

# ON&T

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MARCH 2024

**NAVAL DEFENSE & SECURITY**

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/ trəst / verb

*believe in the reliability, truth, ability or strength of*



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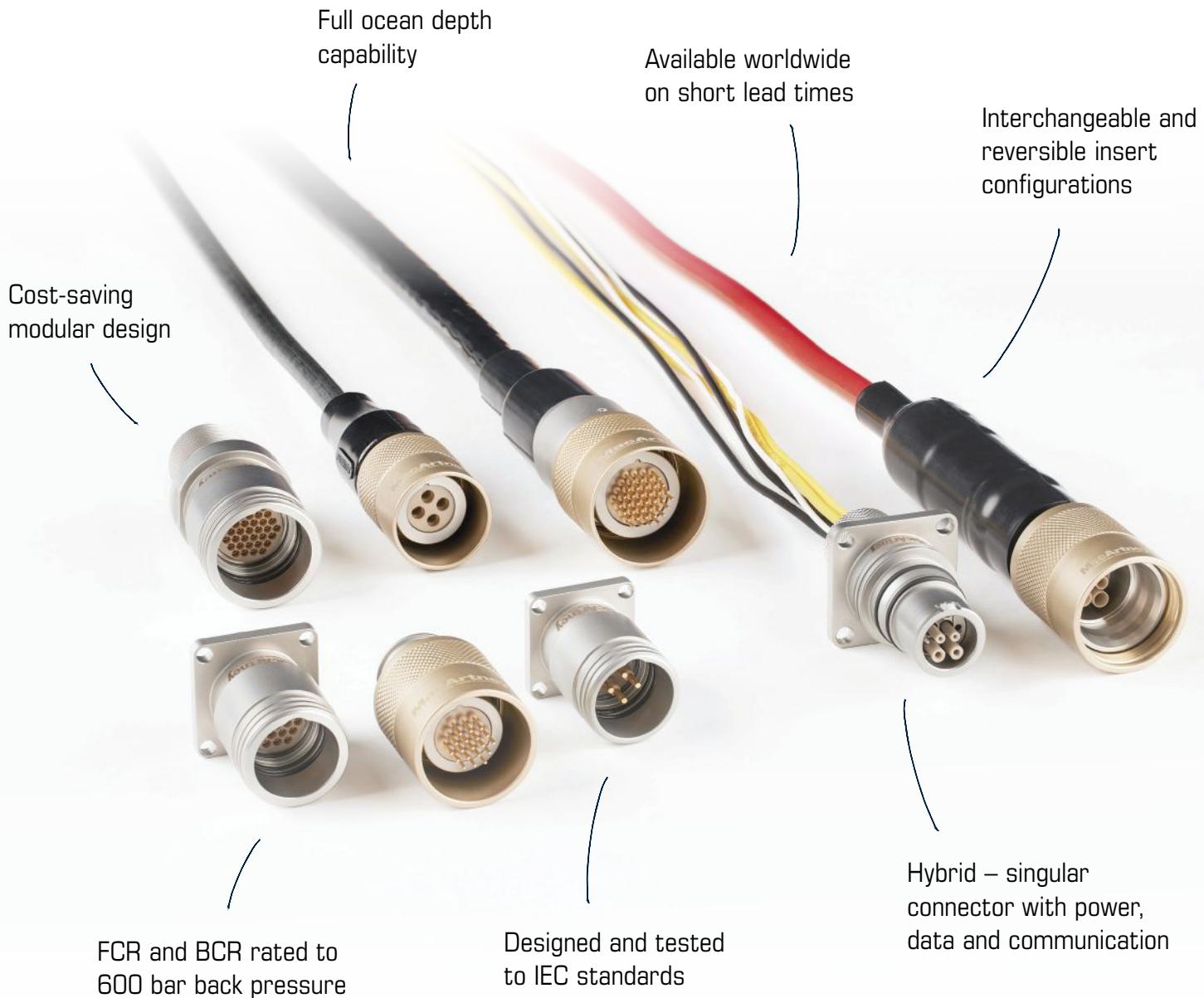
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 **ADVANCED  
NAVIGATION**

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Recent flashpoints in current geopolitical conflicts have served to highlight the growing role of ocean technology in modern defense and security tactics. Whether using surface drones to disarm at-sea threats or intelligent subsea platforms to carry out ISR missions, the carefully orchestrated application of the latest marine systems—many uncrewed and remote—signals a new era for naval warfare.

In March's ON&T we meet some of the leading protagonists working to design and develop cost-effective, reliable, and rapidly scalable solutions to advance the realm of **Naval Defense & Security**. Our thanks this month go to Boeing, GeoSpectrum Technologies, VideoRay, RTsys, and MASSA.

*Ed Freeman*

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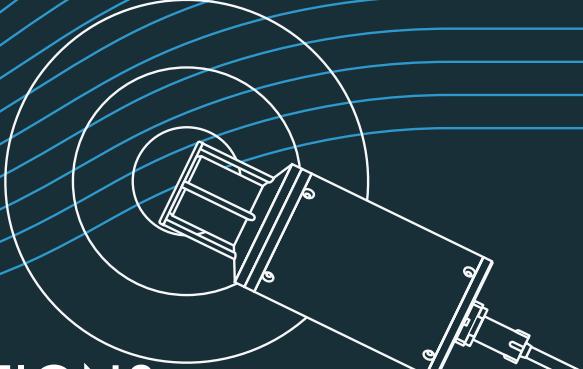
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GeoSpectrum Technologies completes harbor test validation on their Portable Acoustic Target for ASW training in Halifax, Nova Scotia. (Credit: GeoSpectrum Technologies)



## SMART SUBSEA SOLUTIONS

- Delivering data in most adverse conditions: underwater acoustic modems with advanced communication technology and networking
- Accurate USBL, LBL and hybrid positioning of underwater assets, navigation for divers
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- Quadroin - the novel bionic AUV for surveys and monitoring



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**STAND A06**

# AUTONOMOUS VEHICLES

## Helping to shape the future of undersea warfare

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**Ann Stevens**

VP Maritime &amp; Intelligence Systems



We live in a time of limitless possibilities as autonomous warfare revolutionizes the battlefield, blending cutting-edge technology with strategic prowess. Autonomous systems in military operations are capable of making decisions and carrying out tasks without direct human intervention, boasting immense benefits to the US military and its allies.

Enhancing the effectiveness and efficiency of military operations through autonomous systems reduces human error and increases precision. These systems can analyze vast amounts of data in real time, enabling faster decision making and responsiveness. Overall, autonomous warfare offers the US military the opportunity to gain a strategic advantage, improve national security and protect the lives of military personnel.

Autonomous systems are already in action across all branches of the US military. They aid our warfighters with surveillance and data gathering operations, keeping them further and further from the front line. Aerial drones and uncrewed surface vessels have evolved through sensing into offensive warfare, as recently employed during the conflict in Ukraine. The potential to deploy autonomous systems that can aid in deterrence or offensive warfighting can solidify US overmatch in a great power competition.

### XLUUV COLLABORATION

The Boeing-built Extra Large Uncrewed Undersea Vehicle (XLUUV), designated by the Navy as Orca, represents a new class of ship—the autonomous submarine. This class of vessel can undertake long-duration, persistent missions in ever-changing, contested waters. What sets Orca apart is its exclusive ability to operate independently of a host ship with a payload capacity that provides real war-fighting advantage. Orca fills a critical gap in the undersea warfare industry, providing a cutting-edge solution for maritime operations without impacting the submarine industrial base.

Boeing delivered the first Orca to the Navy at the end of 2023, marking an important milestone for the program. Orca's development has been a dedicated team effort for more than a decade, beginning as an R&D project that culminated in the Echo Voyager prototype. This pioneering work demonstrates unwavering commitment to innovation and perseverance in bringing this first-of-its-kind capability to life. We are immensely proud of this achievement and our partnership with the US Navy, which has resulted in the most advanced and capable autonomous submarine in the world.

The Navy has been a tireless partner throughout Orca's development process. Together, we have conducted several phases of at-sea testing, including above and below surface mission sorties, to demonstrate the unique capabilities of Orca. This collaboration has been instrumental in refining and enhancing the vehicle's performance.

### THE FUTURE IS AUTONOMOUS

The future of undersea warfare lies in the advancement of autonomous technologies. While there is an exciting interest from startups and software companies to enter the undersea exploration market, submarine development remains a challenging engineering feat. Orca is backed by more than 50 years of experience building and operating undersea vehicles. Boeing's workforce, lessons learned, experience, and infrastructure are uniquely positioned to lead and drive innovation in undersea autonomy.

The delivery of the first Orca XLUUV to the US Navy is only the beginning of the next phase of development in the program. We are excited to witness the transformative impact of this game-changing technology as it contributes to maritime dominance. With the Navy's partnership, we are confident in our ability to help shape the future of undersea warfare and deliver cutting-edge solutions to the fleet.

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**SAAB**



# REUSABLE OPTIONS

For expendable training targets



**Megan Andrus**  
Marketing and Communications Manager  
 **GeoSpectrum Technologies Inc.**  
Customizing Detection

**E**xpend·a·ble (of an object) designed to be used only once and then abandoned or destroyed.

For decades, expendable Anti-Submarine Warfare (ASW) training targets (also referred to as expendables) have been a low-cost solution for naval operator training and contribute to the overall readiness of naval forces, ensuring they can meet operational requirements.

The targets currently available on the market are highly effective in terms of their ease of use. The expendables are designed for imitating submarine noise and can be programmed easily according to ASW exercise requirements. These portable devices can be effortlessly thrown off the ship's side, and, as the name suggests, require no recovery efforts.

Logistically, they make a lot of sense but aren't without limitations. With conventional methods, expendable targets fail to provide the required training for several reasons. Cost-effective expendables allow passive and active detection, but many do not operate in low-frequency (LF) ranges which renders them useless for LF sonar training exercises. They generate passive discrete tones, broadband noise, active emissions, and echo repeats but have a limited number of bands and are limited in the frequency spectrum they can broadcast based on power and size limitations.

In addition, large quantities of expendables are needed to obtain sufficient training hours. When speaking with former Sonar Chief, Wallace Bennett, he notes that you can "program it and chuck it... but I've also been out with targets that have been part of a bad batch, and now you have nothing."

THOUGH SIMILAR IN HIGH-LEVEL FUNCTION TO EXPENDABLE TARGETS, PAT OFFERS A MORE ROBUST SOLUTION FEATURING A TOWED BODY AND COMPACT HANDLING/STOWAGE SYSTEM WITH OPERATOR-CONTROLLED SIGNAL GENERATION AND MONITORING SOFTWARE.

## ENVIRONMENTAL WEIGH IN

Another important aspect to consider is the assessment of a given acoustic equipment's environmental impact on the ocean and its inhabitants.

Acoustic devices include everything from large-scale sonar systems to smaller underwater projectors and hydrophones. While they serve important purposes in various industries, their improper disposal or accidental loss has led to a disturbing accumulation in our oceans. Wallace speculates, "If you went on the ocean floor there would be hundreds of thousands of expendable equipment." This waste not only pollutes the ocean environment through disintegration but poses a serious risk to marine animals, disrupting their natural behaviors and potentially causing long-term harm.

Once an expendable has completed its mission and depleted its battery, it sinks to the ocean floor where it gradually disintegrates. Traditional expendable targets contain a litany of substances such as heavy metals and plastics—both of which are toxic substances that can affect marine life through absorption and/or ingestion which can then infiltrate the food chain.

In the naval market, there is an increasing recognition of the need for a better balance between acoustic capability and environmental impact, leading to the growing popularity of reusable targets. When designing new and innovative defense technology, companies such as GeoSpectrum Technologies Inc. strive to minimize their ecological footprint while maintaining a high level of standard for their system performance.



▲ GeoSpectrum's Portable Acoustic Target (PAT) loaded for sea trial.  
(Credit: GeoSpectrum)

## REUSABLE SOLUTIONS

In comparison, a reusable target such as GeoSpectrum's Portable Acoustic Target (PAT), is a flexible system that supports active and passive ASW training, system validation, and trials over the full range of the sonar system configurations. Like the expendable targets, PAT can be used as a synthetic target to confirm sonar systems including Hull Mounted Sonars, Towed Array Sonars, sonobuoy processors, and fixed surveillance systems, can actively and passively detect and track sub-surface contacts. It is an end-to-end system that acts as an echo repeater for active sonar in low-frequency and medium-frequency bands and as a passive acoustic target by transmitting pre-programmed sounds across a greater range of frequencies than most training targets.

Though similar in high-level function to expendable targets, PAT offers a more robust solution featuring a towed body and compact handling/stowage system with operator-controlled signal generation and monitoring software. PAT includes full recording of acoustic signals, position, and target telemetry data. This additional data can be very valuable for mission reconstruction, performance assessment, and ultimately operational advancements.

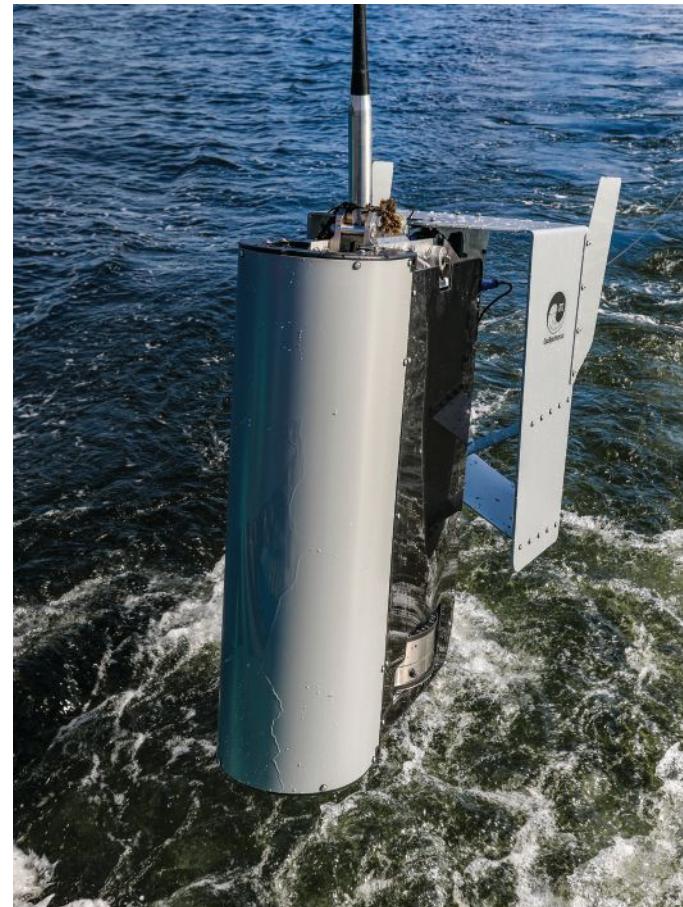
One of the many key differences between the expendable target and PAT is that once the expendable is deployed, there is no way of turning off or altering the scenario. Comparatively, if a marine mammal is detected or a change is required for operational reasons, PAT can be turned off instantaneously or quickly adjusted to react to a dynamic scenario. This includes the option to adjust the source level on the fly to meet the requirements of sonar ramp-up procedures according to SARA (Species at Risk Act) or other reasons. Most expendable targets are limited to pre-programmed source levels with no ability to alter or terminate the run if a problem occurs or an adjustment is warranted.

Thus, PAT can be readily incorporated into current and future operator and team training at all levels, from basic to advanced. As well, the difficulty of the training scenario can be customized at a moment's notice or terminated and rescheduled to accommodate changes in a ship's program. The flexibility and user-friendly nature of PAT enables operators to quickly understand and optimize the capabilities of their sonar systems and tactics in a non-combat environment. This can be accomplished through increased training opportunities and a wide variety of target emulation options to provide a multitude of ASW scenarios in realistic environments.

In addition to the fact that it eliminates the need to use less capable, expendable targets, it also reduces reliance on submarine participation in trials and exercises. This ultimately saves costs and increases opportunities for test and training events within a specified budget. Evaluating the effectiveness of training targets is an ongoing process. By regularly analyzing the results of these training exercises, adjustments can be made to maximize their capabilities and address any identified areas of improvement.

"The PAT system is more robust, and we've been putting it through the paces...it's gaining traction in the market," Wallace comments. Although both systems, expendable targets, and end-to-end solutions like PAT, have their place on the market, there's a need for greater training and mission capabilities for naval operators and companies like GeoSpectrum are answering the call.

[i geospectrum.ca](http://geospectrum.ca)



▲ PAT system being deployed. (Credit: GeoSpectrum)

# PARTNERSHIP FOR OCEAN DISCOVERIES AT THE FAR END OF THE WORLD



▲ RV SONNE. (Credit: Christian Berndt, GEOMAR)

Marine research cooperation between New Zealand and Germany has a long tradition. For more than thirty years, the GEOMAR Helmholtz Centre for Ocean Research in Kiel and the New Zealand institute GNS Science, Te Pū Ao, have been working together to explore the seafloor around the Pacific island nation.

The two institutes have now signed a cooperation agreement to reinforce their mutual support. Three major joint research projects in marine resources and natural hazards in New Zealand waters are planned for the coming years.

Although New Zealand is on the other side of the world, it's not an unusual destination for researchers from the GEOMAR Helmholtz Centre for Ocean Research in Kiel. Many expeditions start or end in the Pacific island nation's ports the region is renowned for its geological activity. To the north of New Zealand lies one of the most active plate boundaries on Earth, where the Pacific plate is subducting beneath the Australian plate.

As part of the Pacific Ring of Fire, there are submarine volcanoes and hot deep-sea springs. Twenty years ago, large gas hydrate deposits were discovered off the coast of New Zealand, which have been a focus of GEOMAR's research for many years.

The signing of a cooperation agreement between the New Zealand institute GNS Science, Te Pū Ao, and GEOMAR confirms the close cooperation between the two countries in the field of marine science. Under the agreement, the two research institutes will pool their resources to study processes at subduction zones, underwater volcanoes and the state of coastal waters.

The next expeditions with the German research vessel SONNE will take place in March in Cook Strait, the strait between New Zealand's two main islands, and in May at the 2,000-kilometer-long chain of underwater volcanoes in the Kermadec Arc, northeast of the Bay of Plenty. Three major projects will study submarine landslides and volcanic activity over the next few years.

In Cook Strait, the dynamics of submarine canyons are being studied to better assess the risk of landslides and the hazards they pose. This is part of the MAWACAAP project (quantifying the role of mass wasting in submarine canyons on active and passive margins).

In the SUBTRANS (Subduction to Strike-Slip Transition) project, GNS Science and GEOMAR will jointly investigate the transition of the two geological phenomena from subduction (one tectonic plate sinking beneath another) to strike-slip faulting (horizontal movements along the Earth's crust).

The BRASS (Brothers Volcano Seismic Structure) project will study the collapse of the caldera of Brothers Volcano in the Kermadec Arc.

In addition to the German-led voyages, there will be joint expeditions with American and New Zealand vessels to the Hikurangi subduction zone east of New Zealand's North Island.

GNS Chief Scientist Gary Wilson said the agreement with GEOMAR would significantly strengthen New Zealand's marine geology research capability: "Our two organizations share a similar vision. We are confident that this collaboration will lead to a new era of discovery and understanding".

On the German side, the head of the Marine Geodynamics Research Unit at GEOMAR, geophysicist Professor Dr. Christian Berndt emphasized that GEOMAR has long benefited from close research links with GNS Science in a number of marine science disciplines: "This new agreement strengthens our relationship at a time when German-New Zealand scientific initiatives are flourishing."



▲ The joint research focuses on volcanic activity and submarine landslides. (Credit: Stuart Henrys, GNS Science)

# TELEDYNE WEBB RESEARCH UNVEILS NEW AUV TO EXPAND ENDURANCE AND CAPABILITIES

Teledyne Webb Research has announced the launch of the Slocum Sentinel Glider. The Slocum Sentinel Glider represents a groundbreaking advancement in autonomous underwater vehicles (AUVs) and promises to revolutionize oceanographic monitoring across myriad applications.

Ocean monitoring—whether for environmental assessments, mammal monitoring, fisheries, physical oceanography, defense, or dozens of other missions—has driven advanced glider technology to meet the modern demand for long-term data gathering of all kinds.

In response to more demanding user requirements for greater endurance and payload capability, the Slocum Sentinel Glider expands the capabilities and endurance of the vehicle by building on the technology of Teledyne Webb Research's Slocum G3 Glider.

The Slocum Sentinel Glider scales the standard Slocum Glider through an increased diameter and length—13 inches in diameter and over eight feet long. This expanded size allows the Sentinel to hold over 3.5 times as many lithium primary batteries as the standard Slocum Glider and to accom-



Teledyne Webb Research

modate up to eight different sensor or hardware integrations.

"The size of the Sentinel gives it the energy capacity to increase mission length to over two years, or users can fit more high-energy sensors like active or passive acoustics, sensors with on-board processing, and imaging, without seeing a significant decrease in their overall mission length," said Shea Quinn, Slocum Glider Product Line Manager at TWR.

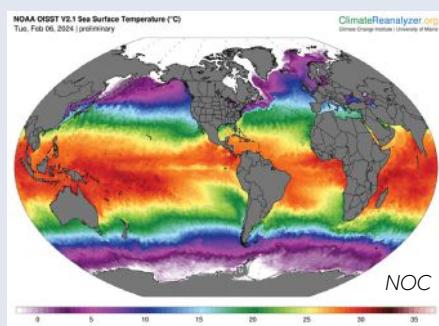
The Sentinel will be driven by the industry's largest buoyancy engine, with a volumetric capacity of four liters—more than double that of any other glider buoyancy engine. This affords the Sentinel a standard glide speed of 0.75 knots. It features dual thrusters on the aft of the vehicle, which users can choose to activate for a sprint speed of up to 3.5 knots.

"The Sentinel is the world's fastest glider—its buoyancy engine is large enough to deal with drastic density changes in the water column, and its thrusters give it the ability to stay on track in strong currents or other difficult ocean conditions," added Quinn.

The Sentinel uses the established piloting, flight control, and communications architecture of the Slocum Glider and allows for the same sensor and hardware options as the standard-sized vehicle.

