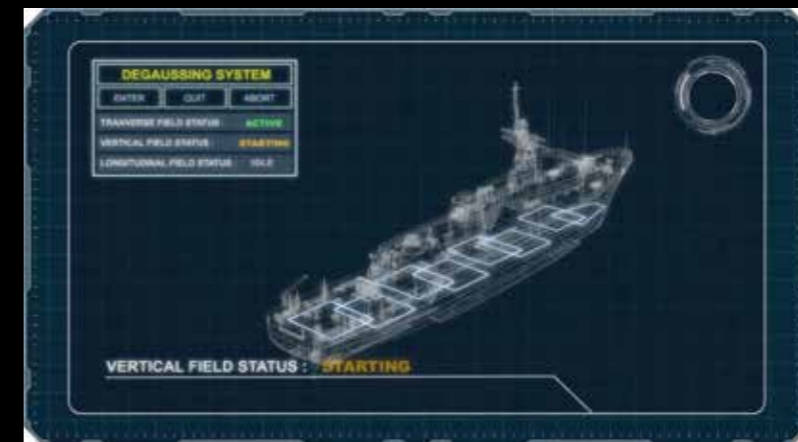
Exail's degaussing system serves to reduce the magnetic signature of the ship. Its modular design makes it adaptable to a wide range of ships, from MCMVs to aircraft carriers and submarines and it is installed during the ship's construction. 3 sets of coils (1 vertical, 1 transverse, 1 longitudinal) ensure that the entire ship is effectively demagnetized.



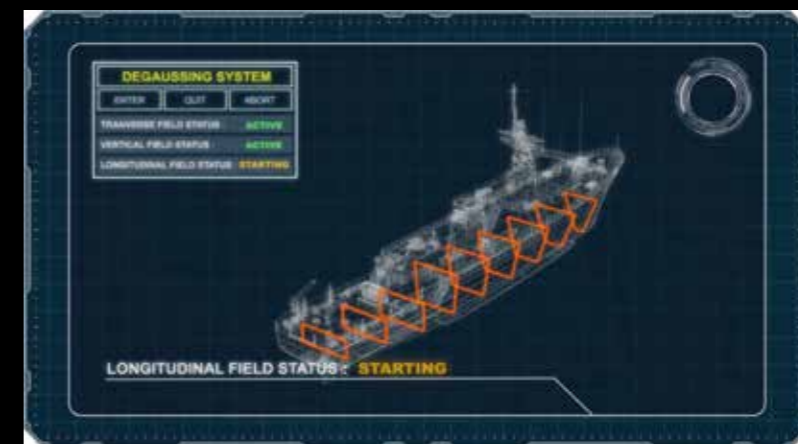
Exail's NATO-compliant degaussing system gives the crew vital information and, combined with Exail's range, is able to predict the ship's magnetic signature in real-time, and calculates safe distances from potential threats. The operator receives this information on a user-friendly HMI working on a standard Windows software suite, optimizing ease of use. Crew can visualize alarm and diagnostics directly on the Human Machine Interface, simplifying maintenance operations. Command & control of the degaussing system is performed from a single PC station through a fault-tolerant distributed network.



➤ Transverse field degaussing



➤ Vertical field degaussing



➤ Longitudinal field degaussing

› Fast and effective deperming

Deperming is the vital pre-deployment process which existing and newly commissioned submarines and surface ships undergo to reduce their risk of being detected by magnetic sensors or attracting certain types of torpedo.

Traditionally, deperming consisted of wrapping the entire body of a ship or submarine in a massive wire coil. Current was then passed through the coil to reduce the magnetic signature of the vessel - a painstaking process which required removing sensitive equipment from the ship, and of course immobilizing the ship throughout the deperming process. Exail's solution uses wire coils laid down on the seabed through which a current is passed, as the vessel moves over the coils.

"This 'over-run' process offers unmatched efficiency, achievable in less than half a day, compared to the traditional coil wrapping which could take 2-3 weeks" explains Dr. Vinciane Chereau, specialist in magnetic signature management at Exail.

The ship also remains available throughout the process, so it can be deployed at short notice if necessary, unlike during the coil-wrapping process.

The over-run system includes a magnetic range and thanks to the vertical compensation coil, the system is able to measure the whole magnetic signature (including vertical permanent and induced parts) enabling the system to deliver predictions of signature worldwide (mine and MAD safety distances) as well as escape scenarios for submarines. Compensation coils can also be used to simulate any location in the world, creating the Earth field of that location.

› Magnetic ranging thanks to a ship-stored UAV

› Multi-influence signature management

Exail's fixed multi-influence range system allows a ship's crew to acquire, analyze and process the acoustic, pressure, magnetic and electric signatures of the vessels thanks to advanced modelling software in order to assess the risk and protect the vessel in operation. Navies are able to perform mine and MAD (Magnetic Anomaly Detection) risk calculations remotely, for locations anywhere in the world, using the worldwide magnetic signature management tool. With the addition of a vertical compensation coil, the system is also able to measure the whole magnetic signature of the vessel.

› Airborne magnetic ranging without leaving the theatre of operations

Exail has engineered STERNA, an innovative magnetic ranging system which can be used to check and reduce the magnetic range of a surface ship or submarine, whilst in the theatre of operations. STERNA is comprised of a magnetometer and its digitizer fitted on an aerial drone, enabling it to fly over the vessel and map the magnetic signature in less than one hour. STERNA then transmits data onboard the vessel, the detection risk is automatically estimated and degaussing parameters are computed. Its key advantage is its speed of use (one hour rather than a day for conventional methods) and the practicality of being able to use STERNA without returning to a ranging facility - the aerial drone can be easily stored on board the vessel. ■



