

# SEA TECHNOLOGY

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MAY 2024

COMMUNICATIONS  
TELEMETRY  
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FEATURING:

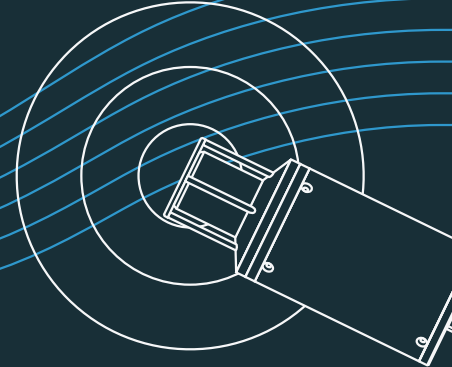
AI-Powered Fish Monitoring  
Cybersecurity Offshore  
The Threat of Spoofing



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#### COVER IMAGE

In a recent product demonstration in St. Petersburg, Florida, In-Situ rep Holly Eschenburg deploys an In-Situ Rugged Buoy with multiparameter water quality instrumentation for continuous data collection. The buoy, a seven-port Aqua TROLL and VuLink telemetry work together to deliver actionable data in real time. (Credit: In-Situ)

#### NEXT MONTH

Multibeam echosounder for hydrographic survey on man-portable USVs and small survey vessels ... MTS dialogues with industry: a roadmap ... Machine learning enhances satellite-derived bathymetry ... Forward-looking sonar for navigation ... Smart, clean tech to improve vessel performance.

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**)) ‘Decarbonization Trajectories’ Report.** New research by Bureau Veritas (BV) has confirmed the potential hefty cumulative impact of operational and technical efficiency measures in keeping shipping within its “carbon budget” to 2050. Titled “Decarbonization Trajectories,” the report examines possible decarbonization pathways for the shipping industry through five distinct scenarios. Each scenario considers several parameters, such as socioeconomic forecasts for the evolution of demand for maritime transport, the possible speed for the uptake of green fuels, and technical efficiency improvements in shipping. Using a bottom-up model that accounts for the particularities of each shipping segment and ship types, the study calculates the resulting greenhouse gas (GHG) emissions for the industry as a whole, providing realistic insight into what decarbonization could look like under different variables. The simulations show that under a “central progressive” scenario, which would see moderate growth in maritime transport and a large uptake of bio and synthetic fuels, implementing measures such as reducing speed and waiting times could reduce total GHG emissions by 44 percent between 2020 and 2050. The BV study emphasizes that waiting for low-emission fuels and new propulsion technologies to mature will not be sufficient to keep shipping within its carbon budget without taking other immediate actions, such as reducing speed and waiting times and using voyage optimization, weather routing, energy-saving devices, and wind-assisted propulsion. The report also highlights energy insetting to bridge the price gap between conventional and very-low-carbon fuels.

**)) Consortium Developing Underwater Single Photon Imaging System.** Sonardyne is leading a consortium of universities and technology companies in a groundbreaking underwater single photon mapping and imaging system (USPIS) project that has been awarded £2.7 million in funding from the Innovate UK Commercialising Quantum Technologies Challenge. The USPIS project will develop next-generation technology and equipment capable of delivering wide-area coverage and high-resolution 3D images in all underwater environments. The consortium comprises: Sonardyne International Ltd., leading the project, system integration and testing; Fraunhofer UK Research Ltd., developing the laser system and environmental testing; RedWave Labs Ltd., designing and building the rugged and compact control electronics for the 100 pico-second pulsed laser source; Photon Force Ltd., developing a next-generation 1D SPAD array sensor and accompanying FPGA for onboard processing targeted at imaging through scattering environments; Heriot-Watt University, designing the transceiver system and single-photon imaging techniques; and University of Edinburgh, assisting Heriot-Watt University in evaluating these SPADs in an underwater setting. The project will deliver a subsea mapping system using innovative single photon array detector technology, combined with a laser producing extremely short and high-power pulses of light. The system is intended for deployment on a subsea vehicle and will generate 3D maps at high altitude above the seafloor. The project has been running for two years, and testing of the prototype equipment began in April 2024.

**)) Milestone for Floating Offshore Solar Technology.** Dutch-Norwegian renewable energy company SolarDuck has been awarded the world’s first prototype certification for floating offshore solar technology, as applied in SolarDuck’s 0.5-MW pilot. BV awarded the certification. The Merganser project, developed by SolarDuck and supported by RWE, features an offshore floating solar pilot with a capacity of 520 kWp. Comprising six interconnected platforms, the solution is designed to withstand challenging offshore conditions, including high waves, strong winds and corrosive environments. The design has been certified to withstand a maximum wave height of 11.6 m at a water depth of 21.5 m at the North Sea Farmers test site. It will be deployed off the coast of The Hague, Netherlands, to evaluate its performance and resilience in the dynamic North Sea.