"We are excited to bring this new product and capability to our customers," said Dan Shropshire, Vice President of Business Development for Teledyne Marine Vehicles. "The Sentinel represents the next generation in persistent ocean monitoring, and its features expand operational opportunities for our customers."

## OCEAN TEMPERATURES REACH NEW HIGHS ECLIPSING RECORD HIGHS OF 2023



New data revealed that sea surface temperatures (SST) have already exceeded the record highs of 2023.

Commenting on the news, Dr. Joel Hirschi, Associate Head of Marine Systems Modelling at the National Oceanography Centre (NOC) said: "Not only have we have seen

record high sea surface temperatures, but the data show that these temperatures are appearing earlier than their usual peak of March. This means there is a high chance of seeing an increase in global SSTs over the next 1–2 months that markedly exceeds the 2023 record."

"Higher SSTs, if they persist towards spring lead to a higher likelihood of a very active global hurricane season in the Atlantic. Around the UK specifically, SSTs are abnormally warm. As these affect the majority of our weather systems, the warmer winds increase the chance of heavy rainfall with the potential for heavy snowfall if this mild maritime air collides with cold air masses from the Arctic and/or Northern Europe."

This data comes from Climate Reanalyzer

which provides daily updates on sea surface temperatures across the world. The data show average SST is now 21.1°C which already exceeds the previous record high recorded in August 2023.

Primary responsibility for this increase can be attributed to ongoing climate warming; the El Niño phenomenon; and widespread warm anomalies across the Atlantic, Indian Ocean and Northwest Pacific.

Dr. Hirschi expects the El Niño phenomenon to wane from spring and early summer which should lead to average SSTs dropping from summer and early autumn in 2024. El Niño waning, however, increases the likeliness of a more active hurricane season as it acts as a break on Atlantic hurricanes.

# HYDROSURV ROBOTIC SEAGRASS SOLUTION TARGETS COMMERCIAL ADOPTION



HydroSurv, a leading provider of electric and hybrid uncrewed surface vessels (USVs), has secured Innovate UK funding to commercialize an end-to-end seagrass monitoring solution with support from the Department for Environment, Food and Rural Affairs (DEFRA).

The project aims to provide a rapidly scalable, low-impact and comprehensive answer to the numerous challenges of monitoring seagrass meadows by combining HydroSurv USV platforms with an automated data processing toolchain. The robotic solution will be demonstrated over spring and summer 2024 at three designated worksites on the southwest coast of England, conducting baseline and seasonal re-survey work and ultimately delivering

some 40 days of on-water testing and data, showing seasonal variation over the project's 9-month duration.

Dubbed SONARS (Seagrass Observation using Novel Acoustic Remote Sensing), the project will see HydroSurv work with Coastal Marine Applied Research (CMAR) from the University of Plymouth, the Ocean Conservation Trust, Falmouth Harbour and the South Devon Area of Outstanding Natural Beauty.

The technology package has already significantly advanced seagrass mapping capabilities. HydroSurv started to develop the non-invasive solution, with Innovate UK support, in early 2022 in collaboration with the University of Plymouth and Valeport. This previous work focused on refining acoustic ground discrimination techniques from the robotic vessel platforms and was successfully demonstrated in live trials over the past two years. The partners envisage that this next stage of technology development will propel the concept towards scale deployment and commercial viability.

"Working with partners and end-users, our focus has shifted from technology development towards the scale pilot of a whole-system solution. The ability to

demonstrate to service operator customers and channel partners that the solution has been extensively tested with engagement from survey commissioners, not only on small field trials, but also on multiple sites and seasonal resurveys, will build confidence in the solution," commented David Hull, CEO of HydroSurv.

"We've received a lot of interest from survey contractors who are interested in delivering these services, amongst others in environmental monitoring. Working together with them, I expect we could take this solution to market within the next 12 months across the UK and further afield in Europe."

HydroSurv's cloud-based data hosting and visualization application, EasySurv, facilitates real-time decision making without the need for specialist GIS packages or interrogation skills. EasySurv hosts content-managed data deliverables, processed using machine learning algorithms, alongside the raw data collected from the company's USVs.

HydroSurv is delivering the project from its facilities in Exeter, in close proximity to the pilot test sites in the Southwest of England, and will expand its data processing team as a result of the project.

## FURUNO INTRODUCES LATEST SUITE OF MFD SOLUTIONS TO OPTIMIZE WORKBOAT OPERATIONS

Furuno has launched the NavNet TZtouchXL series, a suite of cutting-edge Multi Function Displays (MFDs) designed to meet the demanding requirements of workboat operators, including ferries and tugboats. These MFDs bring advanced technology and rugged reliability to the forefront, ensuring seamless operations in the most challenging maritime environments.

The NavNet TZtouchXL series encompasses three robust large-sized MFDs: the 16" TZT16X, 22" TZT22X, and 24" TZT24X. These MFDs feature super-wide, all-glass displays with exceptional clarity and brightness, providing workboat operators with a clear view of their surroundings,

even in adverse conditions. The rugged all-glass design is not only functional but also enhances the durability and functionality of the helm, perfectly suited to the demanding nature of workboat operations. For boats requiring a more compact solution, the 10" TZT10X and 13" TZT13X deliver performance with space efficiency.

When connected to a Furuno DRS Radar, two new, powerful safety features are unlocked: Risk Visualizer™ and AI Avoidance Route™. Risk Visualizer™ is a unique function of Furuno Radars that provides a 360° visual representation of potential collision risks of approaching objects around the vessel. Unlike CPA/TCPA alarms, which

indicate only the risks visible on the ship's current course, Risk Visualizer™ assesses all of the objects around the vessel. The new AI Avoidance Route™ feature takes all the information provided by the Radar and instantly provides a safe route around those hazards.

NavNet TZtouchXL also supports essential workboat tools such as AIS and Autopilot, along with new chart plotting features found in TZ MAPS, a comprehensive new standard in nautical cartography. A one-time, cost-effective purchase unlocks TZ MAPS charts for the entire US or other global areas of your choice.

# FUGRO AND PLANBLUE JOIN FORCES TO ADVANCE OCEAN HABITAT MAPPING

Fugro and PlanBlue are teaming up in a strategic partnership to advance habitat mapping technology. The aim is to enhance and broaden Fugro's hydrographic solutions by incorporating cutting-edge technology such as advanced imaging and AI-based processing and deploying it across different platforms like remote and autonomous underwater vehicles.

This collaboration targets the improvement of habitat mapping solutions, systematically studying and documenting the characteristics and distribution of critical marine ecosystems such as seagrass and corals. Habitat mapping helps in understanding their ecological importance, assessing their condition, monitoring changes over time, and informing conservation and management efforts.

PlanBlue's expertise in advanced imaging and AI-based data processing is set to

gather crucial information about the ocean floor and its ecosystem. This partnership, leveraging Fugro's industry knowledge, aims to develop solutions that meet industry needs while championing environmental conservation.

"We are excited about the opportunities this partnership brings," said Dr. Marco Filippone, Fugro's Solution Director for Ocean Science and Hydrography. "By integrating PlanBlue's advanced technology and analytics, we aim to lead the industry in providing innovative solutions that positively impact the environment and various sectors."

The partnership between Fugro and PlanBlue signifies a shared commitment to driving positive change through technological innovation. This collaboration is particularly vital considering initiatives like the recently awarded Italian government's Marine Eco-

system Restoration (MER) Project, which aims to restore the marine habitats, fortify the national system for observing marine and coastal ecosystems, and comprehensively map coastal and marine habitats across Italian waters (specifically seagrass meadows).



Fugro

## They Said It Couldn't Be Done: Low loss RF cable assemblies with 6km open face pressure resistance

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## THE ON&T INTERVIEW

VideoRay has operated at the forefront of underwater robotics for almost 25 years now and in that time has established an industry-leading portfolio of ROV systems in use across the ocean industries for a wide range of missions including homeland security, search and rescue, infrastructure inspection, and more. We recently sat down with CEO Chris Gibson to get his exclusive take on VideoRay's role in the evolution of inspection class ROVs.

### 1 **ON&T: To what do you attribute VideoRay's unique success in the marine robotics space?**

**CG:** For the past 25 years, VideoRay's success has been rooted in our commitment to listening and working with our customers to solve their challenges by applying and developing new VideoRay technology. Their satisfaction is everything to us. Our early ROVs were quite different from the solutions we offer today. VideoRay was one of the first in the market to deliver small, lightweight remotely operated vehicles

primarily for underwater visual inspection tasks. We sold thousands of these vehicles around the globe, developing a strong reputation for exceptional service and reliability.

As our customers' applications became increasingly complex, we developed technology and established partnerships with best-in-class companies to meet their needs. These companies provided tooling and accessories, addressing our customers' challenges and evolving requirements.

It was around this time that we were approached by the US Navy to fill a gap in



with Chris Gibson  
CEO



their available technology. To address this, we created our Mission Specialist Defender underwater robot, which was ultimately selected as the vehicle of choice for the US Navy's Maritime Expeditionary Standoff and Response (MESR) program. We have been awarded over \$50 million in contracts to date for this program, with additional orders to follow. This shift in technology and focus has driven our sales and significant growth over the past several years, with more exciting opportunities on the horizon.



CUSTOMERS CAN NOW UTILIZE LOWER COST, LOW LOGISTICS INSPECTION CLASS ROVS TO TACKLE MISSIONS THAT PREVIOUSLY REQUIRED EXPENSIVE WORK CLASS VEHICLE SOLUTIONS.



☛ The modular design of the Defender offers operators extended utility. (Credit: Rich Arrietta – NIWC Pacific)

## 2 ON&T: What makes the Mission Specialist series so unique?

**CG:** The unique strength of our Mission Specialist technology lies in empowering our customers in new ways. While we pride ourselves on delivering reliable, high-quality products, we understand the unpredictable nature of the marine environment. Unlike many companies, we don't view repairs and spares as a profit opportunity. Instead, we've revolutionized the repair process, enabling our customers to swiftly replace modules themselves, which delivers operational continuity and reduced downtime. This unique approach ensures that whether on an offshore oil rig, a renewable energy site, or a defense operation, our customers can swiftly address issues and keep their missions on track and on budget.

Our Mission Specialists have also been designed with an open architecture, which allows customers to integrate a wide array of accessories and technologies, vastly expanding the capabilities and applications. Customers can now utilize lower cost, low logistics inspection class ROVs to tackle missions that previously required expensive work class vehicle solutions.

## 3 ON&T: What does the future hold for this category of ROV?

**CG:** With the growing popularity of unmanned systems, the future of inspection class vehicles holds immense promise. While many sectors will benefit, the

defense and security industries stand out as prime opportunities.

As technology evolves, we anticipate significant advancements, including umbilical-free ROV operation—already on trial and expected to revolutionize underwater missions. Enhanced data collection capabilities, facilitated by advanced sensors and tooling, will also allow our customers to gather information and fuse data together into 3D point cloud models which they can use for change detection.

This trend will also fuel the development of more intelligent, autonomous systems, streamlining operations and improving mission effectiveness. This progression aligns with our commitment to innovation, which is highlighted by our acquisition of Blue Ring Imaging last year. This technology offers customers a transformative shift, allowing users to experience missions in a virtual 3-dimensional space, fostering greater precision, collaboration, and immersion.

Our VideoRay Labs advancements will also enable unprecedented mission collaboration. Experts will be able to contribute remotely, optimizing decision-making and problem-solving in real time, regardless of their physical location. We envision a future where autonomous underwater robots not only excel in performance but also facilitate seamless global collaboration, redefining underwater exploration and operations.

## 4 ON&T: What sort of custom options does VideoRay offer?

**CG:** VideoRay is known for its custom design and configuration services. Our modular approach allows users to easily swap interchangeable modules and system accessories. This flexibility is fed by our close partnerships with many of the industry's most innovative and reliable sensor and technology manufacturers, which greatly expands our capabilities.

From navigation to sonars, cameras, tooling, and other mission-specific payloads, our customizable approach means every vehicle can execute on its specific mission requirements. We encourage manufacturers to reach out to us if they have new potential payload innovations that will enable new capabilities.

## 5 ON&T: What does 2024 hold for the VideoRay team?

**CG:** VideoRay is excited about our innovation and advancement in 2024. Our focus remains on enhancing the capabilities of our underwater robots.

One significant development on the horizon is the introduction of our Ultra 4K Smart Camera technology. This new technology represents a significant leap forward in underwater imaging, offering unparalleled clarity and precision for our customers. Embedded with a subsea processor, this cutting-edge camera system will deliver superior image quality and unlock many additional future features and functionalities. Looking further ahead, we're excited about the potential for stereo cameras and multi-camera systems, which will further improve our customers' perception capability, and their ability to navigate with 360-degree situational awareness to explore underwater environments with confidence.

In late Q1, VideoRay will also launch a new 12" diameter underwater robot we've named Ally. This new vector vehicle boasts a 4-knot speed, 21-pound lift load and shares the same modular design and common parts for field compatibility with our other Mission Specialist underwater robots and topsides. It's exciting times at VideoRay, with a robust 5-year roadmap that promises significant new technology advancements to follow.

# SCANREACH LAUNCHES NMEA NODE TO ADVANCE NAVIGATIONAL SENSOR DATA

ScanReach, a leader in advanced maritime technology solutions, has launched a new innovative NMEA Communication Node. This new development is set to revolutionize the accessibility of navigational sensor data for the shipping industry which will help empower shipping companies to optimize their operations and simultaneously elevate safety standards across the industry.

The NMEA (National Marine Electronics Association) protocol refers to a standard communication format developed by the National Marine Electronics Association for the marine industry. Particularly the NMEA 0183 is primarily used for data exchange between various marine electronic devices such as GPS receivers, anemometers, speed logs, autopilots, and other navigational instruments.

The ScanReach NMEA Communication Node, a pivotal addition to the ScanReach portfolio, integrates flawlessly with the ScanReach Onboard Wireless Connectivity (OWC) network. This integration enables the wireless transmission and sharing of essential navigational data, allowing vessels to relay critical sensor information to both onboard systems and shore-based operations.

Additionally, the NMEA Node supports integration with shipping companies' existing reporting platform through an Application Programming Interface (API). Alternatively, ScanReach-provided applications can be used.

Distinctively, the NMEA Node offers a solution for shipping companies seeking to access and utilize navigation sensor data with ease and efficiency. This innovation builds upon the success of ScanReach's ModBus node, further extending the capabilities for real-time data application within the maritime sector.

Tor-Erik Rong, Chief Business Development Officer at ScanReach, said: "The launch of our NMEA Node is a testament to our ongoing



Stolt Tankers installs wireless onboard network for improved data access. (Credit: ScanReach)

commitment to transforming maritime data management. This solution not only streamlines the process of accessing and disseminating navigational sensor data but also provides unmatched adaptability and convenience. It allows shipping companies to integrate critical navigation information seamlessly into their preferred software systems."

Engineered for effortless integration, the NMEA Node can be easily incorporated into existing Onboard Wireless Connectivity (OWC) systems. Its design allows for the combination of multiple nodes, thus offering flexibility in accessing a comprehensive range of real-time sensor data. This data is crucial for maintaining safe and efficient maritime operations.

The NMEA Node's capabilities extend to enhancing the functionality and precision of electronic logbooks, emission/regulatory reporting, Vessel Performance Optimization (VPO) platforms, and various fleet management software.

## CONSTRUCTION OF OTEC STRUCTURE BEGINS IN THE CANARY ISLANDS

Work began in March on an innovative structure that will advance floating Ocean Thermal Energy Conversion (OTEC) technology in severe weather-prone regions. Developed under the EU-funded project PLOTEC, the scaled platform is expected to be installed in the upcoming months in a testing site in the Canary Islands, Spain.

The structure consists of three main parts: a cylindric hull, a cold-water riser pipe, and a gimbal connection point. The cold-water riser pipe is being fabricated in Austria by AGRU and the cylindric hull, the largest element of the installation, is under construction at Hidramar Shipyard, in Gran Canaria,

with delivery scheduled for June.

Once the fabrication phase is concluded, the 1:5 prototype will be assembled and installed in the Oceanic Platform of the Canary Islands (PLOCAN), at around three kilometers from the coast. During its lifetime, the platform will be subjected to the conditions of the Atlantic Ocean for about 12 months. Computer simulations and a scaled tank test in London last year have already affirmed the functionality of the envisioned OTEC structure.

The project findings will contribute to marine engineering design and novel mate-

rials, as well as computational modelling, improving the accessibility of OTEC technology and the design and materials available to other offshore floating energy and marine devices.



Simulation of the full floating OTEC weather resistant structure. (Credit: PLOTEC)

# OCEAN INFINITY TO OPEN ROBOTIC SHIP CENTER IN AUSTRALIAN ISLAND STATE OF TASMANIA

Tasmania is poised to chart a new course in maritime innovation with the arrival of Ocean Infinity, a global leader in marine robotics. Thanks to support from the Government of Tasmania, the Australian island state is on the brink of entering a new era in safer, more environmentally sustainable marine operations.

Ocean Infinity, renowned for its groundbreaking ocean exploration and marine robotics solutions, is set to transform maritime operations across sectors including government, telecommunications, energy, and science and research. The international company believes that robotic technology is the key to safer and more environmentally responsible operations at sea.

David Field, Ocean Infinity's Managing Director in Australia and New Zealand said: "This new Operations Center in Tasmania will give us a more established infrastructure to deliver hydrography services for

the Government and of course also provide capacity to take on more work in this high growth region. Ocean Infinity has already demonstrated that the use of robotics can make for more sustainable operations in Australian waters. In a recent data project for the Government, our robotic vessels collected 58% of the total data but contributed just 4% of the total fuel CO<sub>2</sub> emissions."

The Australian Operations Center is only the latest step in a worldwide roll-out, with centers already operational in the UK and Sweden, and planned for Singapore and another Asian location yet to be announced. Ocean Infinity will soon embark on the search for suitable premises in Hobart.

Ocean Infinity plans to operate the first in its fleet of 36-m Armada ships from the Australian Operations Center. These ships are ideally suited to large-scale hydrography work, enabling the work to be conducted with fewer people at sea and with far

fewer emissions than a conventional ship.

Premier and Minister for State Development, Trade and the Antarctic, Jeremy Rockliff, commented: "Ocean Infinity's decision to establish its robotic ship Operations Center in Hobart highlights the state's strong economy and growing prominence as a hub for maritime innovation."

"Ocean Infinity's establishment will deliver up to 50 new full-time jobs, providing highly skilled positions in the maritime and technology sectors, strategically aligning with Tasmania's competitive advantages."



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# SIGNIFICANT REDUCTION IN CO2 EMISSIONS REPORTED BY ORCA AI PLATFORM

Comprehensive analysis by maritime technology company Orca AI shows that its market-leading automated situational awareness platform achieved significant operational gains for clients in 2023, including a 172,716-ton reduction in CO2 emissions and fuel savings, thanks to fewer sharp maneuvers and speed drops, as well as an overall reduction in the number of potential incidents and collisions avoided.

The analysis was carried out on 15 million nautical miles-worth of data collected in open waters by 267 customer vessels—comprising tankers, containers, dry bulk carriers and Ro-Ro vessels—equipped with the Orca AI platform.

With an increase of 26% in average minimum distance sailed, the fleet as a whole also saw an overall 33% reduction in close encounters in open waters and a 40% decline in crossing events.

Each ship experienced an average of two close encounter events per 1,000 nautical miles sailed. These were assessed against KPIs including closest point of approach (CPA), time to closest point of approach (CTPA), reaction time, average speed over ground (SOG), average cross-track error, and weather conditions.



"Achieving these consistent operational improvements from year to year validates our continuing vision to work in partnership with top-tier shipowners and operators to create a safer and more efficient shipping industry," said Orca AI's CTO and Co-Founder Dor Raviv.

"We remain committed to supporting our forward-thinking customers in ensuring safe navigation in congested waters, reducing the work burden on watch officers also during long voyages in open water, and reducing Opex costs thanks to reduced fuel consumption. Safety, efficiency, and emissions reduction are crucial in terms of not only corporate sustainability targets but also maintaining CII scores for ships. We're proud that our platform has become an invaluable asset that brings significant operational benefits at a reasonable cost," Raviv added.

The Orca AI platform comprises the onboard SeaPod lookout unit which is equipped with high-resolution daylight cameras and thermal cameras providing an unmatched field of view (FOV) of 225 degrees. The computer vision data they generate is then fused with other sensor data from existing sensors onboard the vessel and displayed on a user-friendly interface on the bridge that identifies and tracks marine objects in real time, providing alerts and recommendations to support safe navigation. All events are available in real time to shore via the FleetView platform. Fleet managers can also use the platform to spot trends, monitor navigational behaviors, investigate anomalies, and isolate events for training purposes.

"Using the platform enables vessel masters, officers, and fleet managers to work together in a dynamic way to achieve tangible performance improvements for individual vessels and across a fleet. Reducing fuel consumption and emissions while mitigating the potential risk and costs of safety incidents, downtime and reputational damage is a win-win for all concerned," Raviv said.

"And we look forward to achieving even better results in the coming 12 months."

## EXAIL LAUNCHES NEW INS FOR UNMANNED UNDERWATER VEHICLES

Exail has announced the launch of its latest product, the Phins 9 Compact. This new compact high-performance inertial navigation system (INS) is designed for all unmanned underwater vehicles and offers the market's highest blend of navigation performance, reliability, and Size, Weight, and Power (SWAP) efficiency.

The Phins 9 Compact is built around a high-performance Fiber-Optic Gyroscope (FOG)-based Inertial Measurement Unit (IMU) with advanced accelerometers, making it the most compact high-performance INS available in the market. With compact dimensions, a DVL-aided position accuracy of 0.1% TD, and a power consumption of

less than 7 W, it is particularly suited for compact subsea vehicles operating in demanding applications with low power requirements.

"The Phins 9 Compact represents a significant advancement in subsea navigation technology," stated Maxime Le Roy, Sub-sea INS Product Manager at Exail. "With a heading accuracy of 0.07°, pitch & roll accuracy of 0.01°, it offers exceptional reliability and navigation precision, even in the most challenging environments. The Phins 9 Compact is an ideal solution for new generation AUV manufacturers and e-ROV operators looking to save power without compromising on data processing capabilities."