› In-situ airborne magnetic ranging



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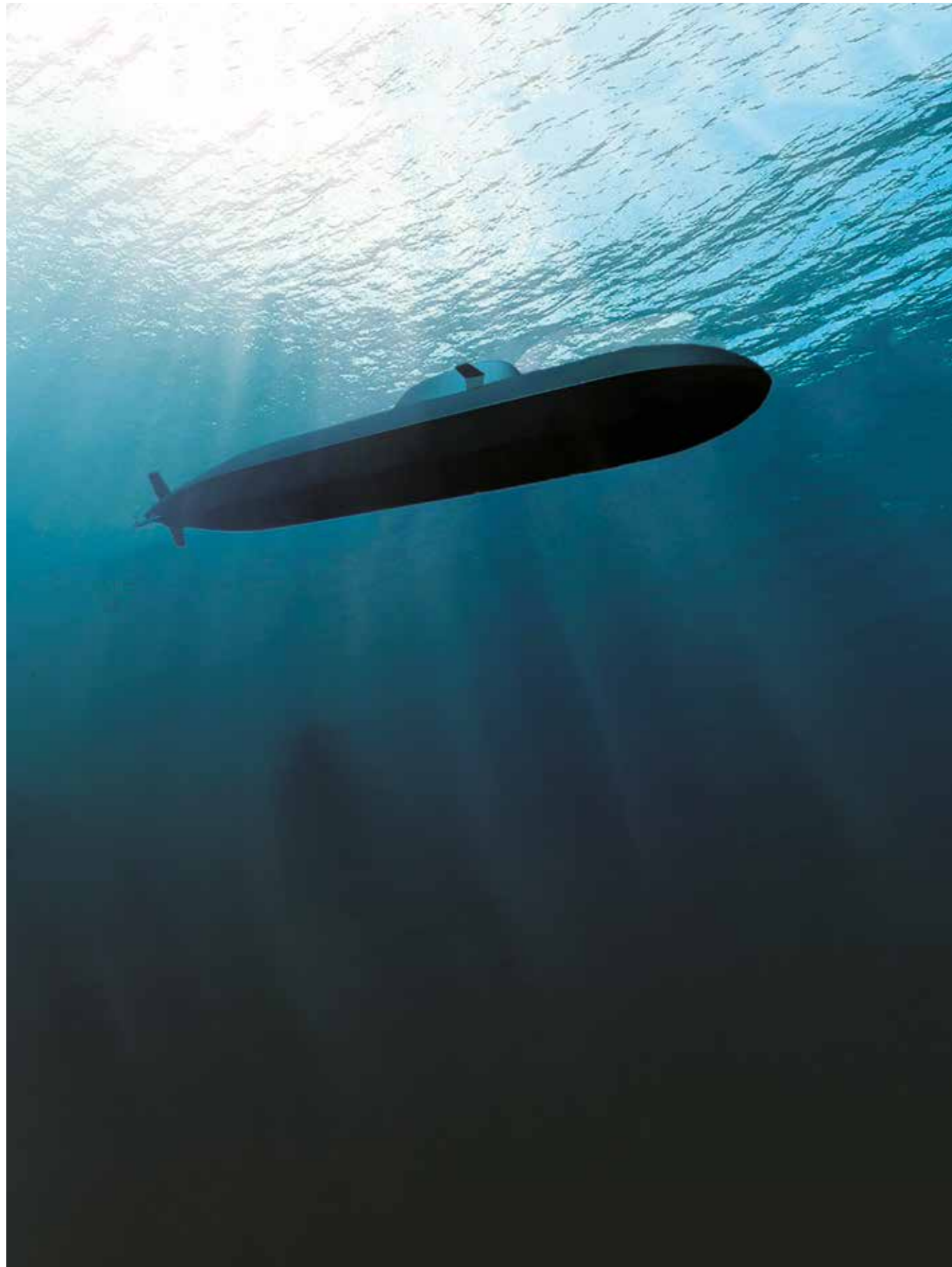
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successful factory acceptance test



KONGSBERG DEFENCE & AEROSPACE (KDA) HAS SELECTED IXBLUE (NOW EXAIL) TO PROVIDE ENHANCED NAVIGATION CAPABILITIES TO THE NEWLY BUILT U212CD SUBMARINES INTENDED FOR THE NORWEGIAN AND GERMAN NAVIES. BUILT BY THYSSENKRUPP MARINE SYSTEMS (TKMS), THE NEW U212CD WILL BE EQUIPPED WITH EXAIL MARINS M8 INERTIAL NAVIGATION SYSTEMS (INS).

EXAIL TO PROVIDE CRITICAL NAVIGATION CAPABILITIES TO NORWEGIAN AND GERMAN NAVIES'

U212CD SUBMARINES

"The U212CD is a major program for the European naval industry, and we are very proud to be on board and supply this new generation of submarines. With the Marins Series, TKMS and Kongsberg have not only chosen highly performant navigation systems, but they will also benefit from well proven and "off-the shelf" systems that will participate to further reducing the risks and costs of the overall program," says Jean-Marc Binois, Sales Director for Exail. "We would like to thank them for their renewed trust on this impressive program and look forward to our ongoing collaboration with them."

The Marins Series are the highest-grade inertial navigation systems (INS) produced by Exail. Innovation has been uninterrupted on Exail's range to gradually extend the performance and propose the highest accuracies to the Navies and therefore answer their need for their most critical applications. Along the accuracy, the technology also combines decisive advantages such as an absolute discretion and unmatched reliability over time.

The very concrete benefits of the Marins Series have been recognized over many years and have led many leading Naval Forces to opt for Exail Marins INS for their submarine programs, for newly built vessels and retrofits. This includes, among others, the full fleet of the UK Royal Navy submarines and the Swedish Navy A19 and A26.

This latest success confirms Exail leadership in naval navigation for both surface and subsea platforms and strengthens the company's collaboration with the German and Norwegian navies. Exail's Marins INS have indeed already been selected for several of their programs such as the F122 (Bremen-class), the F123 frigates (Brandenburg-class), and Jan Mayen OPVs. More globally, recent successes in naval navigation include the newest French FDI, Spanish F110 multi-mission frigates, United States Navy Freedom-class Littoral Combat Ships, Finland's four multi-role corvettes (Squadron 2020 project) or the Polish Navy's Kormoran II class MCMVs. ■

U212CD submarine
3D concept
© TKMS



BELGIUM NAVAL &
ROBOTICS (BNR) SOLUTION

FOR LATERAL DEPLOYMENT

AND RECOVERY OF DRONES

SUCCESSFULLY TESTED

DURING INDUSTRIAL TESTS CONDUCTED IN TOULON, THE SOLUTION FOR RALLYING, RECOVERING, MAINTAINING AND LAUNCHING SURFACE DRONES (LARS, LAUNCH AND RECOVERY SYSTEM) DEVELOPED BY BELGIUM NAVAL & ROBOTICS, A NAVAL GROUP AND ECA GROUP (NOW EXAIL) CONSORTIUM, HAS DEMONSTRATED ITS RELEVANCE AND RELIABILITY IN REAL CONDITIONS.

On Thursday, January, the 13th, 2022, a demonstration of the deployment and recovery operation of the fully remotely operated USV (Unmanned Surface Vehicle) and a presentation of the test results took place in the presence of the Royal Belgian and Dutch navies as part of the rMCM (Replacement Mine Counter Measure) program. The cooperation between the two companies combines Naval Group's ability to design a platform-integrated system that enables the safe deployment and recovery of Exail's USV Inspector 125 surface drone. Result of several years of engineering development, this innovative system deploys laterally on each side of the vessel. This innovation doubles the deployment and recovery capacity.

The industrial tests carried out off Toulon, mobilized up to thirty consortium employees and made it possible to test this innovative technical solution up to sea state 4/5, 40 knots of wind and by day and by night. The analysis and processing of the information collected will enable the solution to be finalized and production of the system to be launched in the second semester of 2022.

Deploying and retrieving robotic drones provides the dual strategic advantage of extending the action capability of ships equipped with the solution, but also of protecting personnel and ships. Thanks to the stand-off solution proposed by Belgium Naval & Robotics (detection, identification

and neutralization of mines without human intervention in situ), the Belgian and Dutch naval forces will be able to rely on these drones for mine clearance operations while remaining at a safe distance.

The tests brought together for the first time four subsystems designed by the consortium and allowed them to be tested in real conditions on the VN Rebel, a specially chartered vessel:

- ▶ The LARS (Launch and Recovery System): equipped with automated arms that equip the two sides of the ships, it works like an elevator, allowing the launching and recovery of the floating dock that hosts the drones;
- ▶ The floating dock: a "cradle" for hosting surface drones (USV). This particularly innovative system makes it possible to limit the swing phenomena by working in a combined and automated way with the kinematics of the gantry combining guide arms, winches and a synchronized system of absorption. The floating dock allows to limit the overall efforts while guaranteeing overall stability. Once lifted on board, the dock allows maintenance and reconfiguration of the USV without having to move it;
- ▶ The security system: allows the drones to be locked in the floating dock. A real asset, securing the drones in their dock limits the need to move them for reconfiguration and

maintenance, thus simplifying operations while protecting personnel from the risks inherent in handling;

- ▶ The drone: Exail's USV Inspector 125 allows the deployment and recovery of:
 - An A-18 underwater drone, carrying the UMISAS synthetic interferometric side scan sonar for mine detection;
 - A T-18 towed sonar, carrying the UMISAS synthetic interferometric side scan sonar for mine detection;
 - A SeaScan underwater drone for mine identification;
 - A K-STER C underwater drone for mine neutralization;
 - An influence mine sweep integrating magnetic, electric and acoustic module.

The twelve ships (MCMPF) ordered by the Belgian and Dutch navies will be equipped with twenty-four of this innovative and now proven solution. The first of class rMCM was laid down by Naval Group in Concarneau the 30th of November 2021.

These mine countermeasures vessels, capable of withstanding underwater explosions and equipped with low acoustic, electrical and magnetic signatures, will be delivered between 2024 and 2030 to Zeebrugge, Belgium. They will be the first dedicated drone carriers in naval history, equipped to operate a fully robotic drone system for mine detection, classification and neutralization. ■



We are delighted with the success of these tests of the new surface drone deployment and recovery systems. This performance is the result of the collaboration between multiple partners in this project, first and foremost Exail. We have great faith in this technology and we thank the Belgian and Dutch navies for their confidence in us.

▶ ERIC PERROT, DIRECTOR OF THE RMCM PROGRAM FOR NAVAL GROUP




Today's demonstration shows the relevance of Exail's drone deployment and recovery solution. It is a constant dialogue between the Naval Group and Exail teams that has allowed this great result of integration of our systems. We are fully committed to the success of this highly innovative program.

▶ DOMINIQUE GIANNONI, CEO OF EXAIL



DEMONSTRATING
COLLABORATIVE
UNMANNED CAPABILITIES
FOR SEABED WARFARE



ECA GROUP AND IXBLUE (NOW EXAIL) HAVE DISPLAYED A POWERFUL FORCE MULTIPLIER COMBINATION OF AUTONOMOUS ROBOTS FOR SEABED WARFARE AND DEEP SEA EXPLORATION. EXAIL'S A18D AUTONOMOUS UNDERWATER VEHICLE (AUV) AND DRI-X UNMANNED SURFACE VEHICLE (USV) WERE DEPLOYED TOGETHER IN A DEMONSTRATION TO DEFENCE MEDIA IN LA CIOTAT (SOUTH OF FRANCE) DURING THE LEAD-UP TO EURONAVAL.

The deep ocean is a new frontier often compared to outer space due to the difficulty in communication and navigation for undersea vehicles. How to control the oceans is receiving increased attention, especially seabed warfare with 95% of the world's information flow passing through more than 450 submarine data and communication cables lying on the ocean floor.

Power cables, natural resource pipelines and extraction systems are other assets at risk. Cutting or destroying this infrastructure by an aggressor would have major impacts for countries. As such, there is a need to better understand the deep-sea environment, monitor it and intervene when necessary and therefore bring new technology or combine existing technologies.

Deployed together, surface and subsea maritime drones can act as a true force multiplier and are key platforms that can secure nations' sovereignty and help them protect vital infrastructures lying on the seabed.

This was the aim of the demonstration conducted in La Ciotat to show how the A18D AUV working together with the DriX USV can be used to improve seabed warfare in particular in deep and ultra-deep waters.

During the demonstration, the DriX surface vessel communicated with the A18D using Exail's Gaps subsea acoustic positioning system providing crucial navigation update data for the A18D and relaying data transmissions to a shore-based command centre. Positioning the DriX USV directly above the A18D AUV allowed high-bandwidth communications using SATCOM or 4G, with the DriX USV able to select the best communication mode depending on the environment, allowing faster data collection without having to wait for the AUV to surface.

While both vehicles are operationally proven and independently in operational service around the world, this demonstration was a first look at the unique and powerful capability provided by combining the systems.

Although the demonstration only included a single AUV, the DriX is capable of simultaneously working with multiple AUVs collaboratively to cover large areas. An added benefit of the DriX is that it has a much smaller visual and infrared signature, and smaller radar cross section than a conventional mothership providing a stealthy and formidable capability for seabed warfare.