# UTEC TRIALS GAVIA AUV UPGRADES IN WATERS OFFSHORE WESTERN AUSTRALIA

UTEC, a geo-services brand in Acteon's Data and Robotics division conducted a day of Gavia autonomous underwater vehicle (AUV) trials off Fremantle in Western Australia. The AUV has recently undergone significant upgrades and the addition of new modules including the subsea ultra-short baseline (USBL) aiding the vehicle inertial navigation system (INS) positioning.

The trial tested the AUV in its reconfiguration and provided further training for the local crew with the support of UTEC's AUV specialists from the UK.

Following on from the training and trials completed since the AUV arrived in Perth at the end of 2022, UTEC has finalized a significant program of upgrades and improvements of the system which has included INS/Doppler velocity log (DVL) modules (PHINS C3 and Pathfinder DVL); battery modules increasing mission endurance from six hours to twelve; cNode USBL modules and nose cone enabling USBL tracking, aiding acoustic communications to the AUV; and incorporating a new eight-megapixel camera in the nosecone.

The control modules also received upgrades including calibration of depth and sound velocity (SV) sensors and a firmware upgrade.

The most significant upgrade, however, is the addition of the module that enables subsea USBL aiding of the vehicle INS positioning. This means the vehicle does not need to surface periodically to update the internal position and account for INS/DVL drift, creating efficiencies by allowing the vehicle to remain subsea and on task for the full 12-hour mission endurance as well as allowing use of the full 1,000 m depth rating.

Previously, the requirement for the vehicle to return to the surface to update real-world position using Global Positioning System (GPS), meant that the deepest that the AUV had worked was 100 m; anything deeper was too inefficient with the time spent diving and surfacing to update the position in deeper waters.



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# THYSSENKRUPP TO PROVIDE SIEMENS ENERGY WITH CO2-REDUCED ELECTRICAL STEEL

thyssenkrupp Electrical Steel has received the largest ever order from Siemens Energy for bluemint® powercore® to equip around 700 transformers in offshore wind turbines from its wind business Siemens Gamesa—a record order for thyssenkrupp Electrical Steel.

The two frontrunners in decarbonization intend to lead the decarbonization of the electricity industry and as well to secure capacity of CO2-reduced steel, enabling a resilient and sustainable supply chain for the energy transition.

bluemint powercore realizes the CO2 reduction by using a specially processed scrap recycling product in the blast furnace at the thyssenkrupp Steel site in Duisburg. This technological change will result in an absolute reduction of CO2 emissions at the Duisburg site, because less coal is needed for the reduction process in the blast furnace.

Using a mass balance approach, only the scrap-based production route in the blast furnace is considered. TÜV Süd confirmed this approach in accordance with the VERI-steel procedure and certified bluemint Steel as a product with a reduced CO2 intensity. With this approach, thyssenkrupp Steel can already offer CO2-reduced products today. However, the aim is to make the entire production process climate-neutral

with the tkH2Steel transformation project. To this end, thyssenkrupp Steel is building a direct reduction plant at the Duisburg site, which will also save CO2 emissions on a global scale from 2027 by using hydrogen and renewable electricity.

The project is a double benefit for climate protection in Europe: In the future, even more green electricity will be generated in offshore wind turbines, while at the same time the CO2 footprint of manufacturing transformers in the wind turbines will be reduced through the use of the highly efficient grain-oriented electrical steel bluemint powercore.

The cores of transformers in offshore wind turbines are made of grain-oriented electrical steel. This special steel enables transformers to operate with a high level of efficiency, transforming electric energy with as little loss as possible. The lower the iron losses of the electrical steel, the higher the efficiency.

This is key when it comes to meeting increasing demand for electricity and the need to generate more power from renewable sources. They ensure that the green electricity is efficiently converted from low to medium voltage and fed into the local power grids via high-voltage lines or underground cables with low losses. Siemens Energy will manufacture the 700 transform-



ers made of bluemint powercore at its Weiz plant in Austria. They will later be used at Siemens Gamesa's offshore wind power plants in Germany, UK, and France. The first project equipped with these CO2-reduced transformers will be Ocean Winds' Moray West offshore wind farm, in the UK. Ocean Winds develops, finances, builds, and operates offshore wind farms all over the world. With this project, Ocean Winds not only reduces greenhouse gas emissions in the generation of electricity, it now tackles the CO2 emissions of the equipment itself.

The project is a milestone in the collaboration between thyssenkrupp Electrical Steel and Siemens Energy to drive the future energy transition with climate-friendly top-of-the-line products within Europe. thyssenkrupp Electrical Steel has established itself as a key technology partner for CO2-reduced, grain-oriented electrical steel—the company already supplies an up to 50 percent CO2-reduced steel product based on alternative feedstocks in the manufacturing process.

## DEME INSTALS FIRST XXL MONOPILE FOR MORAY WEST OFFSHORE WIND FARM

DEME Group (DEME) has announced that its offshore installation vessel Orion has successfully installed its first XXL monopile foundation at the Moray West offshore wind farm in Scotland. DEME's scope includes both the installation of monopiles and transition pieces. Using vibro hammer technology, DEME is minimizing the environmental impact from vibrations.

DEME's jack-up vessel *Apollo* is joining the effort, taking care of installing the transition pieces. *Apollo* previously demonstrated its expertise in Scottish waters by installing the pin piles for the jacket foundations at the neighboring Moray East wind farm in 2020.

Located off the east coast of Scotland, the 882 MW Moray West wind farm, developed by OW Ocean Winds, will have the capacity

to power up to 1.3 million homes in the UK, making a significant contribution to the country's renewable energy goals.



DEMÉ

# BOEM APPROVES EMPIRE WIND CONSTRUCTION AND OPERATIONS PLAN

In support of the Biden-Harris administration's goal of deploying 30 gigawatts of offshore wind energy capacity by 2030, the Bureau of Ocean Energy Management (BOEM) has announced its approval of Empire Wind's Construction and Operations Plan (COP), which authorizes construction and operation of the wind energy project offshore. This is the project's final approval from BOEM, following the agency's Record of Decision approving the project in November 2023.

"We are proud to announce BOEM's final approval of the Empire Wind offshore wind project," said Director Elizabeth Klein. "This project represents a major milestone in our efforts to expand clean energy production and combat climate change. The Biden-Harris administration is committed to advancing offshore wind projects like Empire Wind to create jobs, drive economic

growth, and cut harmful climate pollution."

The approved plan includes construction and operation of two offshore wind facilities, known as Empire Wind 1 and Empire Wind 2. The lease area is located about 12 nautical miles (nm) south of Long Island, NY, and about 16.9 nm east of Long Branch, NJ. Together these projects would have a total capacity of 2,076 megawatts of clean, renewable energy that BOEM estimates could power more than 700,000 homes each year.

On November 21, 2023, the Department of the Interior announced its approval of the Empire Wind offshore wind project, which is the sixth commercial-scale offshore wind project approved by the Biden-Harris administration. It is expected to generate significant economic benefits for New York and the surrounding region, including supporting over 830 jobs each year during the

construction phase and about 300 jobs annually during the operations phase.

Since the start of the Biden-Harris administration, the Department of the Interior has approved the nation's first six commercial-scale offshore wind energy projects. BOEM has held four offshore wind lease auctions, which have brought in almost \$5.5 billion in high bids, including a record-breaking sale offshore New York and New Jersey and the first-ever sales offshore the Pacific and Gulf of Mexico coasts. BOEM has also advanced the process to explore additional opportunities for offshore wind energy development in the Gulf of Maine, Gulf of Mexico, offshore Oregon, and the Central Atlantic coast. The Department has taken steps to evolve its approach to offshore wind to drive towards union-built projects and a domestic-based supply chain.

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# SIMULATING SUBMARINES

An unrivaled tool for Anti-Submarine Warfare training

Submarine simulation by SEMA. (Credit: RTsys)



**Pierre-Alexandre Caux**  
Business Director

**RTsys**  
Underwater Acoustics & Drones

TO CREATE REAL-WORLD SIMULATIONS, NAVIES NEED AN UNDERWATER SOLUTION THAT PROVIDES OPERATORS AFFORDABLE, REALISTIC, AND QUICK-TO-ACCESS TRAINING ANYWHERE IN THE WORLD...

**R**Tsys, founded in France in 2010, has emerged as a trailblazer in the ocean industry, setting new standards and achieving remarkable milestones by delivering acoustic systems tests and training, torpedo firing exercises, and acoustic signature measurements to Navies around the world.

From its inception, the company has dedicated itself to enhancing trust in underwater technology, a journey that has been defined by innovation, resilience, and a commitment to excellence. Today, the company is part of the SeaVorian group, which has more than 30 years of experience in providing equipment for both marine and naval operations and is now recognized as one of Europe's leading names in ocean tech development.

## ASW TRAINING TARGETS

The tracking of enemy submarines is an essential task for navy frigates, helicopters, and maritime patrol aircraft (MPA). However, training personnel is expensive. Similarly, training time with submarines is limited and expensive. Therefore, in recent years, Anti-Submarine Warfare (ASW) training targets have become a more accessible, cost-effective means of sharpening the required tactical skills in the field.

To create real-world simulations, Navies need an underwater solution that provides operators affordable, realistic, and quick-to-access training anywhere in the world and one that operates on every low-frequency active and passive sonar. Over the last decade, client requirements have been

uniform: drones must accurately simulate a submarine during training; they must be cheap, portable, reusable, and give a realistic acoustic response within their peripheral frameworks. In response, SEMA was created in 2015 and continues its ongoing development.

## A RECOVERABLE ASSET

SEMA is an autonomous, recoverable, acoustic target dedicated to ASW training. It is designed to be operable from all kinds of platforms, such as surface ships, submarines, helicopters, and ASW aircraft. Rapid to deploy from both a RHIB (rigid-hull inflatable boat) or a vessel, its navigation route is plotted with waypoints or segments. Different types of training modes can be programmed, such as passive, active, and



combined acoustics. As well as being easy to launch, operate, and recover, SEMA is reconfigurable in one hour with a spare battery.

The two-meter-long SEMA is highly portable, weighing in at a mere 33 kilograms. It offers unrivaled acoustic and kinematic performances while keeping the strong skills of a light target easy to deploy and recover from any kind of watercraft (from RHIB to frigate). SEMA can navigate down to 300 meters depth during 24 hours at 4 knots and up to 1.5 hours at 15 knots to simulate evasive maneuvers at full speed.

Thanks to its secured, high-capacity battery (which is easily rechargeable on board), navigation skills combined with GPS repositioning also offer optimal and increased surface localization conditions at the end of the mission.

#### ACOUSTIC TRAINING

SEMA offers several types of acoustic training capabilities: acoustic echo-repeater: (1 to 33 kHz) with 5 bands for active sonar frequency and 2 bands for active homing torpedo; 6 Narrowbands: 200 Hz to 38 kHz; 2 Broadbands: 450 Hz to 8 kHz and 10 to 23 kHz; and an acoustic recorder with data encryption.

These acoustic features allow the armed forces to train in authentic conditions, as

if identifying and tracking a submarine by offering an acoustic signature simulation and response to latest-generation LFA sonars and homing torpedo heads, putting crew at the heart of operational scenarios by surprising it with kinematic escapes.

#### CONTINUOUS IMPROVEMENTS

Various enhancements have been made to the platform over the years following direct feedback from Navies that have been using SEMA for a decade now, including but not limited to French, Dutch, Belgian, and Indonesian forces.

Continuous improvement efforts to date have centered around safety of use, safety in transport and onboard (UN38.3 air transport compliance and IATA certified), data security, UHF surface localization module, escape capability, magnetic anomaly detection, or constantly evolving functionalities of the user-friendly and intuitive HMI.

SEMA's modular design architecture allows RTsys to respond to customers' specific needs, such as integrating custom buoyancy for freshwater training or different battery configurations for longer endurance missions or quicker turnaround times (recharge and redeploy).

A NATO-preferred tool for ASW training, SEMA has become the gold standard solution for efficiently simulating a submarine



Real-world training between naval assets and active submarines is an expensive pursuit; ASW training targets bring a cost-effective and highly mobile solution to teams in the field. (Credit: RTsys)



SEMA is 2 m long, weighs 33 kilograms, and can dive to 300 m for 24 hours at 4 knots. (Credit: RTsys)

while giving every operator the capability to debrief its exercises.

Also used as a dynamic tool for sonar range prediction and torpedo firing exercise of the latest generations (e.g., MU-90, A244-S, Mark54, F21, etc.), RTsys recently announced the current production of a significant quantity of targets to be delivered in 2024, and several contracts are still under discussions with high-level Navies.

[rtsys.eu](https://www.rtsys.eu)

# WAVE ENERGY BREAKTHROUGH FOR CORPOWER OCEAN WEC

CorPower Ocean's C4 Wave Energy Converter (WEC) has completed the first cycle of the ocean commissioning program at the Aguçadoura site in northern Portugal.

Now proven at commercial scale—at the exposed Atlantic test site—CorPower Ocean's C4 device has demonstrated unique ability to tune and detune according to varying sea states, limiting response to extreme storm waves (up to 18.5 m) while amplifying motion and power capture in regular waves using novel phase control technology.

The progression marks a crucial milestone for wave energy addressing the two major obstacles which have hampered commercial adoption to date—survivability and efficient power generation in normal ocean conditions.

The inflection point provides a firm signal of wave energy's readiness for widespread adoption.

Since deployment in August 2023, all key aspects of the C4 system functions have now been successfully verified, including power export to grid, automated control, and monitoring of the system as well as safe Operations and Maintenance (O&M) methods.

The collected data allowed calibration of the digital twin, an extensive numerical model used to predict the system behavior. Measured motion and power output data from the machine operating



CorPower

with novel 'WaveSpring' phase control has slightly exceeded predictions by the digital twin for the machinery settings used.

The first operational phase has been successfully concluded by disconnecting and towing the C4 device back to CorPower Ocean's on-land base in Viana do Castelo for its first planned maintenance cycle. This demonstration of efficient O&M methods is a key goal of the C4 deployment program, to support scale-up to utility scale wave farms in the future.

After completing a first on-land check-up and maintenance cycle, C4 will be re-deployed at the Aguçadoura site, and the demonstration program continued.

## QATARENERGY ANNOUNCES LNG EXPANSION TO INCREASE PRODUCTION CAPACITY BY 85%

QatarEnergy has announced that it is proceeding with a new LNG expansion project, the "North Field West" project, to further raise the State of Qatar's LNG production capacity to 142 million tons per annum (MTPA) before the end of this decade, representing an increase of almost 85% from current production levels.

H.E. Mr. Saad Sherida Al-Kaabi, the Minister of State for Energy Affairs, the President and CEO of QatarEnergy, made the announcement during a press conference held at QatarEnergy's Headquarters in Doha.

Speaking at the press conference, H.E. Minister Al-Kaabi announced that extensive appraisal drilling and testing have confirmed that productive layers of Qatar's giant North Field extend towards the west, which allows for developing a new LNG production project in Ras Laffan.

H.E. the Minister said: "QatarEnergy has focused its efforts and attention on determining how far west the North Field's productive layers extend in order to evaluate the production potential from those areas. We have continued geological and engineering studies and have drilled a number of appraisal wells in that area."

H.E. Minister Al-Kaabi also announced the presence of huge additional gas quantities in the North Field estimated at 240 trillion cubic feet, which raises the State of Qatar's gas reserves from 1,760 to more than 2,000 trillion cubic feet, and the condensates reserves from 70 to more than 80 billion barrels, in addition to large quantities of liquefied petroleum gas, ethane, and helium.

H.E. Minister Al-Kaabi added that QatarEnergy will immediately commence the basic engineering works necessary to ensure that

the planned progress is achieved according to the approved schedule for this new project, which will be called the North Field West project.



# FPSO BUILT FOR EXXONMOBIL SUCCESSFULLY LEAVES DRYDOCK

SBM Offshore's fourth unit destined for Guyana—the FPSO ONE GUYANA—has successfully left drydock and has now moved along quayside at the Seatrium yard in Singapore. Joining her soon will be three topsides modules, completed at SBM's JV partner yard QMW in China, which are currently in transit. As construction continues, the project team is preparing for installation and integration of the topsides' modules at quayside.

The FPSO is being constructed for ExxonMobil Guyana, and in 2025 will join three other SBM Offshore-operated FPSOs currently producing in Guyanese waters. The FPSO ONE GUYANA builds on the experience to date of three preceding FPSOs—*Liza Destiny*, *Liza Unity*, and *Payara Prosperity*. Her design is based on SBM Offshore's industry leading Fast4Ward® program that incorporates the Company's new build, multi-purpose hull and several standardized topsides modules.

FPSO ONE GUYANA has been designed to produce approximately 250,000 barrels of



oil per day, with an associated gas treatment capacity of approximately 450 million cubic feet per day, and water injection capacity of approximately 300,000 barrels per day. The FPSO will be spread-moored in water depth of around 1,800 meters and will be able to store around 2 million barrels of crude oil.

The project is part of the Yellowtail offshore development, which is the fourth development within the Stabroek block, circa 200 kilometers offshore Guyana. ExxonMobil Guyana Limited, an affiliate of Exxon Mobil Corporation, is the operator and holds a 45 percent interest in the Stabroek block. Hess Guyana Exploration Ltd. holds a 30 percent interest, and CNOOC Petroleum Guyana Limited holds a 25 percent interest.

## BAKER HUGHES WINS WELL SERVICES CONTRACT

Baker Hughes, an energy technology company, announced a significant contract award from Petrobras for integrated well construction services in the Buzios field, offshore Brazil.

The integrated services project is set to start in the first half of 2025 and will



include drilling services, drill bits, wireline, cementing, wellbore clean up, fishing, remedial tools, fluids, services, and geosciences. Baker Hughes will provide these services across three rigs over the course of the multi-year contract.

To date, in addition to providing drilling, completions and wireline services in the Buzios field, the company has supplied WAG manifolds (water and gas) and more than 240 kilometers of flexible pipes, including production lines, gas lift, water injection, and gas injection flexible pipes for use in 2,000-meter water depth.

Baker Hughes also supplied turbomachinery for 10 of the 11 FPSOs.

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Eyes, How Do  
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# ENERGY MARKET TRENDS

Diverge for specific reasons



**G. Allen Brooks**

ON&T's Offshore Energy Expert



Energy Musings

[energymusings.substack.com](https://energymusings.substack.com)

## CRUDE OIL

Price volatility continues in the crude oil trading pits. Besides the issues of hotter-than-anticipated inflation data, continued strong monthly jobs growth, and continuing geopolitical disruptions of the global oil market, traders also are confronting the reduction of commodity assets under management. In other words, traders have less money with which to trade as investors turn to other investment options. Less money contributes to volatility as fewer traders are active and bid-asked spreads widen.

Recently, crude oil prices strengthened with WTI nearing \$80 a barrel. Global oil market forecasts suggest more oil will be needed this year, but the increase will be half of 2023's growth.

OPEC+ continues to hold the global oil price reigns by continuing to restrict its supply. The disruption of Middle East oil shipping routes due to Houthi missile and drone attacks is disrupting the market. Rather than transiting the Red Sea and Suez Canal, oil tankers must travel around Africa to be safe, adding weeks to their journeys, boosting transportation costs, and delaying the arrival of oil cargo in Europe.

With non-OPEC oil-producing regions showing slowing supply growth, including the US, the future supply and demand picture is again being examined. In the very short term, OPEC+ is the only option. Occidental Petroleum CEO Vicki Hollub told CNBC

recently, "We're in a situation now where in a couple of years' time we're going to be very short on supply." Her view is based on the lack of reserve replacement experienced during the past decade.

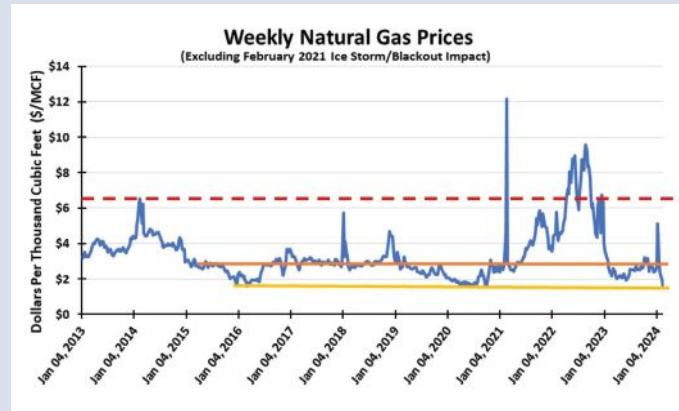
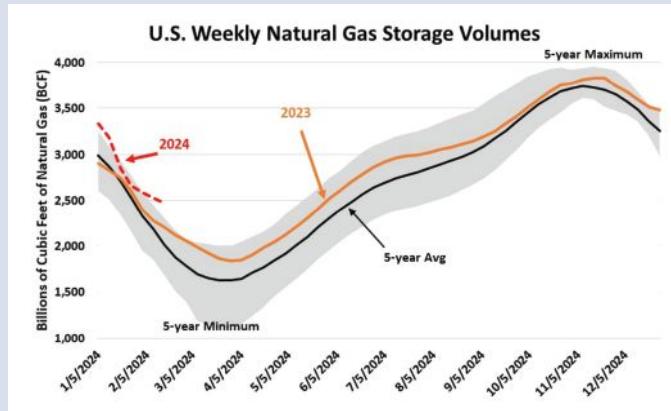
The latest concerns about future oil supply growth involve two divergent factors. First, explorationists suggest that once the huge Guyana and Brazil deepwater discoveries are developed, they do not see other prospects with similarly large reserves.

The second issue is receiving greater attention because it is in the financial news headlines: M&A. The oil and gas industry is in an active phase of industry consolidation. While the merger and acquisition wave began at the top with ExxonMobil and Chevron buying competitors with specific assets highly complementary to each acquirer's strategic business plan, it is now moving down the industry pyramid.