Deploying multiple drones working together heralds great opportunities for seabed warfare and deep-sea exploration. Ensuring the safety of crew, these stealthy platforms increase operational range and allow multiple missions to be conducted simultaneously. This makes them critical technologies for nations worldwide in tackling seabed risks. ■



Exail team of surveyors supervise the mission from their onshore control center



› Inspector
MK2 Unmanned
Surface Vehicle

EXAIL SUPPORTS THE ROYAL NETHERLANDS NAVY'S RMCM CAPACITY & DELIVERS THE FIRST TOOLS OF THEIR **STAND-OFF TOOLBOX**

As part of their replacement Mine Countermeasures (MCM) program, the Royal Netherlands Navy signed an additional contract with ECA Group (now Exail) to test and evaluate its MCM tools in advance and in operational conditions, the OT&E program.

› Earlier this year, intrusting Exail stand-off MCM solution, which places men away from the danger, the navy received the Inspector MK2 USV, a SeaScan for identification and a K-STER ROV for neutralization.

Convinced by Exail's stand-off solution, the Royal Netherlands Navy relies on the company to replace its Mine Countermeasures capacity to ensure the protection of its infrastructures and its men. Additionally, the navy opted for a comprehensive training and transfer of knowledge program to ensure their operators are familiar with this innovative technology, which will allow neutralizing underwater mines without placing men within the danger zone.

As part of the OT&E program, the Royal Netherlands Navy already received AUV A18. This AUV, designed for Mine Countermeasures missions, can operate autonomously in the close vicinity of the smartest mines without triggering them. ■

» We thank the Royal Netherlands Navy for their continued trust in Exail. Our teams are mobilized alongside the Royal Netherlands Navy to provide the best innovative MCM solution and to train its crews to master our solution, placing men away from the danger.

› DOMINIQUE GIANNONI, CEO OF EXAIL



©Finnish MoD

► The multi-role corvettes will be able to operate in versatile tasks around the clock

EXAIL TO EQUIP FOUR MULTI-ROLE FINNISH CORVETTES AS PART OF SQUADRON 2020 PROJECT

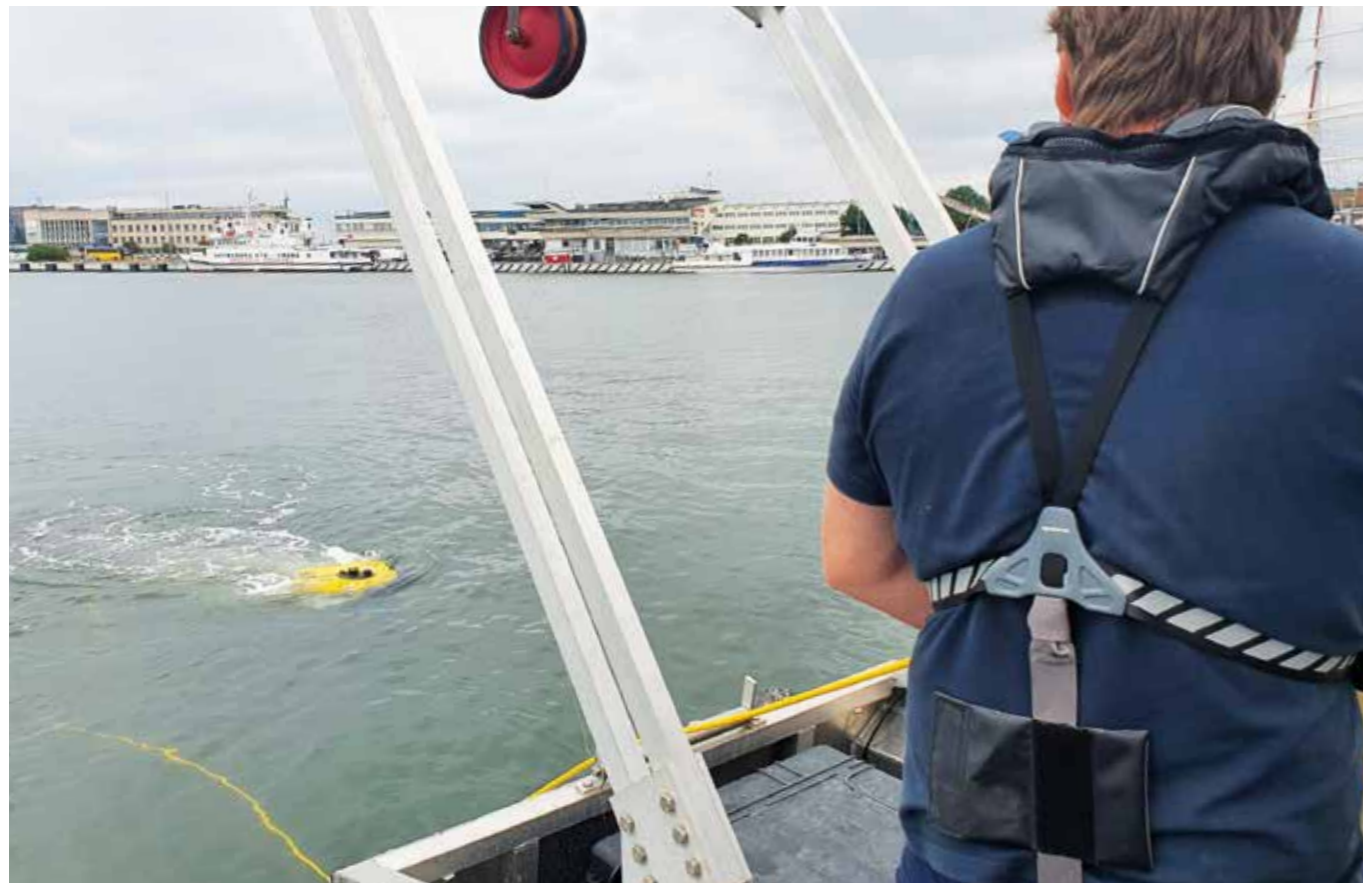
► **ixblue (now Exail) has been selected by the Finnish Navy to provide Phins Series Inertial Navigation Systems (INS) and Netans Data Distribution Units (DDU) as part of the Finnish Navy's SQUADRON 2020 Project.**

► This project involves the development of four Pohjanmaa class multi-role corvettes by the Finnish shipyard Rauma Marine Constructions (RMC). Together with existing Hamina-class missile boats, they will form the backbone of the Finnish Navy. Furuno is in charge of providing a fully integrated navigation system for those future vessels.

Key reasons for this success were Exail's Phins Series excellent navigation performance and efficient interfacing with weapon systems. In addition, important factors of Phins gyros are great heading performance, slow inertial drift and proven compatibility with the Combat Management System (CMS) and its subsystems.

Phins Series is an INS based on the Fiber-Optic Gyroscope (FOG) technology. Purely solid state, the FOG technology does not require preventive maintenance, which implies significant long-term savings for users. Exail has constantly improved their level of accuracy and reliability, which led more than 40 Navies to equip their vessel with its navigation solutions. Meanwhile Netans is a COTS based data distribution unit used for data conversion and broadcast.

"We are truly thankful to Furuno, RMC and the Finnish Navy for their trust in Exail inertial solutions. They have demonstrated strong performance in navigation at high latitude. Therefore, we look forward to partner with Furuno, a leading Naval integrator, to bring those capabilities onboard the future Pohjanmaa class corvettes of the Finnish Navy" says Jean-Marc Binois, Sales Director at Exail. ■



Exail's Gaps M7 USBL system was used to track the new R7 ROV in challenging acoustic conditions

EXAIL DEMONSTRATES SUCCESSFUL SUBSEA ASSET TRACKING TO POLISH NAVAL ACADEMY

iXblue and ECA Group (now Exail) recently demonstrated successful subsea asset tracking in shallow waters using their Gaps M7 USBL (Ultra Short BaseLine) positioning system and their new R7 ROV (Remotely Operated Vehicle).

Hosted by their local partner THESTA, a Polish company providing maritime navigation services and communication systems for the defense sector, the demonstration was organized for the Polish Naval Academy and NAVSUP 2022 attendees with the aim of showing that accurate positioning of underwater targets is possible in a potentially hostile and fast-approaching environment, in coastal regions characterized by shallow waters and often limited access.

As part of the mission scenario, Exail's R7 ROV investigated objects and structures submerged in the shallow waters of the Baltic Sea in Gdynia harbor. The Gaps M7 USBL acoustic positioning system was deployed to geolocate the R7 ROV and correct its trajectory in real time. A fixed transponder was also placed several hundreds of meters away from the vessel, at only 5 meters deep. The trials were carried out in water depths of 7 to 10 meters, surrounded by many docks and vessels causing significant acoustic echoes.

Despite challenging acoustic conditions, the positioning of the ROV and the transponder was stable and accurate. Extremely efficient in shallow waters, Gaps M7 ensured excellent horizontal tracking capabilities with omnidirectional coverage and 200° acoustic aperture. With no calibration required, it was easy to deploy and ready to use, saving precious operational time on the field.

The ROV inspection was successful despite the low visibility. Such environments make the use of traditional cameras impossible, but the HD acoustic inspection camera performed remarkably, providing high-resolution data with superior localization accuracy. The R7 combines the compactness and maneuverability of mini-ROVs with the performance and power of professional observation-class ROVs. It embeds a wide range of fast-equipped payloads and operates well under harsh sea conditions, making it the perfect ally of Navies for quick and efficient subsea interventions.

"The R7 ROV along with the Gaps M7 USBL acoustic positioning system is able to transmit information accurately, even in noisy and difficult acoustic environments. They both enable fast operation as well as regular and quick position updates, even in very shallow waters, which is a definite asset for the navies, given their need for a fast, clear and concise picture of the battlespace to quickly maneuver naval forces in the field." says Cezary Majchrowicz, Technical Director at THESTA. ■

The R7 ROV successfully conducted its inspection mission despite the low visibility

ENHANCING
HYDROGRAPHIC INSTITUTES SURVEY
USING **UNMANNED SURFACE
VEHICLES**



SINCE ITS LAUNCH BACK IN 2017, DRIX HAS PROVEN TO BE AN INVALUABLE ASSET AND A REAL GAME CHANGER ON THE ENERGIES AND GEOSCIENCES MARKETS. OFFERING OUTSTANDING SEAKEEPING AND SPEED CAPABILITIES, THE USV IS INDEED THE PERFECT UNMANNED PLATFORM FOR EFFICIENT AND HIGH-QUALITY DATA ACQUISITION. ALONG WITH ITS PRACTICAL LAUNCH AND RECOVERY SYSTEM, DRIX - THAT HAS RECEIVED BUREAU VERITAS VERY FIRST CERTIFICATION OF AN UNMANNED SURFACE VESSEL - HAS NOW GATHERED THE INTEREST OF MANY HYDROGRAPHIC INSTITUTES AROUND THE WORLD AND IS QUICKLY BECOMING A REFERENCE AS A HYDROGRAPHIC SURVEY FORCE-MULTIPLIER.

Multi-DriX operation supervised by the Shom during sea trials



Hydrographic institutes have identified USVs as a leading-edge survey technology that force-multiplies data acquisition and that helps optimize survey productivity, efficiency and safety. This is why hydrographic institutes such as NOAA, Shom, the British Antarctic Survey or that of the Polish Navy are now actively developing strategies to integrate the use of USVs into ocean mapping”, explains Guillaume Eudeline, Naval Autonomy Market Director at Exail. “USVs are indeed very flexible platforms able to perform extremely well in severe weather conditions. And this of course keeps downtime to a minimum compared to traditional survey vessels.”

“For instance, if we take the example of our own USV being used for a day, first of all DriX can be operated on a 24-hour window, a timeframe that is much higher than a traditional survey launch,” Guillaume adds. “Second, DriX can perform high quality survey at a much higher speed than traditional vessels, covering larger areas in a shorter amount of time, with no compromise on data quality. This means that, to achieve the same seafloor mapping rate than DriX within

the same timeframe, 6 launches would be needed. One can then easily understand how USVs can greatly increase seafloor mapping rate while reducing operations costs.”

“So overall, with USVs, the total vessel time, man hours worked and hours of human at risk for that matter, get drastically reduced, bringing greater efficiency and lowering the HSE impact of survey operations,” Guillaume concludes. “Combine that to reduced fuel consumption and CO₂ emissions, and one can easily understand why hydrographic institutes around the world are trying to assess the potential concept of use for such unmanned platforms.”