ExxonMobil added to its Permian Basin acreage which increases its ability to grow production via applying its shale oil technology to more wells. Chevron purchased Hess Corporation which adds several producing assets with the key one participation in Guyana's huge reserves.

Lately, the industry's M&A is enabling small and mid-sized exploration and production companies to increase scale, improve balance sheets, and better position themselves for growth while boosting financial returns. These ingredients will be important for

## NATURAL GAS MARKETS ARE DESPERATE FOR COLDER OR HOTTER WEATHER





US gas storage is flirting with a 5-year maximum.

the industry to increase output to meet the world's needs. What our chart shows is how dramatically the US oil industry has been able to increase production over the past decade. This growth has changed the energy profile of the United States and helped restrain global oil prices.

The conditions that have made oil prices more volatile are not going away anytime soon. They may never go away. However, the industry is demonstrating that growth at any cost is a poor business strategy. A better one is to adopt a disciplined investment plan with reduced financial leverage. The latest M&A wave confirms that these principles are being embraced for the good of shareholders and the public.

### NATURAL GAS

The ending of devastating cold weather along with surging gas storage volumes caused natural gas futures prices to crash—hitting a decade-low of \$1.52 per thousand cubic feet. In early February, gas prices fell below \$2/Mcf in response to forecasts of an early arrival of spring weather, the federal government's pause of new liquefied natural gas export terminal approvals, and sustained high gas output. Things only got worse, resulting in the recent price crash.

Jeremy Knop, CFO at EQT, the nation's largest gas producer told investment analysts on an earnings call, "The market is asking for not only production curtailments, but also activity reductions," in response to the collapsing gas futures price. EQT responded by reducing its production.

Additionally, two other large gas producers—Comstock Resources and Antero Resources—announced they were dropping active drilling rigs, cutting their exploration budgets, and one company

also suspended its dividend in response to the low gas prices. They indicated reversing these actions depends on higher prices.

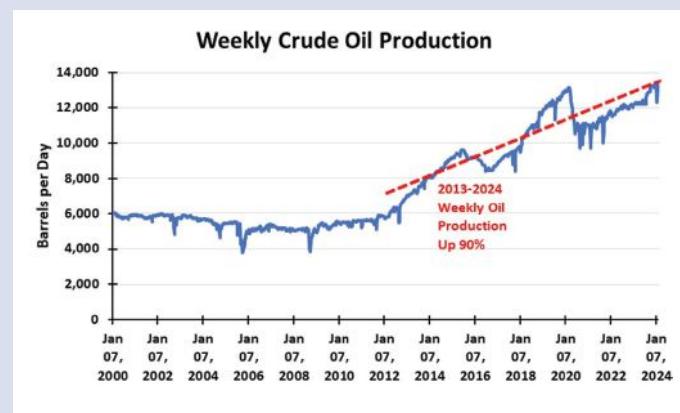
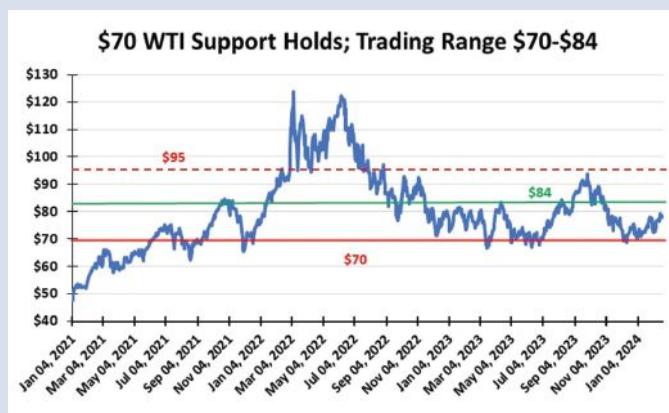
Remarkably, on the same day gas futures touched their decade-low price, major producer Chesapeake Energy announced cutting back on completing wells and reducing capital spending. Management commented that the actions were responding to an "oversupplied" gas market, but they are prepared to "return production in a measured fashion" in response to an improvement in demand which they expect will come.

Gas prices jumped 12 percent the following day along with a seven percent rise in Chesapeake's stock price. Investors believed gas prices had hit bottom and would provide higher prices in the future. They point to the announced actions of these large gas producers to slow supply growth. It will be only a matter of time before prices recover, they believe.

Our chart of gas storage shows volumes flirting with the 5-year maximum. This reflects the absence of winter demand that has left the industry with substantially more gas in storage, which reduces the need for more supplies to store for next winter. The US gas storage problem is compounded by high storage levels in Europe and Japan, key gas-consuming markets. Japan's situation has developed as it restarts its nuclear power plants and reduces LNG purchases.

The problem gas producers confront is the absence of weather-related demand as they are gearing up their productive capacity for the "step change in demand in 2025 as incremental LNG capacity comes online," as explained by Chesapeake's CEO. Expect natural gas prices to continue to struggle until the heat of summer arrives and demand potentially soars.

### SHORT AND LONG TERM SUPPLY/DEMAND CONCERNs CREATE VOLATILITY



# EMPIRE WIND 1 AWARDED OFFTAKE CONTRACT IN NEW YORK'S FOURTH SOLICITATION ROUND

New York State Energy Research and Development Authority (NYSERDA) announced Equinor's Empire Wind 1 project one of the conditional winners in its fourth offshore wind solicitation round.

The award is an important milestone for the advancement of the project, which can deliver 810 megawatts (MW) of renewable energy to New York. An already highly mature offshore wind project, Empire Wind 1 targets to deliver first power to New York in 2026.

Equinor and NYSERDA will now negotiate an Offshore Wind Renewable Energy Certificate (OREC) Purchase and Sale Agreement, with contract execution expected within Q2 2024.

Subject to signing of the OREC contract with NYSERDA, the project is expected to deliver forward looking real base project returns within the guided range for renewable projects of 4–8%. Following a final investment decision expected mid-2024, Equinor plans to use project financing, with financial close anticipated by end of 2024.



Equinor

Full-cycle nominal equity returns for the US East Coast offshore wind investments is currently expected within the range of 12–16%. Equinor also intends to bring in a partner to enhance value and reduce ownership share and exposure.

Empire Wind 1 has already achieved several key permitting milestones, including approval of its Construction and Operations Plan (COP) from the Federal Bureau of Ocean Energy Management, and its Article

VII Certificate of Environmental Capability and Public Need from the New York Public Service Commission.

On January 25, 2024, Equinor announced a swap transaction with bp, under which Equinor will take full ownership of the Empire Wind lease and projects and bp will take full ownership of the Beacon Wind lease and projects. This transaction is subject to regulatory approval and closing of the transaction is expected in Q2 or Q3 2024.

## WINTERSHALL DEA COMPLETES APPRAISAL WELL ON THE ADRIANA DISCOVERY

Wintershall Dea and its partners, Petoro, Aker BP, and PGNIG, have successfully completed an appraisal well on the Adriana gas and condensate discovery in the Norwegian Sea. They are now evaluating potential development options.

The appraisal well, drilled with the Transocean Norge rig, encountered high-quality reservoirs in the primary target within the Cretaceous Lysing Formation. Following the completion of the well, the estimated recoverable volumes for the Adriana discovery have been revised upwards, from an initial 19–31 million barrels of oil equivalent (boe) to a new estimate of 28–43 million boe.

"Our exploration strategy, as a subsea specialist, focuses on investing in areas close to existing infrastructure, where we already have a sound understanding of the geology and potential development options. This improves the possibility of fast-tracking discoveries into new subsea developments. The promising results from the Adriana appraisal well put us in a strong position to consider potential development strategies for this discovery," said Roy Davies, VP Exploration & Subsurface for Wintershall Dea Norway.

The Adriana discovery was made in 2021, as part of a multi-level discovery including the Dvalin North gas field, which is already being developed as a subsea tie-back to the Heidrun platform via the Wintershall Dea operated Dvalin field. The discovery lies 270 km north of Kristiansund on the west coast of Norway, in the Haltenbanken area of the Norwegian Sea close to the Dvalin, Aerfugl and Skarv fields.



Wintershall Dea

# RWE AND SMART WIRES SIGN MOU TO PARTNER ON OFFSHORE WIND CONNECTIONS

RWE, a leading player in offshore wind, and Smart Wires, a grid enhancing technologies and services provider, have signed a Memorandum of Understanding to collaborate on investigating the use of advanced power flow control technology, SmartValve™, on long High Voltage Alternating Current and Direct Current (HVAC or HVDC) cable circuits to support offshore generation connections. The investigation will focus on acceleration and minimization of the need for additional onshore and offshore grid infrastructure.

Renewable energy generation projects often need significant grid upgrades or new infrastructure before they can be connected, in order to reliably transport the electricity from the generation site to demand centers. Such grid projects involve high capital costs, take many years to permit and build, and have a high risk of significant delays and cost overruns. These challenges are further heightened for offshore generation connections that must be seamlessly integrated with the onshore meshed transmission network and often require new offshore grid to be built.

Grid enhancing technologies such as Smart Wires' advanced power flow control—SmartValve—provide the potential to quickly and cost-effectively increase transmission capacity, improve stability margins and reduce lead times for some key equipment both

onshore and offshore. In addition to unlocking capacity by redirecting power flows to push power off overloaded circuits or pulling power onto underutilized circuits, the investigation will also focus on the capability of SmartValve for offshore cable management and power regulation.

RWE and Smart Wires have entered into a MOU to explore the potential use of SmartValve within RWE's offshore wind development projects. This will enable the companies to work together to investigate the capabilities of advanced power flow control technology to support integration of offshore wind generation using either AC or DC technology.

SmartValves are deployed by leading utilities in Europe, the US, Latin America, and Australia, delivering over 3.5 GWs of extra capacity and over one billion in cost savings to customers. SmartValve is a patented, single-phase modular Static Synchronous Series Compensator (SSSC) that injects a voltage in quadrature with the line current to synthesize a capacitive or inductive reactance, meaning it can push power off overloaded lines or pull power onto underutilized. It also provides a range of dynamic services including improving voltage stability and transient stability, which deliver additional benefits to the grid operator.

## ECHO81 AML OCEANOGRAPHIC CALIBRATION CENTER NOW OPEN

ECHO81 is excited to unveil the first and only Calibration Center in the United States for AML Oceanographic Ltd. equipment at ECHO81 HQ located in Hartwell, GA. This expansion aims to better serve customers in the United States and Latin America, offering efficient, fast, and accurate calibration services for AML Oceanographic equipment.

The newly established facility at ECHO81 HQ is equipped to handle the complete range of sensors and provide service for all instrumentation product lines. Customers can now access comprehensive in-house services locally, including troubleshooting, diagnostics, general repair, and calibration for optimized and accurate sensors, along with part replacement.

"We are thrilled to bring AML Oceanographic's renowned calibration services closer to our customers in the United States and Latin America," said Damon Wolfe, President of ECHO81. "With our state-of-the-art facility at ECHO81 HQ in Hartwell, GA, customers can expect prompt and reliable calibration services that ensure their AML Oceanographic equipment performs optimally and maintains its longevity."

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# BEHIND THE SCENES OF FREEDOM

Equipping warfighters calls for closer collaboration between DoD agencies and industry partners



**Dawn F. Massa Stancavish**

President/CEO & Chief Innovation Officer



**W**hen we think of Defense & Security, it's easy to overlook what specifically goes into supporting such a massive operation. Perspective is also a huge factor; oftentimes people take a small nugget of information and embellish it in accordance with their own presumptions, opposed to challenging their beliefs or digging deeper to ascertain, process, and ultimately understand facts. We are all guilty of this to some extent. We don't always appreciate our freedoms, and the price we pay for this isn't fully

understood. As the adage goes, people "don't know what they've got 'til it's gone," and cannot necessarily grasp the full magnitude of efforts supporting the simple things we take for granted.

As we go about our daily life, we owe so much to the dedicated, collective work of others. The reality is that there's an immense and highly orchestrated behind the scenes effort, bridging front-line operations with underwater and hidden-in-plain-sight initiatives that involve various agencies within and outside of the DoD that rely on individuals and teams of

THE HARD TRUTH HERE; AS PRECIOUS AS FREEDOM IS, IT IS NOT AS STABLE AS WE BELIEVE, AND NEITHER ARE THE FORCES CHARGED WITH ITS PROTECTION.

military, agents, civilians, and industry.

The hard truth here; as precious as freedom is, it is not as stable as we believe, and neither are the forces charged with its protection.

## COLLABORATION NEEDED

Although the DoD and industry often work together, seldom is it done efficiently and cost-effectively. However, this has not always been the case. There is a significant difference between wartime and peacetime procurements and acquisitions. There are a lot of legally acceptable ways the DoD and various departments could better utilize innovative partners.

Contrary to common practice and popular belief, the government (in some cases) has the power to conduct business like a business. They executed this power in WWII, and again during the Reagan Era's 600 ship Navy. The discussions revealed, at HASC 2024.02.15 Full Committee Hearing: Outpacing China: Expediting the Fielding of Innovation, where Dr. William LaPlante, Ms. Heidi Shyu, and Mr. Doug Beck testified, that improvement is overdue between DoD and industry

players. There is a great need for advancement with innovation and manufacturing. The Submarine Industrial Base office of the Navy was also set up in recent years to assist the much-devastated American manufacturing base.

However, the truth is only found by those who seek it, and therefore we must listen intently to all such testimonials with a sieve to separate the ideas that work from those that do not.

In Defense News, "*The Pentagon wants industry to transform again to meet demand. Can it?*" by Noah Robertson, described the situation that occurred in 1993 to shrink the defense base and decrease military spending. A task that had ignored the lessons learned from WWII, that so many lived and died to ensure that we would never forget.

"America needed a defense industry built for peacetime. So arrived the Last Supper, a name Augustine himself gave the 1993 dinner. Even at the time, he said, it appeared to be sound policy. Defense spending was bound to fall, leaving the Pentagon with two choices:



CTO Don Massa (left) and CEO/CINO Dawn Massa Stancavish (right) with Torpedo. (Credit: MASSA)



a sprawling industry versus a smaller, more efficient one."

#### PROTOTYPES X PAPERWORK

Except, instead of increasing efficiency, it increased bureaucracy. They had forgotten that in peacetime, the best way to preserve peace is to prepare for war. Worst of all, this act spawned the inertia that we seek to overturn today. Freedom suffers in a world where paperwork comes before prototypes, and people are incentivized to avoid mistakes opposed to stiving for excellence.

Furthermore, today large businesses and venture capitalists are still gobbling-up smaller companies. This doesn't churn out the desired results—capabilities and key personnel are often lost in the transaction. However, there are a few independent innovative companies still standing. Small businesses like Massa continue to lead in their technology and their manufacturing capabilities.

Many professionals in the Defense realm have read the book *Freedom's Forge* by Arthur Herman. It tells the story at the macro-level of what occurred in America leading up to "readiness" during WWII. This out-

lines how the Navy had to shift from peacetime to wartime mentality very quickly. It also spells out how leaders had to choose what was proper over what was popular. It illustrates how Masters of Industry were the behind-the-scenes heroes that supplied the warfighter in their missions.

#### MASSA'S ENDURING VISION

There are likely several lesser-known micro-level stories that exist that tell how more sophisticated technological advancements were ramped-up swiftly and put into production. One such micro-story is that of how Massa's founder, Frank Massa, worked directly with Admiral Furer as Industry Point of Contact during WWII to create hundreds of necessary sonar designs and produce quantities in the thousands of each design to win the war.

Admiral Furer was empowered to make decisions and he had the courage to act rationally opposed to bureaucratically. By cutting the red tape—the sailors, soldiers, and flyers were able to get the tools they needed in real time. Following WWII, Admiral Furer was asked to author a book to preserve the history of what was done

then, so we would not have to suffer as a nation in the future. That is, of course, what history is supposed to be used for—to prevent damaging events from repeating. Yet, sometimes in our complex societal systems, we miss the warning signs. The geopolitical stages have been set, and things are in motion.

However, there are still some of us left who want more and will not give up. We are dissatisfied with the mundane and want desperately to spend our time doing everything in our power to improve our world. We're today's innovative leaders, and we're the companies that are truly indispensable. We're the businesses that will find each other and are the places where those wanting meaningful careers will gravitate.

It is time to rely again on the captains of industry as Furer did. We need businesses like Massa, that want to collaborate and create sophisticated innovations that can be mass-produced in real time for our warfighters.

[massa.com](http://massa.com)



▲ RADM Julius A. Furer's commitment to collaboration enabled the US to quickly advance the state of SONAR technology and give the advantage back to Allied Forces in WWII. (Credit: MASSA)



▲ Company Founder Frank Massa developed over 200 types of SONAR transducers and oversaw the production of thousands under the direction of Admiral Furer during WWII. (Credit: MASSA)

# MERMAID AND MCS GROUP SIGN MOU WITH ENERGYPATHWAYS TO PROVIDE FEED SERVICES

Mermaid Subsea Services (UK) has signed a Memorandum of Understanding (MOU) with EnergyPathways and MCS Group, through its UK subsidiary MCS Subsea Solutions, to advance the development of the Marram field.

Under the terms of the agreement signed on February 9, 2024, Mermaid and MCS Group have agreed to jointly undertake FEED, project support, procurement and offshore construction services to EnergyPathways, the owner and operator of the East Irish Sea project.

As part of the work scope, EnergyPathways has already contracted with MCS and Mermaid in respect of initial work orders, the results of which will allow the company to define the scope of the final contract in due course.

Marram represents the first UKCS development on which MCS and Mermaid will collaborate from FEED to commissioning and deploy proven technology that can reduce development costs and delivery cycles.

MCS and Mermaid specifically plan to access fit for purpose vessel solutions and use NOV Tuboscope Zap-Lok, a mechanical interference fit connection system, for the submarine pipeline. A globally proven and approved technology since the early 1990s, more than 7,500 km of the system has been installed and has been shown to

save up to 40% in installation costs in shallow water relative to other approaches.

The Marram development plan will also facilitate the use of diverless connection systems for shallow water, thus reducing the risks associated with the use of divers for the pipeline tie-in operations.

Scott Cormack, Regional Director for Mermaid Subsea Services UK, said: "Delivering on the UK Government's strategy of Maximising Economic Recovery of offshore oil and gas reserves, while also ensuring an orderly transition to net zero, is core to Mermaid's business, and this agreement is further evidence of that. Marram is a low emission, high reward field, and we look forward to working with EnergyPathways and MCS to make this project a reality."

Alasdair Cowie, MCS Group Business Development Director, added, "The collaboration between MCS Group, Mermaid Subsea and EnergyPathways not only highlights our technical capabilities, but also underscores the commitment to providing reliable and cost-effective solutions for the offshore energy sector. This we plan to be our first pipeline installation project in the UKCS deploying the Zap-Lok™ mechanical connector and our SDDC diverless connection system, following successful deployment in 2020 offshore Malaysia."

EnergyPathways is the operator of Marram,



From L-R Graeme Marks, Director & Co-Founder, EnergyPathways; Scott Cormack, Regional Director, Mermaid Subsea Services UK; and Charlie Hughes, Pipelay Services Manager, MCS Group. (Credit: Mermaid Subsea Services)

which is a short cycle low emission gas field, and is progressing the project towards Final Investment Decision (FID). The project concept envisages a simple low-cost two-well subsea tieback development with first production targeted for 2025.

Commenting on the signing of the MOU, EnergyPathways' CEO Ben Clube said: "The signing of this MOU is an important step in ensuring the necessary subsea expertise and project support capabilities are in place to deliver the Marram Project utilising cost-effective and timely project delivery solutions. The Marram Project will provide affordable and reliable low emission energy to the UK market, while offering security of energy supply and commercial returns to our investors."

## NEW OPITO COURSES FOR ERRVs INTRODUCED BY STREAM MARINE GROUP



Stream Marine Group

Stream Marine Group (SMG) is expanding its OPITO approved training portfolio to include ITSO (Initial Training in Shipboard

Operations) for crews onboard Emergency Response Rescue Vessels (ERRVs).

The UK's leading maritime training provider is expecting to receive approval by the end of April to deliver the Offshore Petroleum International Training Organization (OPITO) ITSO course which will mark its entry into the ERRV market.

The course is a blend of emergency medical training and Fast Rescue Craft (FRC) familiarization required by all crew working onboard vessels in this sector.

SMG plans to further add to its portfolio of training courses with the OPITO FRC Boatman and FRC and Daughter Craft Coxswain courses, designed for the boat teams onboard ERRVs.

The company, with training facilities in Glasgow, UK, is well placed to deliver both the Boatman and Coxswain FRC and Daughter Craft courses, as they are already well established in delivering MCA approved FRC and Proficiency in Survival Craft and Rescue Boats, both full and update courses.

# GTA INFELD PIPELAY SCOPE COMPLETED ALLSEAS' OFFSHORE CONSTRUCTION VESSEL

Pioneering Spirit has completed the infield pipelay scope for BP's ultra-deepwater GTA liquified natural gas project offshore Mauritania and Senegal. Two months after arriving in the field, production crew welded, scanned and field joint coated the final piece of pipe for the second 16-inch export gas line.

Safely landed in a 2-meter target box at 2,400-meter water depth, the pipeline will be recovered in J-mode configuration to install the termination assembly. To make this happen, the vessel aft has been fitted with a bespoke J-mode frame with a 1,000-ton load capacity. Designed, built, and installed on board in only eight weeks by their engineering and fabrication teams, it typifies Allseas "can do" mentality.

The pipelay scope comprises approximately 75 kilometers of 16-inch export lines and 10 kilometers of 10-inch CRA infield lines, some of the pipeline infrastructure exceeding 2,700 meters water depth at the deep end. To meet Allseas' own ambitious production rate, the main firing line and double jointing facilities on *Pioneering Spirit* have run in parallel throughout the campaign. *Pioneering Spirit* will conclude the offshore works by installing the six outstanding flowline termination assemblies.

Allseas Project Manager Laurent Beghin said: "Our Agile approach was key to a quick and efficient start to the project and decision-making process throughout the offshore campaign. Thanks to great collaboration between the onshore and offshore teams, we've overcome all challenges faced during the project preparation and execution phases and met all milestones without delay."



Allseas

## ROVOP PARTNERS WITH BOSKALIS TO DELIVER INTEGRATED SUBSEA SOLUTIONS

ROVOP, a global supplier of ROV services and the Aberdeen based Boskalis subsidiary Subsea Services, a leading subsea provider of IRM, Construction and Decommissioning services, announced a global partnership.

The partnership provides five diving support vessels (DSV) and one construction support vessel (CSV) of the Boskalis fleet, with dedicated ROV services to maximize service delivery, efficiency, flexibility, and capability.

The partnership will see the placement of seven ROVOP ROV systems across these DSVs and CSV for a minimum three-year period on an international basis. ROVOP will also mobilize additional ROV systems on an ad hoc basis as required.

ROVOP's diverse fleet of vehicles allows for varying configurations onboard the Boskalis Subsea Services fleet depending on the end client requirements. This partnership is an extension of an existing relationship, which sees significant cooperation between both companies both on and offshore.

Driven by increased demand and limited supply in the subsea market, this agree-

ment enhances supply chain reliability. Being enabled with the right ROV operated by the right skilled offshore personnel is key in delivering efficiency and consistency across projects.

Crucially, the placement of ROVs across the six Boskalis assets drives increased safety performance as the ROVs act as an additional visual support for diving operations. Furthermore, it enables the ability to carry out diverless tasks, such as cutting and recovery.

Stuart Cameron, Boskalis Subsea Services

Managing Director, said: "This collaboration not only strengthens our capabilities but aligns perfectly with the addition of the CSV Northern Ocean to our fleet, further solidifying our commitment to the North Sea and evolving needs of our clients."

Neil Potter, ROVOP Chief Executive Officer, added: "Boskalis Subsea Services are known for their strength in vessel and diving based service delivery and we believe our ROV service, delivered by our world class personnel, will be complementary and combine to offer a market leading solution to the global offshore energy industry."



ROVOP

# SULMARA TO REFIT HIGH-SPEC OFFSHORE VESSEL AFTER DEAL WITH ATLANTIC OFFSHORE



Subsea specialist Sulmara has made its biggest commitment yet to the renewable energy industry after signing a three-year deal with Atlantic Offshore to charter the 67 m DPhi multi-purpose support vessel *Ocean Marlin*.

Sulmara is undertaking a substantial refit of the vessel, including the installation of class-leading survey equipment, a subsea crane with active heave compensation, and the creation of extra bed space.

CEO Kevin McBarron said the decision to go down the unconventional yet pragmatic route of repurposing an emergency response rescue vessel (ERRV) aligns with Sulmara's ambitions to deliver work for clients that has as little an impact on the environment as possible.

"This deal is a step change for Sulmara as we continue to challenge conventions and find new ways of working to increase our capabilities and further support our clients in their projects and achieving their Net Zero targets," said McBarron. "Sulmara has proven the capabilities of uncrewed surface vessels (USVs) for certain offshore survey tasks and our vision is for their use to be widespread in the industry, but we recognize the current limitations of the technology."

"USVs are not the answer to all of our clients' needs and there is still a place for conventional ships. In partnering with Atlantic Offshore, we can bring a vessel that is as fuel efficient and environ-

mentally friendly as possible to the market. We had opportunities to charter older, less efficient vessels, but for our first long-term charter vessel, that does not align with our company vision, and we wanted to make the right choice."

"We'll be tracking the efficiency of the vessel throughout 2024, comparing emissions and fuel burn to existing and older assets in an effort to highlight the sustainability benefits of our solutions to both our clients and the wider industry."

Built in 2014, the *Ocean Marlin* is 2298GT, with ample deck space for a range of mobilized equipment and accommodation for 28 Sulmara and client personnel. She is likely to commence activities for Sulmara in late Q1 2024 and will initially operate on projects across Europe.

"Modern, environmentally friendly vessels to carry out this type of work are in short supply, and we are fortunate to have partnered with an agile organization like Atlantic Offshore," added Kevin.

"The multi-million-pound upgrade to the vessel includes installation of both WROV and ObsROV vehicles to complement a 34T AHC crane and a full survey and positioning spread, as well as further engineering upgrades to support the deployment of a wide range of fixed and towed equipment."

"We want the industry to reassess how it approaches all aspects of a project to maximize the potential environmental and commercial benefits. This design of ERRV is known for its superior seakeeping abilities in adverse weather conditions, further maximizing operational windows and reducing the duration of offshore projects."

"This is a big part of why we are refitting the *Ocean Marlin*, and we look forward to bringing this advanced vessel type to the renewables market."

Atlantic Offshore CEO Roy Wareberg commented: "We are excited by the plans Sulmara has for the *Ocean Marlin* and are delighted to partner with them. The vision shown by both organizations in transforming an ERRV is yet another example of how traditional oil and gas infrastructure can be repurposed to help the energy industry move forward."

## TDI-BROOKS COMPLETES GEOTECHNICAL SURVEY IN THE GULF OF CAMPECHE

TDI-Brooks, as a subcontractor of Dreibel de Mexico out of Cd. del Carmen, successfully and safely completed a geotechnical coring campaign. TDI-Brooks deployed its geotechnical coring tools and operators on the Laguna Azul. A total of one-hundred fifty-eight gravity CPT's (gCPT's) and eight T-Bar's in three pipeline corridors was performed.

The TDI-Brooks suite of innovative geotechnical tools is specifically tailored for soil sampling and measurement purposes. This includes

a wide range of equipment such as box corers (BC), piston corers (PC), gravity corers (GC), jumbo piston corers (JPC), vibracorers (VC/pVC), cyclic t-bar instrument (TBAR), deep-reaching Shelby tube samplers (SPLR), and piezocone penetrometers, including our CPT-Stinger and Gravity CPT tools (gCPT).

In addition to their offshore geotechnical sampling tool kits, TDI-Brooks also offers soil testing services through their in-house geotechnical laboratory.

# INTEGRATING AI AND UNCREWED SYSTEMS

A collaborative approach to optimizing remote systems

**T**oday's steady and successful integration of uncrewed and remote maritime systems into offshore operations across the ocean industry is clearly indicative of a sea change. The various developing technologies geared towards realizing the true benefits of autonomy—lower campaign costs, lower HSE risks, lower emissions, to name but a few—seek to enact a paradigm shift and challenge convention. However, a movement of this scale relies on more than a shared appetite among operators to trial and adopt new autonomous hardware and software—it hinges on the steadfast commercial collaboration needed to bring such packages to market.

ACUA Ocean, an ocean monitoring and protection innovator and uncrewed vehicle specialist, recently signed a commercial contract to integrate maritime leader Robosys Automation's ground-breaking Voyager Artificial Intelligence (AI) vessel control systems with its unique ACUA hydrogen-powered uncrewed surface vessels (H-USV).

The contract marks ACUA Ocean's ongoing commitment to further develop its range of

innovative long endurance hydrogen-fueled uncrewed surface vessels (USV) for open ocean monitoring and data collection, across the security, offshore energy, and marine conservation sectors.

## SEAMLESS FIT

Partnering with Robosys Automation, ACUA plans to undertake a phased approach of integrating the Voyager AI vessel control software with its hybrid electric and hydrogen propulsion systems. Robosys' Voyager AI is regarded as a world-leading maritime AI software, which delivers autonomous navigation and remote control for USV's control systems at various levels of autonomy with integrated collision, obstacle, and grounding avoidance; advanced situational awareness and decision aid support; and loss of communications (LOC) functionality for safe return to base.

ACUA's highly seaworthy offshore H-USV will deliver up to 40 days of endurance, meaning increased operational time on site and data collection through its novel modular sensor payload system. The integration of Robosys' solutions will provide navigational, platform controls, and supported decision aids, to deliver precise USV monitoring and protection to oceanic operations.

## TESTING CAPABILITIES

ACUA Ocean has deployed its first mobile Remote Operations Center situated at its Plymouth, UK headquarters, with vessel Harbor and Sea Acceptance Testing commencing in Q2 2024. This will rigorously evaluate its Small Waterplane Area Twin Hull (SWATH) design for seakeeping and maneuverability, as well as its unique hydrogen-electric hybrid powertrain and command, control, and communications systems.

ACUA Ocean's H-USVs are powered by RAD Propulsion's drive-by-wire 40 kW elec-

tric twin drives allowing clean and efficient control by third party systems such as Robosys. RAD's drives provide exceptional control and maneuverability.

Talking exclusively to ON&T, Nigel Lee, Chief Sales Officer of Robosys Automation, which is headquartered at the National Oceanography Centre in Southampton, UK, said: "Pairing the innovative and unique technologies offered by ACUA and Robosys stages the H-USV to be a leading disrupter for the offshore industry—never before has this pairing been available on the uncrewed surface vehicle market."

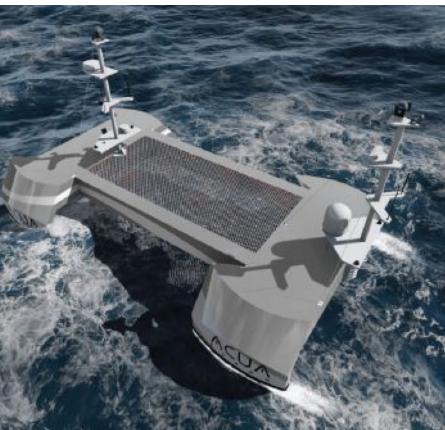
Through the partnership with Robosys, the H-USVs will operate to Workboat Code Edition 3, Annex 2, ROUV. Additionally, as part of the agreement, the companies will further collaborate in workshops with the Maritime Coastguard Agency and Lloyd's Register, aiming to obtain UK Flag and vessel class society certification of the ACUA H-USV with Robosys Voyager AI software.

[robosysautomation.com](http://robosysautomation.com)

[acua-ocean.com](http://acua-ocean.com)



Robosys Voyager AI systems will integrate into ACUA's USV technology to offer intelligent remote control. (Credit: Robosys)



ACUA Ocean and Robosys have signed a commercial contract to integrate Robosys' Voyager AI systems with ACUA's unique hydrogen-fueled USV. (Credit: ACUA)



In partnership with Oi24's Ocean-ICT, this month we profile the latest innovations in earth modeling, geo-data management, and team collaboration software leader—with Sequent.

Sequent offers innovative subsurface software solutions, including Oasis montaj, Leapfrog, Sequent Central, Imago, PLAXIS, Open-Ground, AGS' ResXDInv, and Workbench—which empower geoscientists with advanced tools for data processing, interpretation, and visualization. These solutions are crucial for the precise, efficient, and safer execution of offshore projects.

Sequent's innovative work stems from the comprehensive integration of geophysics and geotechnical portfolios to create integrated offshore ground modeling. This approach combines adaptive and interactive ground models with regional geological, geophysical, and geotechnical assessments.

This integrative approach enables Sequent's user community to perform geohazard assessments, drilling/shallow hazard assessments, engineering unit identification, ground-based risk identification and management, and more.

"The future of ocean-based ICT hinges on seamlessly integrating interoperable cloud-based solutions and advanced software tools to enhance sustainability, safety, and operational efficiency," said Matt Grove, Regional Manager, Environment for Sequent.

Read our exclusive interview with Sequent at [oceannews.com/take5](http://oceannews.com/take5)



## SEAJET COMPLETES SUCCESSFUL OFFSHORE TESTING IN THE UK

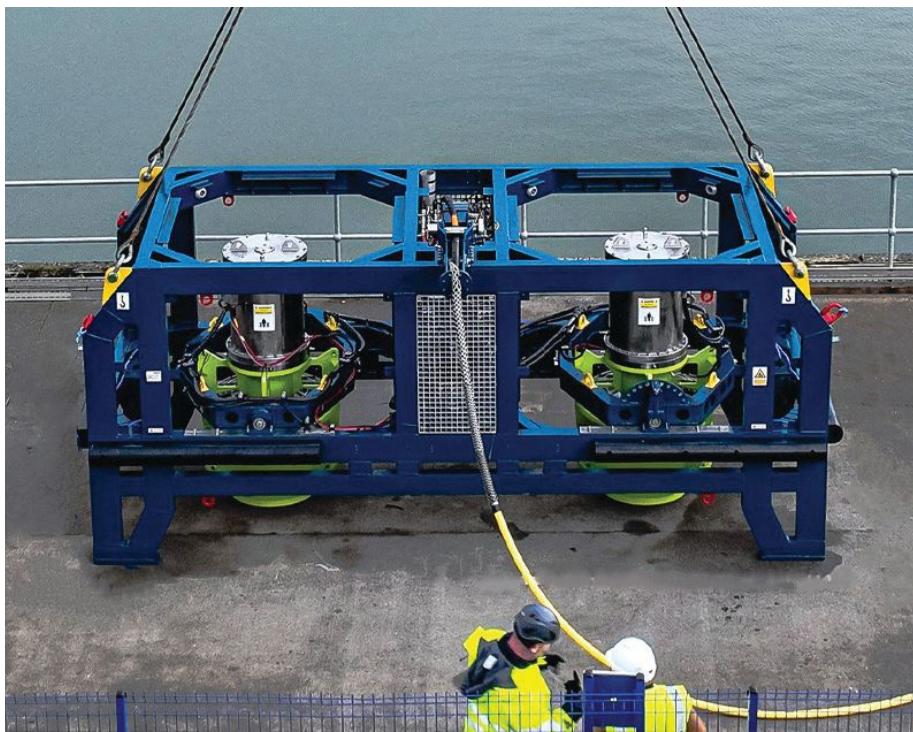
OEG Energy Group Limited, a leading offshore solutions business, recently announced that SEAJET Systems Ltd (SEAJET), an OEG Renewables company, has successfully wet tested its all-Electric Controlled Flow Excavation (E-CFE®) technology called HYDROMOLE. The 'wet test' was completed at ORE Catapult research center in Blyth, Newcastle in the Northeast of England and represents the final milestone in the development of the world's first all-electric twin CFE, which is now available for commercial deployment into the global subsea market.

This revolutionary HYDROMOLE E-CFE system is the most powerful and advanced system available in the market with the ability to deliver 400 kW of power to the seabed, independent of water depth. The advanced control system on the HYDROMOLE also allows system performance to be monitored and optimized in real-time, ensuring reliability and maximizing project uptime. In departing from industry standard older hydraulic technology, E-CFE also massively reduces CO2 emissions and fuel

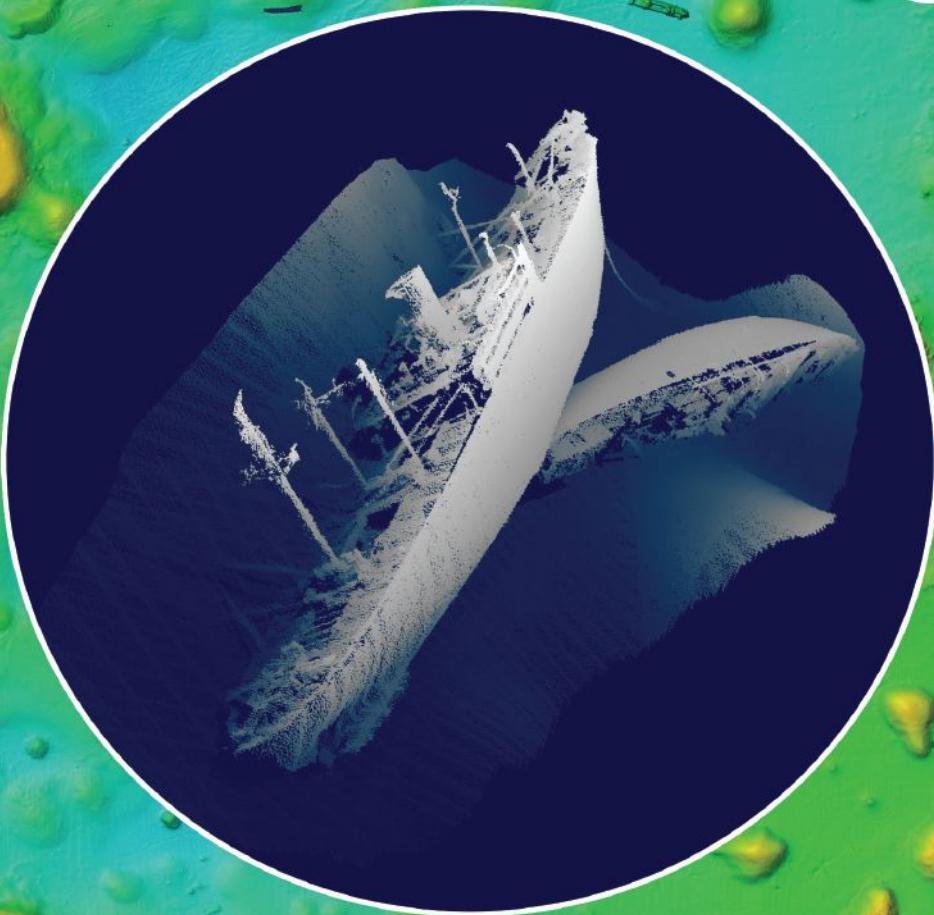
cost savings by 40% as well as eliminating the risk of high-pressure, high-volume oil spills into the marine environment.

The system has a wide range of applications across the full lifecycle of an offshore energy project, from pre-commissioning, construction, inspection, maintenance, and repair through to final decommissioning. The non-contact method of excavation and trenching allows for multiple applications such as seabed preparation, cable and pipeline trenching and backfilling, free-span mitigation and the deburial of subsea infrastructure.

OEG's multi-million-dollar investment, combined with SEAJET's management team who have unrivaled experience in this sector, and a manufacturing partnership with Soil Machine Dynamics (SMD) have resulted in the development of a transformational technology for seabed intervention. Being part of OEG also allows access to a global infrastructure of offices and facilities giving SEAJET the capability to provide HYDROMOLE to clients in strategic locations around the world.



▲ All-Electric Controlled Flow Excavation (E-CFE®) technology called HYDROMOLE. (Credit: OEG)



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# DEEPOCEAN TO INSPECT PIPELINES FOR EQUINOR UNDER NEW CONTRACT IN THE NORTH SEA

Ocean services provider DeepOcean has been awarded a contract by Equinor to deliver pipeline inspection and survey scopes on the operator's pipelines in the North Sea.

In addition to its extensive infield pipeline networks, Equinor also has operational responsibility for the world's most extensive subsea pipeline system for transportation of gas.

DeepOcean's scope of work includes pipeline inspections, seabed mapping, and ad-hoc pipeline survey and light construction work. The agreement is valid for 2024.

The latest contract is an additional award under DeepOcean's frame agreement with Equinor for the provision of offshore survey services. DeepOcean has not disclosed the value of the new contract.

"Equinor is the largest operator on the NCS and Europe's leading energy provider through both oil and gas and renewable energy assets. We are proud to continue to support Equinor with subsea services in the North Sea. We will utilize the vessel Edda Flora with our Superior Survey ROV to perform the survey work," said Trond Hagland, Commercial Manager—Survey & Inspection at DeepOcean.

The Superior Survey ROV provides unmatched ROV survey performance. Its hydrodynamic shape, power and modular design provides excellent operational versatility and data quality. The ROV is equipped with the latest navigation and sensor system technologies. Seamless integration with the ROV control system ensures stable and precise ROV flying capabilities, which translates to cost-effective, high-quality inspection and survey deliveries.

DeepOcean will manage the contract delivery out of its office in Haugesund, Norway, supported by the company's operation in Aberdeen, UK.



▲ Superior Survey ROV system.  
(Credit: DeepOcean)

## BLUE ORCA MARINE AND VALO JOIN FORCES TO PROPEL HYDROFOIL INNOVATION

Blue Orca Marine, a Canadian pioneer in zero-emission sustainable marine solutions, recently announced a strategic partnership with San Francisco-based VALO, a leading provider of innovative hydrofoil systems. This collaboration marks a significant step towards revolutionizing eco-friendly maritime transportation.

Under this partnership, VALO will provide Blue Orca with high-powered industrial hydrofoiling systems tailored to the ORCA vessel, an innovative 36-meter versatile commercial workboat powered by zero-emission hydrogen technology. VALO will contribute hydrofoil design expertise and proprietary foil stabilization software for the anticipated construction of 50 ORCA vessels by Blue Orca over the next decade.

ORCA sets new standards for utility workboat platforms, boasting a range of 1,000 NM, cruising speeds of 40 knots, a 375 square meter work deck, and a 300 metric ton payload. Designed as the "pick-up" truck chassis for mid-size marine workboats, ORCA's customizable deck can play a pivotal role in decarbonizing numerous coastal maritime sectors, including ferry/personnel transportation, short-haul high-speed freight, marine service & support, eco-tourism, and offshore energy operations.

Rich Robillard, CEO of Blue Orca Marine, remarked, "Our partnership with VALO will drive us closer to our vision of a sustainable and decarbonized maritime industry. Hydrofoils are integral to ORCA, making our long-term collaboration with VALO crucial."

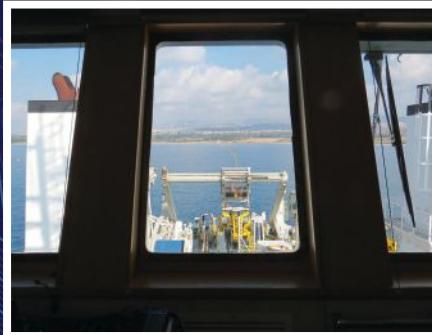
This collaboration leverages VALO's expertise in hydrofoil technology, known for its efficiency, performance, and delivering a quieter, smoother, and wake-free experience. By combining the power of hydrogen technology with hydrofoil efficiency, performance, and low wake disturbance, ORCA eliminates harmful emissions and reduces erosion in sensitive maritime ecosystems, contributing to a cleaner and greener future for marine transportation.

"We are excited to join forces with Blue Orca Marine to advance our hydrofoil technology in sustainable commercial marine workboats and transportation," said Ed Kearney, CEO of VALO. "Together, we aspire to redefine the possibilities of zero-emission hydrofoiling commercial vessels."