➤ **NOAA: expanding the footprint and efficiency of ocean exploration**

It is within that context that the Ocean Exploration Cooperative Institute (OECI), funded by NOAA's Office of Ocean Exploration and Research (OER), signed a purchase contract to acquire a DriX USV, along with its novel custom-designed Universal Deployment System (UDS). Developed by iXblue Shipyard division (now Exail), this UDS is able to

launch and recover DriX as well as other AUVs. The contract comes after a series of sea trials conducted in 2019 with NOAA's iconic Thomas Jefferson hydrographic survey vessel, and that successfully demonstrated DriX hydrographic survey force-multiplier capability in offshore waters.

“The ability to launch and recover unmanned surface vessels as well as other autonomous systems like AUVs from the same launch and recovery system allows us to support a range of collaborative ocean exploration operations from a single research vessel”, said Larry Mayer, Director of the Center of Coastal and Ocean Mapping and the University of New Hampshire's co-PI on the Ocean Exploration Cooperative Institute. “With these collaborative, multi-vehicle operations we hope to greatly expand the footprint and efficiency of ocean exploration.”

“Along with the innovative Universal Deployment System, other features that led to the selection of DriX by the OECI were its mission endurance, ability to operate at high-speed and excellent offshore seakeeping

ability”, explains Marine Slingue, VP at iXblue, Inc. (now Exail). “NOAA is a true reference in the hydrographic industry and being part of their new unmanned systems strategy is a great endorsement of our USV. We now look forward to our continuous partnership and to helping them expand the development and operations of unmanned maritime systems in the U.S. coastal and world's ocean waters.”

➤ **Shom: understanding the potential concept of use for USVs**

But NOAA is not the only major hydrographic institute to have shown interest in DriX hydrographic capabilities. Shom, the French Navy's Hydrographic and Oceanographic service, also conducted a test campaign of DriX and its launch and recovery system on board the Beautemps Beaupré (BHO) hydro-oceanographic vessel in October 2020.

The DriX USV was indeed tested in line with the “Future Hydrographic and Oceanographic Capacity (CHOF)” program, conducted by the French Directorate General of Armament (DGA) with the support of Shom. DriX assessment consisted in evaluating the

added value and hydrographic performance of Unmanned Surface Platforms compared to the existing launches and vessels currently in service, as well as in understanding the potential concept of use of such drones.

These tests, carried out under a contract between the French DGA and Exail, consisted of bathymetric surveys reaching various depths (up to 200 m), with the aim of qualifying the overall performance of DriX. Several Shom reference areas were thus surveyed, attesting of the bathymetric data quality, even at high speeds (up to 14 knots) and in rough seas. Overall, DriX autonomy (up to 10 days) enabled a total of over 2,000 km of survey lines to be completed during these trials.

The multiplication of Shom's hydrographic capacities, thanks, in particular, to the simultaneous use of several USVs, was also successfully tested for the first time. Two DriX were thus deployed simultaneously by the Exail survey teams within survey areas close to the shore and worked both independently and collaboratively with the BHO Beautemps-Beaupré.

DriX intrinsic qualities, such as its positioning and navigation capabilities, were also tested (anti-collision, stability, speed of execution, endurance, ability to navigate and work in high sea states, etc.).

“We are extremely proud to have carried out these DriX tests with the Shom, the DGA and the French Navy as part of the CHOF program, and to have reached new milestones together, in particular the hydrographic work with several USVs,” said Guillaume Eudeline. “We would like to thank the Shom and the crew of the Beutemps-Beaupré for their unfailing investment and for the positive reception given to our USV during these trials, which were, from our point of view, a real success.”

► Advancing the Polish Navy hydrographic operations

And after NOAA and the Shom, another major Hydrographic Office has turned to DriX to advance its hydrographic capabilities: that of the Polish Navy.

“The Hydrographic Office of The Polish Navy having led the way towards the adoption of autonomous solutions within the Polish Navy, we are honored that they turned to our DriX USV as their next reliable and proven autonomous platform for their future bathymetric survey. By significantly increasing both the quality of the collected data and the survey area coverage, the use of this new Unmanned Surface Vehicle will open up new possibilities for the Polish Hydrographic Office.” Cezary Majchrowicz, Technical Director at Thesta, Exail local partner, explained.

“We are honored by the choice of the Polish Navy to operate our DriX Unmanned Survey Vessel for survey applications in the wake of other prestigious international hydrographic services and private companies in the world such as the US NOAA.” Commented Guillaume Eudeline. “Offering outstanding seakeeping and speed capabilities, Our DriX USV will act as a true force-multiplier and will help the Polish Navy acquire high quality data while optimizing their survey productivity, efficiency, safety and environmental footprint. We would like to thank them for their trust and are now looking forward to our continued partnership with them.”

► British Antarctic Survey: helping capture data from the extreme polar environments.

The British Antarctic Survey (BAS), a world-leading centre for polar science and operations, has also more recently chosen to add the DriX Unmanned Surface Vessel (USV) to its advanced robotic survey means. Deployed from polar research stations and from the British polar research ship RRS Sir David Attenborough, the DriX USV will help BAS conduct multi-disciplinary sciences such as surveying the impact of ocean currents on melting ice flow or mapping the seabed in the polar regions.

A versatile platform able to deploy various sensors with multiple missions’ capabilities, the DriX USV will be equipped with CDT, ACDP, MBES and MetOcean sensors and will help BAS capture data from the extreme polar environments.

Pierre Dutrieux, Ocean and Ice Research Scientist at BAS, explains: “DriX offers a mix of excellent sea-keeping and mission endurance to observe treacherous near-glacier ocean and seabed processes repeatedly with high data accuracy, opening new perspectives for polar discoveries.”

“We would like to thank the British Antarctic Survey for trusting our DriX USV as they turn to unmanned systems for their cutting-edge scientific operations in the challenging environments of polar regions”, Regis Blomme, Sales Director at Exail comments. “We’re very proud to have been selected by such a leading-edge research institute and it is an honor for Exail to be part of the BAS ocean exploration operations.” ■

► DriX being deployed by NOAA from the Thomas Jefferson using its dedicated launch and recovery system



►► We’re very proud to have been selected by such a leading-edge research institute and it is an honor for Exail to be part of the BAS ocean exploration operations.

► REGIS BLOMME, SALES DIRECTOR AT EXAIL



A18D AUV EVALUATED
BY THE FRENCH DIRECTORATE GENERAL OF ARMAMENTS,
FRENCH NAVY
AND NAVAL HYDROGRAPHIC
AND OCEANOGRAPHIC SERVICE

THE A18D AUTONOMOUS UNDERWATER VEHICLE (AUV) WAS RECENTLY EVALUATED BY THE FRENCH DIRECTORATE GENERAL OF ARMAMENTS (DGA), THE FRENCH NAVY AND THE NAVAL HYDROGRAPHIC AND OCEANOGRAPHIC SERVICE (SHOM) AS PART OF THE FUTURE HYDROGRAPHIC AND OCEANOGRAPHIC CAPACITY (CHOF) PROGRAM. THE AIM OF THIS ARMAMENT PROGRAM IS TO UPDATE AND DEVELOP FRANCE'S CURRENT CAPACITY FOR OCEANOGRAPHIC AND HYDROGRAPHIC DATA ACQUISITION AND PROCESSING.

➤ SAS tile mosaic, resolution 3cm

➤ SAS tile mosaic (5cm resolution) transparently merged with a multibeam echosounder (MBES) digital terrain model (20cm resolution)

Embarked on the French Navy's Offshore Support & Assistance Vessel (BSAM) Rhône, the A18D AUV performed a large variety of missions to precisely map the relief and sea beds down to 3000m depth, in the currents and swell of the Atlantic.

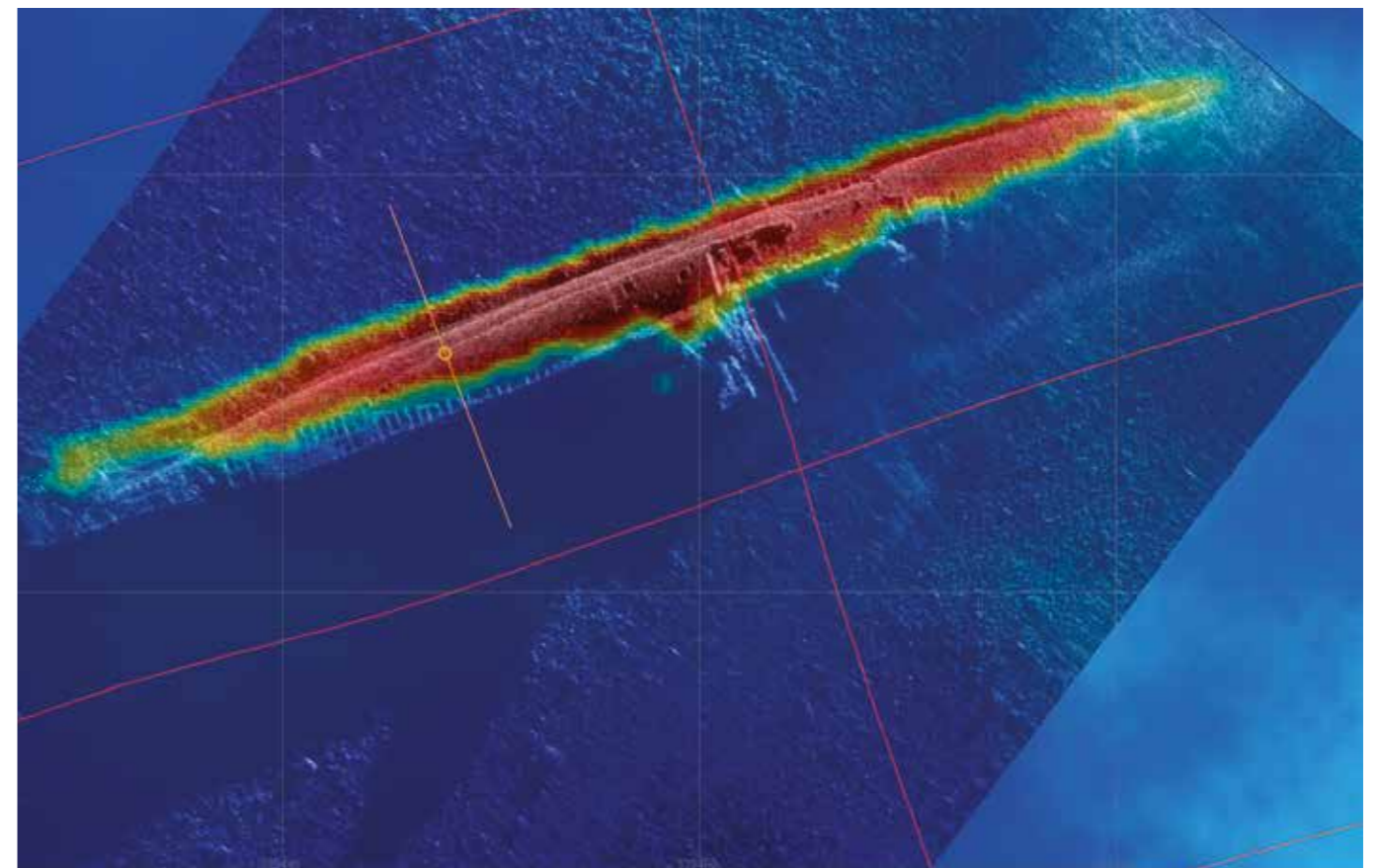
The example of the A18D tested showed a high level of reliability and proved to be easy to install and operate, thanks to its optimized size-to-weight ratio (5.7m-780kg) and its intuitive user interface.