Blue Orca Marine

# DESIGN. DEVELOP. DEPLOY.



Integrating autonomous and remote systems from seabed to surface

**A**dvanced Ocean Systems (AOS) was founded in late 2021 with a singular mission: to support offshore operators with the custom engineering, manufacturing, and installation services needed to manage cradle-to-grave ocean systems projects. Today, as a Small Business, AOS offers a unique spectrum of capabilities designed to integrate autonomous and remote systems—from seabed to the surface—into the at-sea operations of the defense, offshore energy, subsea infrastructure, and scientific markets.

While a relatively new name to the market, AOS is backed by over 45 years of highly specialized marine engineering product design; more than 20 years of fielding breakthrough uncrewed marine technology platforms; and nearly 25 years of delivering complex subsea system integration and multistakeholder project management. Such weighty credentials, afforded the Group by its well-established businesses—SeaRobotics, Ocean Specialists, and Okeanus Science & Technology—allow AOS to establish a unique position in the ocean solutions space.

## HARNESSING CRITICAL EXPERTISE

"First and foremost, we are a capabilities company," explained AOS CEO John Jacobson. "While our affiliate companies are industry-recognized in their own right and will continue to operate as such, AOS is taking a proactive approach to bring cost-effective technical innovation and sys-

tems integration expertise to the field, be that a battlefield, offshore energy field, or any other marine environment."

Central to AOS ambitions is the steady introduction, integration, and expansion of autonomous and remote systems in the marine space. This is common ground to AOS' affiliate companies:

**SeaRobotics** offers both commercial-off-the-shelf USVs and fully custom options, with rapidly deployable, fully integrated models (SR Surveyor Class), mid-sized units designed to offer greater in-field versatility and pair with interchangeable payloads (SR Utility Class), and a series of larger USVs that maximize range and endurance in challenging waters (SR Endurance Class).

**Ocean Specialists** has completed over 200 international projects for government and commercial partners around the globe, designing and delivering end-to-end project management, supplier integration services, and the evaluation, planning, and installations of critical seabed infrastructure, such as submarine cable networks and subsea nodes.

**Okeanus** has fielded a growing range of heavy-duty winches and custom LARS to deploy and uncrewed surface vehicles (USVs), remotely operated vehicles (ROVs), and autonomous underwater vehicles (AUVs), as well as other subsea assets. In addition, Okeanus offers an extensive pool of leased equipment that can be mobilized quickly from strategic locations.

But it is the sum of these parts, and the cross-company synergies that AOS prioritizes in its collective offering, that demands attention.

## READY TO SERVE

"Naturally, there are many companies out there that promise a full range of engineering and fabrication capabilities," added Mr. Jacobson, "but we believe that AOS Group's track record in developing standard products and custom solutions for the ocean industry, developed over almost a century of collective corporate technology development, places us in a unique position to satisfy our customer's critical mission requirements, from seabed to surface, and from rapid prototyping to full-scale developments."

Following the January completion of AOS' acquisition of Ocean Specialists, the company is poised for take-off. After all, the rate at which the ocean industry embraces true autonomy will undoubtedly hinge on the capacity for trusted system developers to pool their refined talents to rapidly assess, develop, and scale practical solutions that effectively leverage the promise of remote operations. AOS is ready.

[i advancedoceansystems.com](https://advancedoceansystems.com)



# US NAVY ACCEPTS DELIVERY OF LCS AT AUSTAL USA'S SHIPYARD IN MOBILE

The US Navy accepted delivery of the future USS *Kingsville* (LCS 36) at Austal USA's shipyard in Mobile, Alabama, March 1, 2024. *Kingsville* is the 18th Independence-variant Littoral Combat Ship (LCS) constructed, and is the first ship ever named after Kingsville, Texas.

The LCS class comprises fast, optimally manned, mission-tailored surface combatants that can operate in both near-shore and open-ocean waters to counter 21st-century coastal threats.

*Kingsville* successfully completed Acceptance Trials in February 2024, marking the last significant milestone before a ship is delivered to the Navy. She will be commissioned later this summer, and will be homeported in San Diego, California.

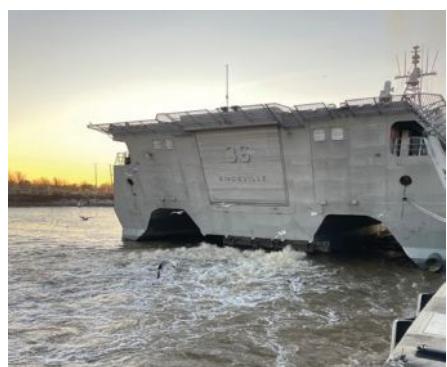
"The performance of *Kingsville* during this trial demonstrates a continuation of the

standard of excellence in the LCS class as a whole. We are thrilled by the quality of the ship and the performance of our partners at Austal," said Mr. Jonas Brown, deputy program manager of the LCS (PMS 501) program office, who was aboard LCS 36 throughout the trial events.

Following *Kingsville*, the future USS *Pierre* (LCS 38) is the last Independence-variant LCS still under construction at Austal USA, as the LCS production line approaches its planned closure.

The LCS class consists of two variants, *Freedom* and *Independence*, designed and built by two separate industry teams. The trimaran-hulled Independence-variant team is led by Austal USA (for the even-numbered ships). The monohull *Freedom* variant is built by a team led by Lockheed Martin (for the odd-numbered ships).

The Program Executive Office for Unmanned and Small Combatants (PEO USC) and the LCS Program Office (PMS 501) lead the Navy's efforts to integrate with joint, combined, manned, and unmanned teams to support forward presence, maritime security, sea control and deterrence missions worldwide.



▲ USS *Kingsville*. (Credit: US Navy)

## EDGE GROUP AND FICANTIERI TO MANUFACTURE NAVAL VESSELS



▲ Hamad Al Marar, EDGE Group CEO and Pierroberto Folgiero, Fincantieri CEO, sign a naval joint venture agreement. (Credit: EDGE Group)

EDGE, one of the world's leading advanced technology and defense groups, and Fincantieri, one of the largest shipbuilding companies in the world, have entered into a term sheet aimed at creating a joint venture (JV) to capitalize on global shipbuilding opportunities with a focus on the manufacturing of a broad range of sophisticated naval vessels.

EDGE will hold a 51% stake in the venture, which has a commercial pipeline valued at approximately 30 billion euros, with man-

agement direction provided by Fincantieri. The Abu Dhabi-based JV will be awarded prime rights to non-NATO orders, especially leveraging on the attractiveness of UAE G2G arrangements and export credit financing packages, along with a number of strategic orders placed by select NATO member countries.

At Palazzo Marina, Rome, Italy, in the presence of Matteo Perego di Cremona, Undersecretary of State for Defense, Admiral Enrico Credendino, Chief of the Italian Navy, Lieutenant General Luciano Portolano, Italian Secretary General of Defense/National Armaments Director, and, for Fincantieri, of General Claudio Graziano, Chairman, and of Dario Deste, General Manager of the Naval Vessels Division, the term sheet to create the JV was formalized through the signatures of Hamad Al Marar, Managing Director and CEO of EDGE Group, and of Pierroberto Folgiero, CEO and Managing Director of Fincantieri.

This agreement grants the JV strong cooperation to market its products with the

Navy of different countries in the world, underlining its global ambition and commitment to developing joint intellectual property and future designs. This strategic agreement significantly enhances EDGE's ability to design and build frigates and other large vessels, broadening its range of operations and marking a crucial advancement in the diversification of its maritime solutions portfolio. The JV also harbors ambitions to develop an underwater program for mid-size submarines. The incorporation of the JV is subject to a series of conditions precedent, customary for an agreement of this kind.

The JV will concentrate on sales, commercial operations, and engineering for design and service, taking charge of developing shared intellectual property and retaining exclusive rights to all future designs. Furthermore, the JV will set up a dedicated design authority, opening up opportunities for highly skilled Emiratis, and drawing in international expertise to support this innovative and strategic initiative.

# OCEANEERING SELECTED BY DIU TO DEVELOP UNMANNED UNDERSEA VEHICLE PROTOTYPE



Oceaneering

Oceaneering International, Inc. recently announced that its Aerospace and Defense Technologies (ADTech) business segment has been awarded a contract by the Defense Innovation Unit (DIU), a US Department of Defense organization, for the development and testing of the Freedom™ autonomous underwater vehicle (AUV) as a potential large displacement unmanned undersea vehicle (LDUUV) prototype for the US Navy's Program Office for Advanced Undersea Systems.

The contract includes a Manufacturing Readiness Review to assess current production capacity and tradeoffs that could be performed to speed LDUUV capabilities to the fleet.

The Freedom AUV recently completed a five-year test and development program, culminating in commercial operations beginning in 2023.

Its design incorporates unique features that make it well suited

for commercial and defense operations, including its multi-thruster design which provides six degrees of freedom in vehicle maneuverability.

With eight independent thrusters, Freedom supports mission success with its ability to conduct low altitude, precision operations in complex, critical subsea infrastructure environments.

Martin McDonald, Senior Vice President, Subsea Robotics, said: "Oceaneering is pleased to have been selected by the US Navy and the DIU for this program supporting the development of LDUUV capabilities. The Freedom AUV offers the flexibility needed to support mission critical operations and we are delighted to be recognized for the flexibility Freedom offers and its suitability to support an LDUUV prototype."

As the worldwide leader in subsea robotic services, Oceaneering used its remotely operated vehicle (ROV) database, encompassing over six million hours of operation, to identify several technology building blocks (thrusters, connectors, batteries, etc.) that are key to the performance and reliability of the Freedom AUV system. These technology building blocks were designed and tested to provide Freedom with a prolonged maintenance-free operating period, which enables sustained subsea operations.

Long duration, reliable performance in subsea environments requires mature maintenance and logistics systems. The Freedom AUV uses the same maintenance and logistics systems used by Oceaneering's fleet of work class ROVs, the largest in the world, which last year performed over 450,000 hours of subsea robotic services.

## AMENTUM WINS NAVSEA CONTRACT FOR FLEET ENGINEERING SOLUTIONS

Amentum has been awarded a \$591.6 million contract by the US Naval Sea Systems Command (NAVSEA) International Fleet Support Program Office (PMS 326) to deliver life-cycle support and other follow-on technical solutions and services to eligible allied international naval forces. This contract enables Amentum to deliver naval ship and systems engineering, maintenance, sustainment, and modernization capabilities to numerous allied navies.

"As a longtime partner for the US Navy, we enable technological advances and engineering solutions to provide important international fleet support and secure the interests of our nation and our allies around the world," said Jill Bruning, President of Amentum's Engineering, Science, and Technology Group.

Under this contract, Amentum will provide foreign customers access to security cooperation solutions and follow-on technical support (FOTS), including system upgrades, systems integration support, training, and efforts related to the transfer and acquisition, operation, and maintenance of naval vessels. We will use our

ShipTRAC enterprise resource planning system, ship and system technical expertise, and global supply chain management system to deliver advanced solutions to NAVSEA PMS 326 and their Foreign Military Sales (FMS) customers.

"We look forward to helping the Navy provide our trusted international maritime partners with leading edge sustainment and modernization solutions," said Jack Kasiski, Senior Vice President for C5I, Engineering and Training.



NAVSEA

# BABCOCK AWARDED CONTRACT FROM UK SDA TO RETROFIT VANGUARD CLASS NUCLEAR SUBMARINE

Babcock and the UK's Submarine Delivery Agency (SDA) have agreed a full cost recovery contract worth an estimated £560 million to undertake the planned deep maintenance and life extension program for HMS Victorious, one of the UK's Vanguard Class nuclear submarines.

The multi-year life extension program will deliver HMS Victorious back to the Royal Navy modernized and improved, enabling it to continue operational patrols well into the 2030s. Work on the submarine is already underway, following a commitment by the Department to authorize early-works from July 2023.

HMS Victorious is the second Vanguard Class submarine to undergo a life extension package at Babcock's Devonport facility. It performs a vital role as part of the UK's critical continuous at sea deterrent and represents one of the most complex pieces of engineering there is.

Babcock CEO David Lockwood, said: "Delivering the program for this vital and complex defense asset is our top priority. We are proud to have been awarded this complex defense program which will use our deep engineering expertise to help keep the UK safe."



HMS Victorious

Babcock's supports all of the UK's submarine fleet. The capability and experience gained through delivery of similar complex projects, combined with new ways of working, is being applied to deliver this important overhaul program at pace.

The program is being delivered at Babcock's facility in Devonport where a major infrastructure program is underway to ensure the future capability requirements of the Royal Navy and the submarine enterprise are met for decades to come from state-of-the-art facilities.

## ROYAL NAVY SUPPORTS SCIENTISTS IN TAKING QUANTUM TECHNOLOGY TO SEA

The Royal Navy's Office for the Chief Technology Officer (OCTO) recently supported experts from the University of Birmingham and Dstl to run quantum experiments that could pave the way for advanced positioning and navigation tools at sea.

In the latest round of testing, the technology was taken to sea on MOD cargo ship *Hurst Point* to see how the system would work in a real-life setting and to improve the effectiveness of the atomic performance.

Already proven to work on a vessel alongside, quantum navigation has the potential in the future to provide GPS-free navigation, making it less susceptible to jamming, imitation or other sabotage. A new type of accelerometer, it measures how an object's speed changes over time.

By combining this information with rotation measurements and the initial position of the object, the current location can be calculated. It uses ultracold atoms to make highly accurate measurements which, when

cooled to extremely low temperatures the atoms start displaying wave-like properties.

As the atoms move through the sensor, an 'optical ruler' is formed by using a series of laser pulses. This allows the acceleration of the atoms to be precisely measured.

By taking this technology to sea, OCTO, the University of Birmingham and Dstl were able to evaluate the effects of ship vibration, motion and acceleration which will lay further foundations for quantum mechanics as navigation systems.

Chester Butterworth, Deputy Chief Technology Officer and MOD Project Lead, said: "The convergence of the traditional sciences with quantum phenomena will greatly disrupt conventional technology across many operational capability areas, causing evolutionary and revolutionary change.

"Quantum technologies have the potential to solve some of Defense's most pressing problems, improve our operational advantage, and pave the way to new, [not] yet

realized opportunities.

"In this experiment, we are advancing novel navigational techniques towards a fully resilient satellite free capability."

The University of Birmingham project lead Professor Michael Holynski added: "We are excited to be leading this project which could pave the way for enhanced quantum capability for the Royal Navy."

"Building upon developments in the UK National Quantum Technology Program, including projects funded by the Engineering and Physical Sciences Research Council, Dstl and Innovate UK, this next phase of trials will provide the team with valuable insight into future real-world applications at Sea, and the associated challenges this presents."

The Royal Navy's Chief Technology Officer Brig Jamie Roylance and his team seek to capitalize on the burgeoning strength of UK quantum research to accelerate its potential uses at sea.

# NAVAL GROUP COMPLETES MODERNIZATION OF LAST FRIGATE OF LA FAYETTE TYPE

Naval Group completed the modernization of the third and last La Fayette frigate (FLF), the Aconit, after six months of work followed by a series of dockside and sea trials. With this delivery of the refurbished ship, Naval Group has concluded a major modernization program involving a series of three ships that now have new anti-submarine warfare capabilities and can continue to carry out their missions for five more years.

Notified to Naval Group in 2017 by the French General Armament Directorate (DGA), the contract to modernize the FLFs covered the three frigates Courbet, La Fayette and Aconit. In particular, the worksite made it possible to deal with a number of obsolescence issue, modernize several systems and add new capabilities.

Among the modernizations carried out, that of their combat system (CMS) led to the replacement of the original system by the SENIT developed by Naval Group. They have also renewed their optronic surveillance capabilities, improved their structural strength and stability, and replaced their Crotale anti-air defense system with two Sadral systems armed with the latest-generation Mistral very short-range ground-to-air missiles. With the addition of a hull sonar, the three FLFs now have anti-submarine warfare capabilities.



Naval Group

The sea trials phase, carried out after the work was completed, demonstrated the ship's maneuverability despite the increased displacement (several tons) and the addition of the sonar dome. It also confirmed that acoustic discretion levels were being maintained and that maximum speed targets were being met, as well as validating the integration of the sonar and the new combat steering system, which has improved performance.

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# PATROL BOATS FOR ROYAL AUSTRALIAN NAVY UNDER NEW AUSTAL CONTRACT

Austal Limited is pleased to announce that Austal Australia has been awarded a contract extension for the construction of two additional Evolved Cape-class Patrol Boats for the Royal Australian Navy.

The A\$157 million contract follows the procurement announcement made by the Commonwealth of Australia (CoA) on November 23, 2023, and brings the total number of Evolved Cape-class Patrol Boats being delivered to the Navy, under the SEA1445-1 Project, to ten.

Austal Limited Chief Executive Officer Paddy Gregg has reiterated the importance of the Evolved Cape-class Patrol Boats to both the Australian defense industry and the Royal Australian Navy.

"These additional Evolved Capes, designed and constructed by Austal in Henderson, Western Australia, are helping us to retain and build our sovereign, naval shipbuilding workforce and continue to engage supply chain partners from across Australia," Mr. Gregg said.

"The Evolved Capes are also enhancing the Navy's operations throughout Northern Australia, adding greater capability for



maritime surveillance and border patrols, as part of the ongoing Operation Sovereign Borders mission."

The SEA1445-1 project, initially constructing six 58-meter aluminum monohull patrol boats for the Royal Australian Navy from May 2020, was extended by two vessels in April 2022. The first five Evolved Cape-class Patrol Boats, *Cape Otway*, *Cape Peron*, *Cape Naturaliste*, *Cape Capricorn* and *Cape Woolamai* were delivered within an eighteen-month period, from March 2022. Following the sixth and most recent delivery, *Cape Pillar*, in October 2023, there are two Evolved Capes currently under construction.

The Evolved Cape-class Patrol Boats feature larger amenities to accommodate

up to 32 people, improved quality of life systems and advanced sustainment intelligence systems that further enhance the Royal Australian Navy's ability to fight and win at sea. The patrol boats are utilized for a wide variety of constabulary and naval missions and play a critical role in Australia's national security, as a high-performing, reliable and effective maritime asset.

In-service support for the Cape, Evolved Cape and Guardian-class Patrol Boat fleets operated by the Australian Border Force, Royal Australian Navy and Pacific Island nations is provided by Austal Australia through dedicated service centers located in Henderson, Western Australia; Cairns, Queensland; and Darwin, Northern Territory.

Austal Australia is also contracted to deliver 22 steel-hulled Guardian-class Patrol Boats to the Commonwealth of Australia under the Pacific Patrol Boat Replacement Project (SEA3036-1) and has delivered 18 vessels since 2018.

This ASX announcement has been approved and authorized for release by Paddy Gregg, Austal Limited's Chief Executive Officer.

## BAE SYSTEMS SIGNS SUPPORT AGREEMENT FOR DANISH CV90 FLEET



BAE Systems has signed a framework agreement with the Danish Ministry of Defense Acquisition and Logistics Organization (DALO) to provide repair and maintenance services for the Danish Army's CV90s over a period of 15 years.

Under the agreement, worth approximately

\$400 million, BAE Systems will provide an upgraded level of operability for the infantry fighting vehicles. The agreement covers repair and maintenance services for the Danish Army's fleet of 44 CV90s, such as the delivery of spare parts at a time when the service's operational tempo remains at a high level.

"This important agreement will secure the functionality of the Danish Army's fleet of CV90s and will ensure that they remain operating at a high capability level and tempo for many years to come," said Tommy Gustafsson-Rask, Managing Director of BAE Systems Hägglunds, the company which designs and builds the CV90.

"We are proud to deliver these critical capabilities to the customer."

The CV90 infantry fighting vehicle provides world-leading, combat-proven capability and commands the 20-38-ton class. It integrates a wide range of weapon systems, providing capability against a wide array of targets to land forces around the world.

With a total of 1,700 vehicles, in 17 different variants, in service or on order, the CV90 has covered more than eight million kilometers to date. Ten European nations, of which seven are NATO members, have selected the vehicle, and it has seen combat in Liberia, Afghanistan, and Ukraine.

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# THE NEXT FRONTIER

## Uncrewed Systems Integration



**Captain George Galdorisi**  
USN – retired

THERE IS ONLY ONE WAY TO COMPREHENSIVELY REMOVE THE SAILOR OUT OF THE MINEFIELD, AND THAT IS TO LEVERAGE UNCREWED TECHNOLOGIES TO HUNT AND DESTROY MINES AT A DISTANCE.

In an era of great power competition, uncrewed maritime systems (UMS) have begun to take center stage and are now on an accelerated development path for reasons that are clear. Like their air and ground counterparts, these UMS are valued because of their ability to reduce the risk to human life in high threat areas, to deliver persistent surveillance over areas of interest, and to provide options to warfighters that derive from the inherent advantages of uncrewed technologies.

While air, surface, and subsurface systems have undergone extensive evaluation in Navy and Marine Corps exercises, experiments and demonstrations, their development has been somewhat stovepiped, that is, these evaluations have typically occurred in just one domain. Given the new technologies that these systems represent, this "crawl, walk, run" approach has represented best-practices.

### MCM CONOPS

Today, that is changing. Operators have conjured up concepts-of-operations (CONOPS) where uncrewed systems in various domains have been evaluated together in Navy and Marine Corps events. Rather than speak in generalities, I will refer to a specific and recent event where uncrewed

systems in different domains were operated together with good success.

Mine-countermeasures (MCM) continues to be a vital mission for all navies. However, there is only one way to comprehensively remove the sailor out of the minefield, and that is to leverage uncrewed technologies to hunt and destroy mines at a distance.

During a comprehensive Navy exercise designed to evaluate the ability of uncrewed technologies to perform the MCM mission, the Navy harnessed together three commercial-off-the-shelf (COTS) systems to provide an end-to-end autonomous MCM capability.

### COTS SYSTEMS

The MARTAC Devil Ray T38 high-speed catamaran provided the host platform for the other two components, and served as a communications and data transmission hub, and featured a ramp-deck-aft configuration for autonomous launch and recovery of these subsystems.