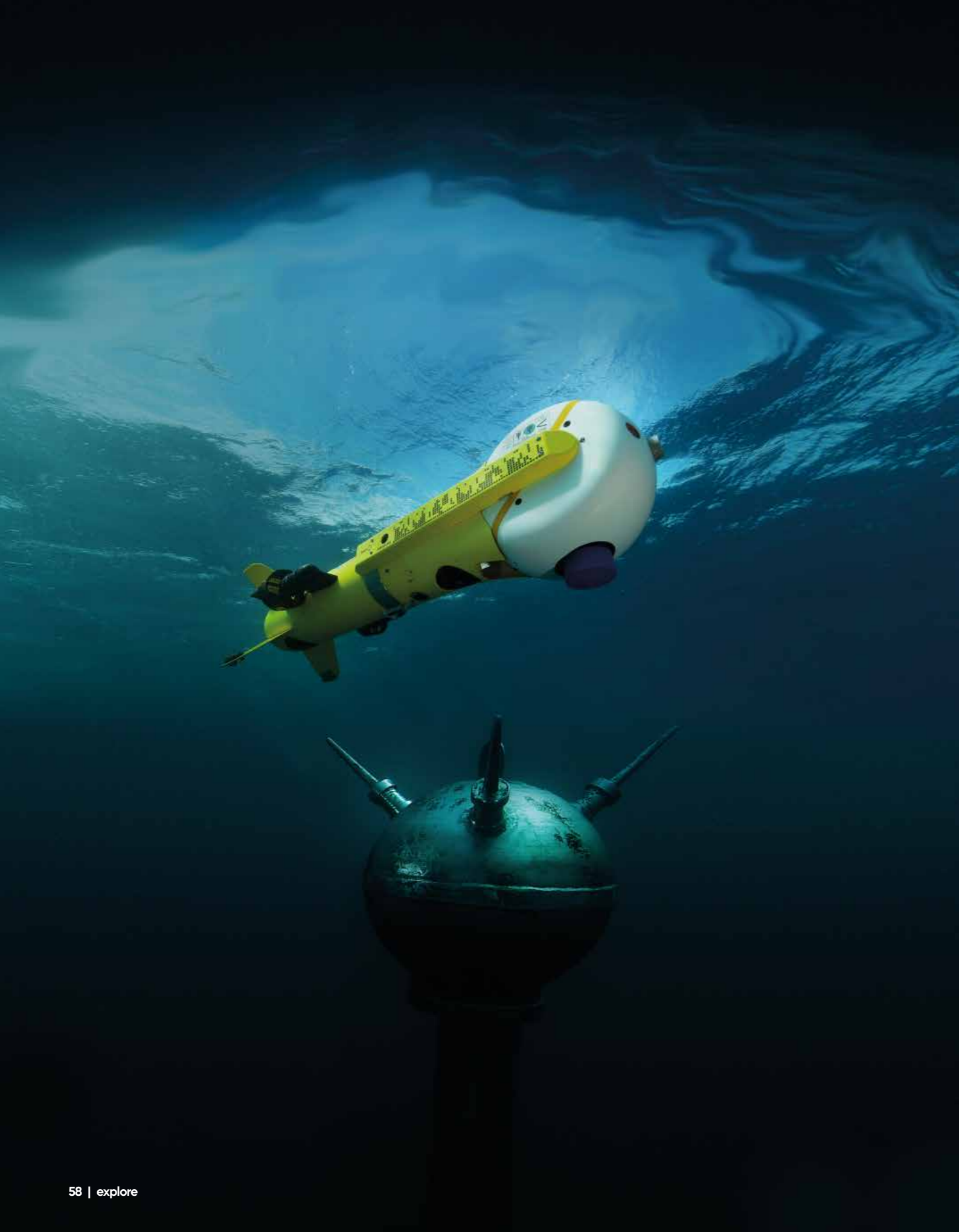
With ECA Group's (now Exail) supervision, the onboard crews of the DGA, the French Navy and the Shom were able to take charge of the AUV and be autonomous at all stages of the mission: from the preparation, launching, supervision of the measurement campaigns, up to recovering the vehicle and the data obtained.

These trials have allowed the A18D's maturity to be measured. Moreover, the richness of the feedback allowed the teams to evaluate the potential of using a drone to accompany and enrich hydro-oceanography missions. The quality of the very high resolution images acquired by the A18D was recognized.

➤ **The A18D AUV, a contribution for Seabed Warfare**

Surveying seabeds is of prime importance to ensure the integrity of the equipment laid on them (communication cables, pipelines, etc.) and through which 95% of the world's information flows. Its purpose is to search for debris or wrecks and to locate possible malicious systems. The A18D offers a balance between compactness, endurance, performance, modularity, data quality, innovation and competitiveness. It can provide a sectorial solution for these missions. ■





› The Latvian Navy will use 10 K-STER expendable mine disposal systems

EXAIL MCM SOLUTION: SUCCESSFUL FACTORY ACCEPTANCE TEST FOR LATVIAN NAVAL PROGRAM

Last June, ECA Group (now Exail) welcomed the Latvian Navy to carry out the Factory Acceptance Tests (FAT) for their modernized ship's Command and Control (CC) system and Mine Identification and Disposal systems (MIDS). These systems will be soon integrated onto Latvia's Tripartite-class Mine Hunter vessels (IMANTA Class). The Latvian Navy will be the first to be equipped with a comprehensive drone solution from Exail, specifically designed to be fitted during modernisation programs of previous generation Mine Hunters.

› Selected in 2020 following an international tender, Exail is in charge of the modernization of the MCM capacity of the three Latvian MCM vessels. The traditional mine warfare system is completely replaced by a new command and control system and a full set of drones, all designed and manufactured by Exail: the A18-M AUV fitted with Exail's UMISAS Sonar, the SeaScan mine identification vehicle and the K-STER mine disposal system.

Exail is also responsible for the ship modification and the upgrade of the navigation system, composed of W-ECDIS warship electronic chart display and information system, Gaps M7 USBL positioning system and Phins C7 compact Inertial Navigation System by iXblue, as well as a new Autopilot by SIREHNA.

During the FAT, the ship's command and control with W-ECDIS and Autopilot, the sensors' functionalities and interfaces were successfully tested. In addition, during the acceptance tests, the Latvian Navy successfully performed a scenario of mine identification with the SeaScan and firing simulation with the K-STER for mine disposal.

"The work progress on this program is fast enough. I see the big efforts from the Exail side to develop new sensors and systems based on our requests" Dmitrijs Jankovs, MCM squadron upgrade program Manager.

"So far, I am satisfied of the performances of the K-STER and the SeaScan", said Arturs Knoks, Commander of M-08, the first ship to be modernised.

This program builds on the long-standing partnership between the Latvian Navy and Exail. The Navy has been operating Exail's A9 autonomous underwater vehicle (AUV) for several years. With this modernization contract, 10 K-STER mine disposal systems, 2 SeaScan mine identification systems and a A18-M mid-size AUV with their common software suite will be delivered for each of the 3 ships to be modernized.

By upgrading the mine warfare equipment on existing vessels, Exail brings state-of-the-art capabilities at a cost-effective price to navies while enabling them to extend the life of their fleet already in service.

This toolbox can be installed on any conventional mine countermeasures vessels or on non-dedicated ships. Exail offers this modernization solution to all navies that intend to keep and optimize their conventional mine countermeasures vessels or consider the acquisition of pre-owned vessels. ■