The ThayerMahan Sea Scout Subsea Imaging System is specifically designed for missions such as mine-hunting. The Sea Scout system is founded on the in-production COTS Kraken Robotics Katfish-180 tow-body mounted synthetic aperture sonar.

The system is designed to search for mine-like objects (MLOs).

The *Pluto Gigas* Mine Neutralization System (MNS) remotely operated vehicle (ROV) is an existing, stand-alone, third generation MNS with several systems deployed globally. The *Pluto Gigas* deploys an acoustically armed and detonated countermeine charge. Several charges enable a single-sortie field clearance.

To be clear, this is not a platform-specific solution, but rather a concept. When operators see a capability with any uncrewed COTS platforms in the water successfully performing the MCM mission, they will likely press industry to produce even more-capable platforms to undertake the autonomous mine-hunting and mine-clearing task and take the sailor out of the minefield.

Throughout 2024 and beyond, the Navy and Marine Corps are conducting an ambitious series of exercises, experiments, and demonstrations to evaluate the ability of uncrewed maritime vehicles to support multiple missions. Readers of *Ocean News & Technology* would be well-served to read future issues of this magazine to learn more about how the Navy is pursuing uncrewed maritime systems integration.

# KRAKEN ROBOTICS MINEHUNTING SYSTEMS OPERATIONAL WITH THE ROYAL DANISH NAVY

Kraken Robotics Inc. has announced the successful sea acceptance of all systems for its mine-hunting sonar equipment under the Royal Danish Navy Minehunting sonar upgrade program. This contract was signed in September 2020, following a competitive bidding process.

Under the contract with the Danish Ministry of Defense Acquisition and Logistics Organization (DALO), Kraken has delivered four complete turnkey mine-hunting systems, with each system consisting of a KATFISH™ towed Synthetic Aperture Sonar, Tentacle® Winch and Autonomous Launch and Recovery System (ALARS), topside command and control equipment, and remote operation and monitoring capability for standoff mine-hunting operations.

Starting in 2022, the KATFISH mine-hunting systems were integrated onboard the Royal Danish Navy's optionally uncrewed surface vessels (USVs), the MSF-class. Kraken worked closely with MCM Denmark operators and workshop technicians as well as skilled local Danish shipyard, JOBI, to install Kraken's DNV design approved Autonomous Launch and Recovery System (ALARS) onto the MSF-class in parallel with the MSF-class planned mid-life refit.

Kraken also integrated the KATFISH system with Saab's Command and Control (C2) software, providing operators with a seamless experience for mission planning and mission monitoring. The inclusion of Kongsberg's Maritime Broadband Radio (MBR) enables the complete system to operate remotely, streaming full resolution sonar imagery in real time at ranges exceeding line of sight.

In 2023, Kraken also entered in a 7-year sustainment contract with DALO, with options for two further 7-year extensions, for a total possible 21 years of sustainment. The sustainment program includes regularly scheduled maintenance, repair, and overhaul as well as provision of training and spare parts, and the delivery of regular capability enhancements through software updates. Throughout 2024, Kraken will also be delivering additional spares, including spare tow cables and two spare KATFISH tow bodies.

Kraken has developed and delivered extensive training programs with the MCM Denmark team, including Onboard Operator, Onboard Maintainer, and Depot Maintainer training certification programs. As of 2024, the Royal Danish Navy will have completed their first full year of KATFISH operations, with an undisclosed large number of operational hours.



## HII LAUNCHES MASSACHUSETTS (SSN 798) VIRGINIA-CLASS SUBMARINE

HII announced that Virginia-class submarine *Massachusetts* (SSN 798) was launched into the James River at the company's Newport News Shipbuilding (NNS) division.

Shipbuilders transferred the submarine from a construction facility to the floating dry dock, where it was later submerged and moved by tugboats to a submarine pier at the shipyard for final outfitting, testing and crew certification.



"Following the christening of this mighty submarine in May, witnessing *Massachusetts* launch into the river is a source of immense pride for our shipbuilding team," said Jason Ward, NNS Vice President of Virginia-class submarine construction. "We understand the importance of *Massachusetts*, and we will continue to execute with purpose to bring this important national security asset to life and deliver it to the Navy."

Virginia-class nuclear-powered fast attack submarines are built for a broad spectrum of open-ocean and littoral missions to replace the Navy's *Los Angeles*-class submarines as they are retired. Virginia-class submarines incorporate dozens of new technologies and innovations that increase firepower, maneuverability, and stealth to significantly enhance their warfighting capabilities. These submarines are capable of supporting multiple mission areas and can operate at speeds of more than 25 knots.

*Massachusetts* is the 25th Virginia-class submarine and will be the 12th delivered by NNS, which is one of only two shipyards capable of designing and building nuclear-powered submarines for the US Navy.

# DAMEN UNVEILS NEW MULTI-PURPOSE SHIP TO MEET FUTURE COMBAT CHALLENGES

Damen Shipyards Group has unveiled a new ship design based on modern defense and security requirements. The Multi-Purpose Support Ship (MPSS) has been co-developed with the Portuguese Navy, the vessel's launching customer. It is a solution for the increasing use of drone technology in combat and surveillance. In addition to its primary function, the MPSS is designed to fulfill a wide range of additional tasks, including auxiliary roles.

Damen has begun construction of the first vessel of this new design. The MPSS range, featuring 7,000 and 9,000 tons versions, combines the vision of the Portuguese Navy, with Damen's proven process of shipbuilding, using standardized solutions wherever possible. As a result, the vessel can be constructed quickly and offers a reliable, cost-effective platform.

While the electrical, communication and navigation equipment installed on the MPSS will be military class equipment, the vessel will also use commercial off the shelf technology. This includes, for example, the mission specific equipment modules, by which the vessel achieves its multi-functional capability.

In this way, when not required to perform its primary function, the MPSS can be applied to a wide range of duties including managing drones (air, sea, and sub-sea), conducting amphibious support, emergency/disaster relief, search & rescue, diving support, performing submarine rescue operations and helicopter operations.

The MPSS 7000 is 107 x 20 meters. It is foreseen that it will be operated by a crew of 48 personnel, with additional facilities for up to 100 special personnel and extra, temporary, accommodation for 42 persons, for example in the event of a disaster relief operation. The MPSS 9000 is 130 x 20 meters and is able to conduct even more operations.

As a result of its modular approach, the vessel could be utilized year-round and is also easy to maintain. The MPSS Series can remain at sea for periods of at least 45 days. All these factors contribute to the vessel's overall value, significantly increasing uptime.

Piet van Rooij, Commercial Manager of Damen's Defense and Security department, said: "The MPSS range is a response to the increasing use of drone technology that we see in modern combat and surveillance situations. We could see that such capabilities would be of growing importance for countries looking to sustain their sovereignty. At the same time, this is a multi-purpose vessel that can be applied to wide range of additional operations, thereby offering value for taxpayer's money. This theme is further developed using commercial off the shelf technology, which ensure the cost-effective construction of a reliable platform. We're very much looking forward to showcasing this new vessel, including at exhibitions, in the coming months."



▲ MPSS 9000. (Credit: Damen)

## THALES DELIVERS FIRST CAPTAS-4 SONAR TO US NAVY'S CONSTELLATION FRIGATE PROGRAM



The first CAPTAS-4 variable-depth sonar transmitter has been delivered to the US Navy's Constellation Frigate (FFG-62). Advanced Acoustic Concepts (AAC) delivered the system on October 12, 2023, ahead of contractual milestones while under very aggressive time constraints.

Thales' sonar technology was chosen by Fincantieri Marinette Marine, in agreement with the US Navy to equip its new frigates. In addition to the two systems already ordered to date, up to eight additional CAPTAS-4 transmitters assemblies could be supplied under the current contract. In this perspective, in April, AAC will complete construction on a new CAPTAS production facility located at their current site near Uniontown, Pennsylvania, where final assembly, integration and acceptance testing will occur for shipsets two through ten.

Thales has more than 50 years' experience in underwater warfare and is the world's leading sonar exporter. The CAPTAS family comprises a series of low-frequency

variable-immersion sonars dedicated to anti-submarine warfare. The CAPTAS-4 delivered to the US Navy is the most powerful of the CAPTAS family. It has been tested under a wide range of operational conditions for instance by the French, British and Italian navies, and its technical maturity and performance are recognized the world over.

In 2020, 2021 and 2022, several French multi-mission frigates equipped with the CAPTAS-4 system won the prestigious Hook'Em Award, the American prize for excellence awarded to the best crew performance in the field of anti-submarine warfare, during coalition exercises in the 6th Fleet area of operations.



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# ØRSTED AND INCHEON CITY SIGN MOU TO ESTABLISH WORLD-CLASS OFFSHORE WIND

Ørsted has signed an agreement with Incheon Metropolitan City, Korea, to cooperate on developing a world-class offshore wind power industry in the region. The aim of the agreement is to establish a successful local wind power industry driven by Ørsted's 1.6 GW offshore wind project off the coast of Incheon.

Through this collaboration, Incheon City will provide administrative support, including enhancing local awareness and understanding, and establish policies and infrastructure for offshore wind, while Ørsted will leverage its more than 30 years of experience to develop its projects into an exemplary model that will be of mutual benefit to local residents, businesses, and suppliers.

On behalf of the Ørsted Group, Thomas Thune Andersen, Chair of Ørsted's Board of Directors, signed the agreement together with Yoo Jeong-bok, Mayor of Incheon, at a ceremony at Ørsted's offices in Greater Copenhagen in Denmark. The event was attended by Lars Aagaard, Danish Minister for Climate, Energy & Utilities, Kim Hyung Gil, Korean Ambassador to Denmark, and Svend Olling, Danish Ambassador to Korea.

The Ministry of Trade, Industry & Energy of the Republic of Korea issued a 1.6 GW electricity business license (EBL) in November 2023, granting Ørsted exclusive development rights for an offshore wind farm located 70 km off the coast of Incheon. It is set to become the largest in Korea on completion, accelerating the country's net-zero transition while creating local jobs and supply chain opportunities, building on Ørsted's industry-leading sustainability commitments.

The next steps for Ørsted's Incheon offshore wind project include environmental impact assessments, site investigations, and preparations for participating in Korea's annual fixed-price wind auction.

Subject to the successful outcome of these processes and Ørsted taking final investment decision, the project is expected to be completed in the early 2030s.



▲ (L-R): Ingrid Reumert, Ørsted's Head of Global Stakeholder Relations; Lars Aagaard, Danish Minister for Climate, Energy & Utilities; Yoo Jeong-bok, Incheon Metropolitan City Mayor; Thomas Thune Andersen, Chair of Ørsted's Board of Directors; Kim Hyung Gil, Korean Ambassador to Denmark; and Svend Olling, Danish Ambassador to Korea. (Credit: Ørsted)

## NEW INTEROCEAN MARINE SERVICES BRAND TO BE DRIVEN BY NEW LEADERSHIP



Interocean Marine Services (Interocean), the specialist provider of support services to the offshore, energy, marine and renewable sectors, has kicked off 2024 with the announcements of a new Chief Commercial Officer (CCO) and Chief Financial Officer (CFO).

Simon Laing joins Interocean as CFO and Alex Clark moves into a CCO role following his position as a Marine Technical Advisor for bp Solutions. The two appointments strengthen the existing leadership team following Alex Reid stepping into the COO position

and joining Fraser Moore as CEO who moved to Interocean in July 2023. The reinforced expertise builds on the proven track record in managing integrated marine services including engineering, survey, and remote inspection.

The new leadership team is the driving force behind a refreshed brand and identity. Interocean (formerly Rigmor Group), incorporates the diverse portfolio of services across the oil and gas sector, offshore, floating wind and marine industries.

Interocean works with several oil majors, drilling contractors, wind farm operators and Tier 1 Renewable firms and has a team of 40 experienced staff including naval architects, master mariners, project managers and engineers—all working across the UK, Caspian region, UAE and Far East.

Interocean provides a 'total project solution' from planning, design and installation to operational maintenance, and decommissioning. The global team provides services throughout an asset's life cycle to create safe, efficient, and cost-effective services.

# HEXICON ACQUIRES 100% STAKE IN FLOATING OFFSHORE WIND PROJECT



Hexicon

Hexicon AB has signed a Sales and Purchase Agreement (SPA) to take full ownership of MunmuBaram Co., Ltd. from its joint venture partner Shell Overseas Investments B.V. Under the agreement, Hexicon AB will increase its stake in the project from 20% to 100%, increasing the project portfolio by 900 MW. Completion of the transaction is subject to regulatory approval.

The MunmuBaram project, originally initiated by the joint venture Hexicon Korea in 2018, is developing a 1.125 GW floating offshore wind farm, planned off the coast of Ulsan City in the southeastern region of South Korea.

Hexicon's full ownership of the MunmuBaram project is enabled through the support of Glennmont Partners, one of Europe's largest infrastructure funds focused on clean energy. The commitment in the agreement falls within the existing framework of Hexicon's Glennmont loan facility. The purchase price for the acquisition will be paid with a first down payment of \$5 million. In addition, the SPA includes a profit-sharing arrangement of up to \$50 million over a three-year period.

In the event that Hexicon sells its shares in MunmuBaram, the size of the profit-sharing will depend on several parameters, including the timing and the net proceeds. Hexicon has already started the process of setting the long-term ownership structure for MunmuBaram, as well as the process for government approvals to proceed with existing licenses. In the short term, Hexicon will reallocate resources to optimize value in the project whilst working in close collaboration with Shell to ensure a smooth transition. Once concluded, the MunmuBaram project will represent approximately 15% of Hexicon's net portfolio in terms of megawatts (MW).

"South Korea continues to be a leading market with good conditions for the development of floating offshore wind. Through this transaction, South Korea remains a core market for Hexicon and strengthens our position as a leading global developer of floating offshore wind," says Marcus Thor, CEO of Hexicon AB.

## JERA ANNOUNCES SPA WITH WOODSIDE FOR INTEREST IN SCARBOROUGH GAS FIELD

JERA Co., Inc. has announced a Sale and Purchase Agreement with Woodside Energy Group Ltd., a major Australian energy company, to acquire a 15.1% participating interest in the Scarborough gas field development project (the Project). The total consideration of the acquisition of the Project is estimated to be approximately \$1.4 billion, which comprises the purchase price and reimbursement to Woodside for JERA's share of expenditure incurred up to completion. Completion of the transaction is subject to conditions, including obtaining permits and approvals.

The Scarborough gas field is located off the northwest coast of Western Australia in Commonwealth waters. Natural gas produced from the Scarborough field will be transported via a subsea pipeline to the Pluto LNG facilities for the production of LNG. The composition of the Scarborough gas is very low in CO<sub>2</sub>, at less than 0.1%.

The annual LNG production expected from the Project is approximately eight million tons per annum (Mtpa) at its peak rate. JERA will off-take an equity share of approximately 1.2 Mtpa of LNG cargoes. The final investment decision for the Project was made in November 2021, and the first cargo is targeted for 2026.

As part of the broader strategic relationship, JERA also entered into a non-binding head of agreement (HOA) with Woodside, for

the sale and purchase of LNG from its portfolio. Under the agreement, JERA intends to purchase six cargoes (approximately 0.4 Mtpa) of LNG from Woodside for 10 years from 2026 onwards.



## AMERICAS

### Sea-Air-Space

National Harbor, MD | April 8–10  
<https://seaairstospace.org/about>

### International Offshore Wind Partnering Forum (IPF)

New Orleans, LA | April 22–25  
[www.offshorewindus.org/2024ipf](https://www.offshorewindus.org/2024ipf)

### Canadian Hydrographic Conference

St. John's, Canada | May 27–30  
<https://chc2024.org/en>

### H2O Conference

Halifax, Canada | June 3–5  
[www.h2oconference.ca](http://www.h2oconference.ca)

### Offshore Wind USA

Boston, MA | June 17–18  
<https://events.reutersevents.com/renewable-energy/offshore-wind-usa>

### Dredging Summit & Expo

Tampa, FL | June 24–27  
<https://dredging-expo.com>

## EUROPE

### Hydrogen 2024

Amsterdam, NL | April 9–10  
<https://events.reutersevents.com/renewable-energy/hydrogen-europe>

### Undersea Defence Technology (UDT)

London, UK | April 9–11  
[www.udt-global.com](http://www.udt-global.com)

### Offshore Wind Connections

Hull, UK | May 1–2  
[www.offshorewindconnections.com](http://www.offshorewindconnections.com)

### GeoHab

Arendal, Norway | May 6–10  
<https://geohab.org/geohab-2024>

### All-Energy

Glasgow, Scotland | May 15–16  
[www.all-energy.co.uk](http://www.all-energy.co.uk)

### Underwater Technology Conference (UTC)

Bergen, Norway | June 11–13  
[www.utc.no](http://www.utc.no)

### Seanergy

Nantes, France | June 26–28  
[www.seanergy-forum.com/en/seanergy2024](http://www.seanergy-forum.com/en/seanergy2024)

## OTHER REGIONS

### OCEANS Singapore

Singapore | April 14–18  
<https://singapore24.oceansconference.org>

### Subsea Technology Eastern Mediterranean

Limassol, Cyprus | April 16–18  
[www.subseatechnologyconference.com](http://www.subseatechnologyconference.com)

### MSEAS

Yokohama, Japan | June 3–7  
<https://meetings.pices.int/meetings/international/2024/MSEAS/Background>

### Australia Wind Energy

Melbourne, Australia | July 9–11  
<https://www.windenergyaustralia.com>

### International Conference on Ocean Energy (ICOE)

Melbourne, Australia | September 17–19  
[www.ocean-energy-systems.org/icoe/conferences/icoe-2024-melbourne-/](http://www.ocean-energy-systems.org/icoe/conferences/icoe-2024-melbourne-/)

### MAST Australia

Adelaide, Australia | November 19–21  
<https://mastconfex.com/australia2024>

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## 2024 EDITORIAL CALENDAR

MONTH	DEADLINES	EDITORIAL FOCUS AND SHOW DISTRIBUTION	THEME FOCUS
JANUARY/ FEBRUARY	Editorial: January 17 Ad: February 2	<b>OCEAN SENSORS &amp; DATA MANAGEMENT</b> • Oceanology International   March 12–14 • Canadian Underwater Conference & Exhibition (CUCE)   March 24–26	Ocean observation, multidisciplinary survey, telemetry, communications
MARCH	Editorial: February 12 Ad: March 1	<b>NAVAL DEFENSE &amp; SECURITY</b> • Underwater Defence Technology   April 9–11 • Sea-Air-Space   April 8–10	Uncrewed systems, cyber security, marine surveillance systems
APRIL	Editorial: March 11 Ad: March 29	<b>REMOTELY OPERATED VEHICLES (ROVs) IN FOCUS</b> • International Partnering Forum   April 22–25 • H2O Conference   June 3–5 • Underwater Technology Conference (UTC)   June 11–13	ROV development, subsea residency, deployment technologies
MAY	Editorial: April 8 Ad: April 26	<b>OFFSHORE ENERGY DEVELOPMENT</b> • Canadian Hydrographic Conference   May 27–30	Infrastructure development for oil and gas, renewables, subsea power
JUNE	Editorial: May 13 Ad: May 31	<b>UNDERWATER IMAGING</b>	Advances in geophysical survey and subsea imaging capabilities
JULY (DIGITAL ISSUE)	Editorial: June 18 Ad: June 28	<b>UNCREWED VEHICLE BUYERS' GUIDE</b>	<i>Special Edition</i>
AUGUST	Editorial: July 15 Ad: August 2	<b>SUBMERSIBLES &amp; THE DEEP SEA</b>	Subsea vehicles, naval archaeology, bathymetric studies, geotechnics
SEPTEMBER	Editorial: August 12 Ad: August 30	<b>REMOTE MARINE OPERATIONS</b> • ACP Offshore WINDPOWER   October 28–30 • Offshore Energy Exhibition & Conference   November 26–27	Marine autonomy, digital twins, remote monitoring and intervention
OCTOBER/ NOVEMBER	Editorial: September 9 Ad: September 27	<b>UNCREWED VEHICLES &amp; MARINE ROBOTICS</b> • International Workboat Show   November 12–14	USV R&D, emerging applications, breakthroughs in remote ops
DECEMBER	Editorial: October 17 Ad: October 28	<b>THE FUTURE OF OCEAN TECHNOLOGY</b>	<i>Special Edition</i>

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# METAL SHARK DOUBLES DOWN IN LOUISIANA WITH NEW FACILITIES AND WORKFORCE EXPANSION

Following the recent divestiture of its Alabama-based ship refit and repair business, boat builder Metal Shark is expanding its presence in its home state of Louisiana with the addition of a third manufacturing facility and an aggressive recruitment effort to meet surging customer demand.

"Last year, Birdon America, Inc. approached Metal Shark about acquiring our Alabama operations," said Metal Shark CEO Chris Allard. "They put forth an offer that made good business sense for us while providing long-term opportunities for our Alabama team members. With the sale of our refit and repair business and steel boat building operations now concluded, we are refocusing our energies and doubling down on our core business: the design and construction of durable, high performance, manned and autonomous welded aluminum vessels."

Metal Shark is adding production capacity with the opening of its third Louisiana location, a 40,000 square foot manufacturing facility in Iberia Parish, adjacent to Tabasco's headquarters on Avery Island. Together with Metal Shark's nearby Jeanerette and Franklin production facilities, the company now boasts nearly 200,000 square feet of enclosed manufacturing space spread across 35 acres and employs nearly 400 people.

"As a diversified builder, at any given time we're producing boats for customers across a range of markets including US and foreign military forces, state and local law enforcement agencies and fire

departments, and numerous commercial markets including pilot groups, passenger vessel operators, and the offshore wind industry," said Mr. Allard. "Our new Avery Island facility will reduce lead times for vessels that lie outside our mainstream production mix, with an experienced crew of boat building professionals specializing in custom rigging and production efficiency."

To support a robust backlog, Metal Shark has been aggressively recruiting to expand its workforce across all of its Louisiana facilities. The company is currently hiring for all production trades, and is also recruiting naval architects, project coordinators and project engineers. In addition to its efforts aimed at local recruitment, Metal Shark is now offering relocation assistance for qualified welders interesting in finding a home in Louisiana.

"Louisiana is steeped in boat building tradition, it's the home of some of our nation's best boat builders, and we will continue to invest in our people and facilities here," said Mr. Allard. "We're now working to recruit additional skilled workers to our state, where they can earn competitive wages for their talents while enjoying our food, culture, outdoor recreational opportunities, climate, and overall lifestyle."

While Metal Shark continues to expand in Louisiana, the company has not vacated Alabama entirely. The builder has retained a portion of its Alabama waterfront to support ongoing training, trials, and autonomous testing.



▲ US Navy Near Coastal Patrol Vessel (NCPV) #7 launched at Metal Shark's Franklin, LA, shipyard on February 6, 2024. (Credit: Metal Shark)

# UDT

Undersea Defence Technology

9 - 11 April 2024  
ExCeL, London

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# AOS ACQUIRES OCEAN SPECIALISTS TO BROADEN GROUP CAPABILITIES



Advanced Ocean Systems (AOS), a US-based Small Business offering autonomous and remote systems development capabilities to the ocean industry, recently announced the acquisition of Ocean Specialists, Inc. (OSI), joining SeaRobotics and Okeanus Science & Technology under the AOS umbrella.

"Today marks an important milestone for AOS and our long-term strategy to serve the defense, offshore energy, seabed infra-

structure, and scientific markets with a unique spectrum of capabilities to design, develop, and deploy standard and custom products as well as integrated solutions for our customers," said AOS CEO John Jacobson.

Now, through the strategic combination of Ocean Specialists, SeaRobotics, and Okeanus, AOS is leveraging almost a century of collective ocean industry experience to provide a broad range of marine system

design, development, and deployment services, from rapid prototyping to full-scale engineering, production, test, commissioning, and installation.

"We are thrilled to announce the acquisition of Ocean Specialists, a recognized industry authority in the build out and installation of submarine cable systems and seabed infrastructure," said Jacobson. "Ocean Specialists brings almost 25 years of delivering complex subsea systems integration and multistakeholder project management to AOS, a unique set of capabilities that will help drive AOS' founding mission to deliver genuine turnkey integrated solutions to governmental and commercial clients, from the seabed to the surface and beyond."

Speaking of the announcement, Ocean Specialists' President Perry Wright, added: "This is an exciting new chapter for Ocean Specialists, and we look forward to capitalizing on the operational synergies and engineering capabilities that make AOS a formidable end-to-end ocean technology developer and system integrator."

## MANTA MARINE TECHNOLOGIES ANNOUNCES NEW LEADERSHIP

Manta Marine Technologies, formerly known as Yara Marine Technologies (YMT), has unveiled their new brand and leadership team, following its recent acquisition by Geneva-based Okapi Supply Trading Advisory SA.

These changes mark a new era for the company, which intends to expand its existing customer relationships and strong product portfolio to help the maritime industry meet its aims of GHG emission reduction.

The Manta Marine Technologies team will now be led by CEO Ina Reksten, who previously served as Deputy CEO and Chief Operating Officer.

Outgoing CEO Dr. Thomas Koniordos has been appointed as Chair of the Board, while former Chief Sales Officer, Alexander Askeland will be the new CFO and Richard Engelhart Bjercke will be the new CCO.

## AQUA COMMS APPOINTS ANDY HUDSON AS ACTING CEO

Aqua Comms, a leading provider of global subsea connectivity services, has announced that Jim Fagan, who served as the CEO, is leaving the business with immediate effect. Andy Hudson, the company's Chief Network Officer is now the acting CEO, and Chairman Alan Harper will continue to provide commercial and strategic assistance to the business through the remainder of 2024.

Chairman Alan Harper commented, "Aqua Comms would like to thank Jim Fagan for the excellent work he has done in creating a healthy and growing business since joining in 2023. We wish him the best of luck in his future endeavors. Aqua Comms continues to be in a strong position in the market and are optimistic about the future of the business."

Aqua Comms continues to execute on its ambitious plans for multiple trans-Atlantic routes and new geographical capabilities to meet current and future customer requirements.

# ENVIRONMENTAL AND TECHNICAL EXPERTISE FOR COASTAL AND OFFSHORE PROJECTS



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MVI is a small business, multifaceted solutions provider working with a wide variety of industries and government agencies whose project needs are in the fields of ocean observing systems, engineering and development, subsea communications, ROV operations and training, environmental consulting, marine mammal observation, offshore field operations and sampling, and the provision of Subject Matter Experts (SMEs) to address marine environmental challenges.



# OCEAN INDUSTRY DIRECTORY

## ADCP/DVL



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Nortek excels in the development and manufacture of acoustic Doppler instrumentation. Doppler Velocity Logs (DVLs) are used for subsea navigation. Acoustic Doppler Current Profilers (ADCPs) are used to understand physical processes in the ocean, rivers, lakes, and laboratories. We pride ourselves on being innovative in product development and production processes. Nortek provides solutions to engineers and scientists by offering real-time data collection and support from our responsive technical team.

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## CAMERAS/LIGHTS/LASERS



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Arctic Rays specializes in deep-sea lighting, imaging and surveillance systems and other subsea technologies, custom-engineered to the demanding requirements of deep ocean use on AUVs, ROVs, manned submersibles, landers, and other offshore and underwater structures. This tailor-made tech meets the demands of your project with small size, low power consumption, responsive service and the right price—all without sacrificing quality.



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For over 40 years, Deepsea Power & Light has provided high-quality and innovative products to the oceanographic community. The company's expertise and product line has grown to include underwater cameras, video systems, lighting solutions, pressure relief valves and lasers. Products are rigorously tested in both the initial design process and manufacturing stage to perform in the harshest marine environments—from wet/dry surface applications to full ocean depth deployments. You can count on continued ease of service, reliability, high performance and cost effectiveness to meet the demands of any application, from offshore oil fields to oceanographic exploration. DeepSea offers a versatile product line while developing new designs to continue exceeding market expectations.



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SubC Imaging pioneers cutting-edge subsea imaging solutions for marine research, offshore energy, aquaculture, fisheries, and more. Our globally acclaimed equipment includes complete camera systems, cameras, LEDs, and lasers. Committed to innovation, we also offer DVRs and remote operations solutions, enhancing efficiency and accessibility. With clients in over 30 countries, SubC Imaging leads in advancing technology for intelligent and high-performance subsea inspections and surveys.



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Remote Ocean Systems has been an industry leader in the design and manufacture of reliable, high-tech equipment and systems for the most severe subsea, oceanographic, shallow water, industrial, commercial and military environments since 1975. Our product line includes high accuracy and robust positioners and rotators and a wide variety of lighting including: halogen and LED technology offering 10,000+ lumens, flood, spot, dimming and non-dimming types. Our cameras offer exceptional sensitivity in low light conditions, high definition color, ethernet control, compact size rated to 6,000-meter depth. We also have a fully staffed engineering department to help with your special requirements.



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We provide SMART Cable hardware, software, and data management solutions. SMART (Sensor Monitoring and Reliable Telecommunications) Cables are submarine telecommunications cables equipped with sensor packages inside their repeaters (amplifiers). SMART Cables will enable transformative advancements in Tsunami and Earthquake Early Warning monitoring, global climate monitoring, and network integrity, providing substantial societal benefits through enhanced protection of life, property, and global telecommunications infrastructure.



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For nearly six decades, Winchester Interconnect has been a key supplier and a solution provider to the oceanographic and maritime industries supporting a wide range of subsea applications. We design and manufacture high performance cables for use in harsh and demanding environments. Our rugged Xtreme Cables are known and preferred worldwide for superior reliability and durability in commercial and military projects. Innovative cable solutions for ROVs, instrumentation, towed array and many others, ranging from high flex miniature cable designs to rugged EOM steel cables incorporating high performance optical fibers and Ethernet pairs. Winchester Interconnect offers an extensive list of stock cables specifically designed and produced for subsea applications. Visit our website: www.falmat.com

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 ☐ Bill Tell, Sales Manager

Established in 1957, South Bay Cable designs, manufactures and tests specialized Electro-Optical-Mechanical Cables for use in demanding marine environments. Our cables tackle stringent customer requirements which include ROV Tether and Umbilical Cables, Towed Array Cables, Mux BOP Control Cables, Video Inspection, Fairied Cables and a host of other customer-specific applications.

## CONNECTORS



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BIRNS has served the subsea industry since 1954, and is an ISO 9001:2015 certified global leader in the design and manufacturing of high performance connectors, cable assemblies and lighting systems. With a NAVSEA PRO-020 certified molding facility, it offers sophisticated connector lines, including 6km-rated electrical, electromechanical, coaxial, electro-coax, optical, electro-optical and electro-opto-mechanical hybrids. BIRNS provides the industry's highest volume of cost-effective hydrostatic and helium pressure testing, and has a wide range of ABS Product Design Assessment (PDA) certified fiber optic and electrical penetrators. BIRNS' LED and tungsten-halogen marine, chamber, security and commercial diving lights are trusted in the world's most extreme environments.

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Birns Aquamate designs and manufactures underwater electrical connectors, cable assemblies, and cable terminations. The company produces a wide range of standard industry products such as the **5500 Series, SC, MC, LP, FAWL/FAWM, NANO, TC, Rubber Molded**, etc. Birns Aquamate is the only manufacturer to guarantee compatibility with other UW connectors. Birns Aquamate also specializes in fast turn-around for custom design of special connector solutions. All connectors are manufactured under IQC ISO 9001:2015 certification. Dealers in Canada, Brazil, UK, Belgium, Holland, Norway, Germany, South Africa, Holland, Italy, and China.

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The EdgeDVR is currently used worldwide by most of the major ROV and Diving contractors. With our present Version 4 software, we have six models. The EdgeDVR has become an essential part of any ROV and Diving system offshore, easy to use and reliable. The system is capable of recording simultaneous High Definition and Standard Definition video, together with auto creation of Dive, Video, Photo and Anomaly logs. Multi channel digital overlay is also available for all recorded channels, logos and realtime survey data can be displayed. With around 500 systems now offshore, we have a proven record of reliability.

Our version 5 software is currently in development and full details will be released soon...

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Okeanus Science & Technology is an established market leader for field-proven deck handling systems, including an exclusive series of winches, LARS, and A-Frames. Whether we are custom-fitting a heavy pull multi-purpose winch or developing a prototype sample collector for deep-sea exploration, we have the industry expertise, marine engineering experience, and technological know-how to deliver failproof, mission-critical assets. Okeanus also owns an expanding portfolio of rapidly mobilized rental equipment and instrumentation to manage your operations with optimal flexibility. Okeanus has offices in Houston, TX and Houma, LA.

SeaCatalog Vendor

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Ocean Specialists, Inc. (OSI) is a system development and advisory firm for undersea cable projects and technology with global capabilities. OSI works with clients during all project phases of subsea network development, from planning and design to procurement and implementation. Our customers, primarily representing Oil and Gas, Telecommunications and Ocean Observing, recognize the value of fiber optic networks to their field and services solutions, and look to OSI to deliver the skills and experience that developing these networks require.

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Bluefield Geoservices was established in 2018 to provide the ocean industries with a fresh approach to offshore geotechnical survey. Our mission: to leverage the team's 100 years of combined offshore geotechnical engineering and geosurvey experience to devise and deliver innovative solutions to the most persistent problems in offshore developments. We develop and deploy progressive in situ seabed investigation methods and custom technologies that deliver best-quality geotechnical and related site data and analysis.

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#### KONGSBERG DISCOVERY

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Kongsberg Discovery develops, manufactures and delivers innovative technology to enhance knowledge, surveillance and sustainability in the ocean space. From the deepest sea to outer space, our unique offering allows our customers to understand complex environments, mitigate risk and achieve ambitious objectives. The Kongsberg Discovery portfolio spans hydro acoustics with sonars and echo-sounders, marine robotics, inertial navigation, communication, and underwater and above surface position reference systems using laser, radar and GNSS technologies. Our technology, combined with deep application knowledge and software expertise, provides significant value for our customers.

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ATL specializes in the design/manufacture of custom bladder-type fluid containment systems, including tanks, inflatables, pillows and bellows for surface and subsea. ATL's flexible fluid containers boast unparalleled chemical tolerance, abrasion resistance, and remarkable durability - used with methanol, diesel fuel, gases, ethyleneglycol, hydraulic fluids and chemical cleaning cocktails. Expedited deliveries are also available.

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CSA Ocean Sciences Inc. brings more than five decades of experience in marine environmental assessments in the US and internationally, with offices in the United States, the Eastern Mediterranean, Trinidad, Suriname, Brazil, and Australia. CSA's expertise in coastal, marine, and deep ocean surveys is built on the integration of science, operations, and an understanding of environmental data collection, management, and analysis within geospatial domains.



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Morgan & Eklund provides accurate and reliable hydrographic and geophysical survey services in support of marine and coastal infrastructure projects, beach restoration, and large-scale water management projects. M&E clients include engineering firms, government entities and construction contractors. We own and operate state-of-the-art land and hydrographic survey equipment including RTK/GPS, digital levels, invar rods, bathymetric charting equipment, electronic total stations and data collectors.



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Marine Ventures International, Inc. (MVI) provides high quality, marine environmental and technical experts to conduct coastal and offshore field operations worldwide. We leverage our wealth of talent and resources to bring you a customized team of independent contractors, subject matter experts and specialized equipment to get the job done. Our professionals work in a variety of sectors from submarine cable projects and engineering services to protected species observation and environmental consulting.

## MOTION SENSING EQUIPMENT



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Kongsberg Discovery develops, manufactures and delivers innovative technology to enhance knowledge, surveillance and sustainability in the ocean space. From the deepest sea to outer space, our unique offering allows our customers to understand complex environments, mitigate risk and achieve ambitious objectives. The Kongsberg Discovery portfolio spans hydro acoustics with sonars and echo-sounders, marine robotics, inertial navigation, communication, and underwater and above surface position reference systems using laser, radar and GNSS technologies. Our technology, combined with deep application knowledge and software expertise, provides significant value for our customers.



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EvoLogics provides the world's most advanced spread-spectrum underwater communication systems (S2C) with multi-channel data management, networking capability, built-in tracking and positioning functions with USBL. Data loggers, acoustic wake-up module and releasers optionally included. Deployments in offshore platforms (FPSO, ABS), environmental monitoring, defense systems, ROV and AUV operations and more. Applications include simple positioning and sensor information to transmission of underwater photos.



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Kearfott is a leader in the design, manufacture, and support of guidance, navigation, and motion-control products for the aerospace, defense, energy exploration, and unmanned system markets.

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## NETWORKS & DATA COMS



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## OCEANOGRAPHIC INSTRUMENTS/SERVICES



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- Manufacturer's Representative:** Teledyne Marine, Deep Water Buoyancy, Valeport, Trimble, Hemisphere, ANB Sensors, SOFAR and WERA Oceanographic HF Radar.

## STAR:ODDI

## STAR-ODDI

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Valeport provides leading-edge marine sensing and monitoring solutions. We are a British manufacturer of hydrographic and oceanographic instrumentation, which includes: Bathymetry, CTD and Environmental, Current, Sound Velocity and Tide Gauges. Valeport has supplied the subsea sector for over fifty years, supporting the hydrographic and oceanographic communities with a comprehensive portfolio of products that deliver highly innovative solutions. Valeport's worldwide customer base that includes the environmental monitoring, water survey, energy, dredging, civil engineering and scientific research sectors. Our philosophy of keeping development and manufacturing entirely in-house, assures our customers of our expertise and commitment to providing the highest levels of quality, performance and service.

## ROPE

## CORTLAND

## CORTLAND COMPANY

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Cortland designs, manufactures, and supplies technologically advanced synthetic fiber ropes, slings and synthetic fiber strength members. For example, we offer deep water synthetic fiber rope solutions, oceanographic mooring systems, synthetic reinforcing over braids, hair fairing to reduce drag/strumming, and in-line attachments or lifting points (cable grips).

Collaborating with customers, our team uses its experience in high performance materials and market knowledge to transform ideas into proven products. We continue to innovate fit-for-purpose synthetic solutions for the ocean sciences. Cortland is a part of the Enerpac Tool Group (NYSE: EPAC), a diversified industrial company. Visit us online at cortlandcompany.com.

## SONAR SYSTEMS



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EdgeTech designs, manufactures and sells industry-leading side scan sonars, sub-bottom profilers, bathymetry systems and combined sonar systems. Additionally, the company produces world class underwater actuated and transponding solutions including deep sea acoustic releases, shallow water and long life acoustic releases, transponders, reliable USBL acoustic tracking and positioning systems, and custom-engineered acoustic products.

## IMAGENEX

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Imagenex Technology Corp. is an innovative company that was founded in 1988 by pioneers in the development of high resolution sonar. With thousands of systems in use on imaging and profiling projects all over the world, Imagenex has developed a reputation for products that break new ground for depth capability, size, cost, imaging quality and functionality. Each system in this growing product line integrates the latest in sub-miniature electronics into industry proven, robust underwater housings for a total package that is small, rugged, and will provide years of maintenance-free use. Products include multibeam, mechanical scanning, and sidescan sonars.

## MASSA

## GENERATIONS AHEAD IN SONAR &amp; ULTRASONIC TECHNOLOGY

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SeaRobotics Corporation, headquartered in Stuart, Florida, specializes in the design and manufacture of intelligent marine robotics, including a line of Autonomous Surface Vehicles (ASVs) for commercial and defense markets around the world. Applications for SeaRobotics vehicles range from bathymetric and hydrographic coastal surveys to, harbor, and riverine inspection and surveillance. From ground-breaking ASV design through to custom manufacturing for theme parks, SeaRobotics designs, engineers and manufactures smart solutions for complex marine challenges. In addition to our ASV line, SeaRobotics also designs and builds hull and tank bio-inspired underwater grooming and cleaning systems.

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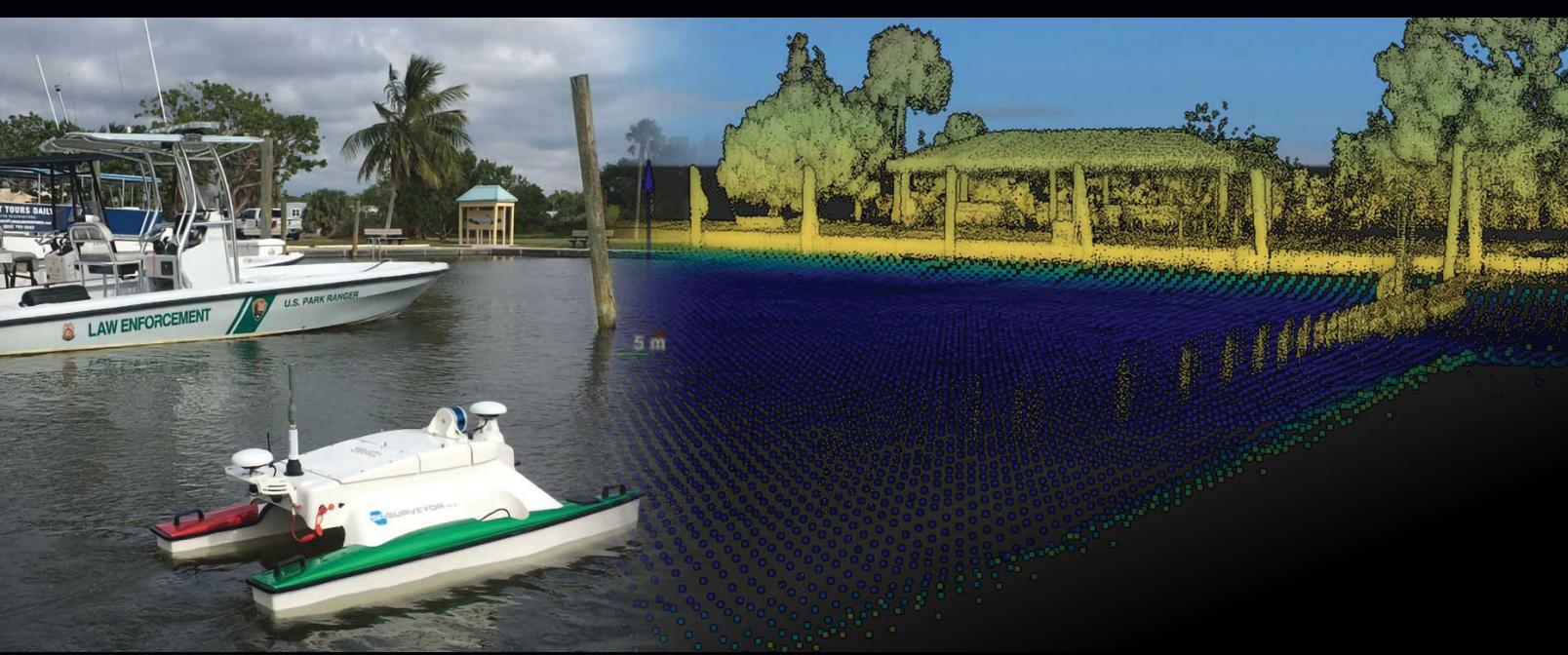
Okeanus Science & Technology is an established market leader for field-proven deck handling systems, including an exclusive series of winches, LARS, and A-frames. Whether we are custom-fitting a heavy pull multi-purpose winch or developing a prototype sample collector for deep-sea exploration, we have the industry expertise, marine engineering experience, and technological know-how to deliver failproof, mission-critical assets. Okeanus also owns an expanding portfolio of rapidly mobilized rental equipment and instrumentation to manage your operations with optimal flexibility. Okeanus has offices in Houston TX, Houma LA, and East Greenwich RI.



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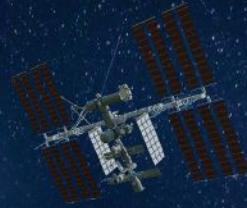
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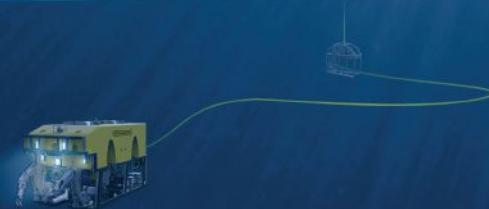


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