**)) Career Academy Model.** General Oceans has launched the General Oceans Academy: a collection of professional programs designed to nurture the leaders of tomorrow ([www.generaloceans.com/academy](http://www.generaloceans.com/academy)). The Academy offers groundbreaking opportunities to see, learn and contribute to General Oceans’ future while building a career as a leader in underwater tech. The academy seeks to recognize and champion high-performing individuals while offering exciting, international, and impactful professional opportunities within General Oceans. Headquartered in London, General Oceans comprises the brands Nortek (Norway), Trittech International Ltd. (U.K.), Klein Marine Systems (U.S.), Reach Robotics (Australia) and Strategic Robotic Systems (U.S.). The Academy will be launched in stages and is structured around a number of pillars, each with programs targeted toward a specific stage in a person’s career. GO Explore is aimed at those who are leaving school and seek to start a career in underwater technology. Training is offered through internships, work experience, and apprenticeships in engineering, production, sales, customer service, and more. GO Experience is for new and existing General Oceans team members. This program standardizes the approach to onboarding, secondments (job rotation) and talent exchanges. GO Experience will give participants exposure to something novel, whether it’s the initial onboarding, secondments to other group companies or knowledge-sharing projects. GO Faster is a fast-track management program for internal and external candidates. It is tailored to high-potential individuals who will shape General Oceans’ future leadership. GO Further is the collective term for General Oceans’ internal development programs. **ST**

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# The Fleet of the Future Is Digital

An estimated 11 billion tons of cargo traverses the world's oceans each year for the global economy. The slightest change in weather or route could severely impact the supply chain and the environment. A report by the World Bank and the International Association of Ports and Harbors suggests that digital technology could greatly enhance the performance and resilience of maritime supply chains, especially in developing countries.

As an industry, shipping has traditionally been reactive, not proactive. Pre-conceptions of the cost and risk associated with digitalization have slowed progress in adopting new technologies. Meanwhile, the COVID-19 pandemic has forced the sector to accelerate the introduction of digital processes. Increasing efficiency, maintaining the highest safety standards and delivering more sustainable solutions through digitalization are now priority.

Digital transformation within the maritime sector will enable access to big data and analytics. Embracing digital insights gathered from ships and ports, such as historical ocean conditions and container trends, could yield a competitive advantage and increase efficiency. Ultimately, efficiency is inextricably linked to profitability, so implementing innovative technologies can increase profits.

The introduction of IoT devices, automation and seamless connectivity will increase vessel performance and enable access to real-time data, which can improve day-to-day decision making and operations. IoT networks enable the use of big data and analytics so that crews no longer have to rely on manual or siloed processes to keep track of cargo, ocean conditions and onboard maintenance. Wireless sensors can monitor engine performance during inclement weather and analyze historical satellite data to chart the most economical and environmentally friendly course for a particular journey.

Digitalization also offers shipping owners the capability to make last-minute changes to route planning in the event of a large-scale disaster or a rise in geopolitical tensions, for example. The ability to customize systems and automate processes to fit the needs of individual ships and cargo means businesses can save time, money and, more importantly, lives.

As for sustainability, the maritime industry currently relies on many outdated legacy systems that release high carbon emissions. The sector accounts for an estimated 3 percent of global greenhouse gas emissions. Transporting the world's cargo burns approximately 300 million metric tons of fossil fuels each year, which emits around 1 billion metric tons of CO<sub>2</sub> into the atmosphere.

Regulation has increased as world leaders look to limit the damage by industry to marine ecosystems and the larger environment. New technologies can help implement evolving policies and ensure compliance. Technology is already being used to develop greener fuels and to plot the most efficient, sustainable routes.

Greater innovation is on the horizon. AI and robotics offer possibilities in autonomy, for example. A report by Allianz has calculated that human error accounts for 75 to 96 percent of marine accidents. AI-controlled vessels could significantly improve safety and operational efficiency while reducing carbon emissions.

Digital transformation is part of the global economy, and the maritime sector must catch up. Embracing innovation in automation, IoT and AI can deliver unrivaled performance and improve the supply chain network. Reluctance to adopt new technologies means falling behind. **ST**

# SEA TECHNOLOGY® 2024

## JANUARY

### **Annual Review & Forecast**

**\*\*EUROMARITIME 2024**, January 30-February 1, Marseille, France

## FEBRUARY

### **Instrumentation: Measurement, Processing & Analysis**

**\*\*Oceanology International 2024**, March 12-14, ExCel, London, U.K.

## MARCH

### **Electronic Charting/Vessel Management/ Ports & Harbors/Dredging/Homeland Security**

**\*\*UDT 2024**, April 9-11, ExCel, London, U.K.

**\*\*OCEANS 2024 Singapore**, April 14-18, Singapore

**\*\*XPONENTIAL 2024**, April 22-25, San Diego, CA

## APRIL

### **Offshore Technology/Alternative Energy & Ocean Engineering**

**\*\*Offshore Technology Conference**, May 6-9, Houston, TX

## MAY

### **Communications, Telemetry, Data Processing**

## JUNE

### **Seafloor Mapping/Sonar Systems/Vessels**

**\*\*Sea Technology supports these shows**

## BONUS INFORMATION

- |                            |                     |                       |
|----------------------------|---------------------|-----------------------|
| • Capital Report           | • Marine Renewables | • Ocean Engineering   |
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# 4 EDITORIAL CALENDAR

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## JULY

**Deck Gear, Cable, Connectors, Power Systems & Salvage**

**\*\*IMAGE 2024**, August 25-30, Houston, TX

## AUGUST

**Ocean Resources Development & Coastal Zone Management**

**\*\*OCEANS 2024 Halifax**, September 23-26, Halifax, Canada

## SEPTEMBER

**Geophysical Exploration/Seafloor Engineering**

## OCTOBER

**Environmental Monitoring, Remote Sensing & Pollution Control**

**\*\*EURONAVAL 2024**, November 4-7, Paris, France

**\*\*CLEAN GULF**, November 18-20, San Antonio, TX

**\*\*MAST Australia 2024**, November 19-21, Adelaide, Australia

## NOVEMBER

**Undersea Defense/Antisubmarine Warfare**

## DECEMBER

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# AI-Powered Fish Monitoring

*Comprehensive, Real-Time Insights for Hydropower Operations*

By Stephanie Smedbol • Aaron Legge

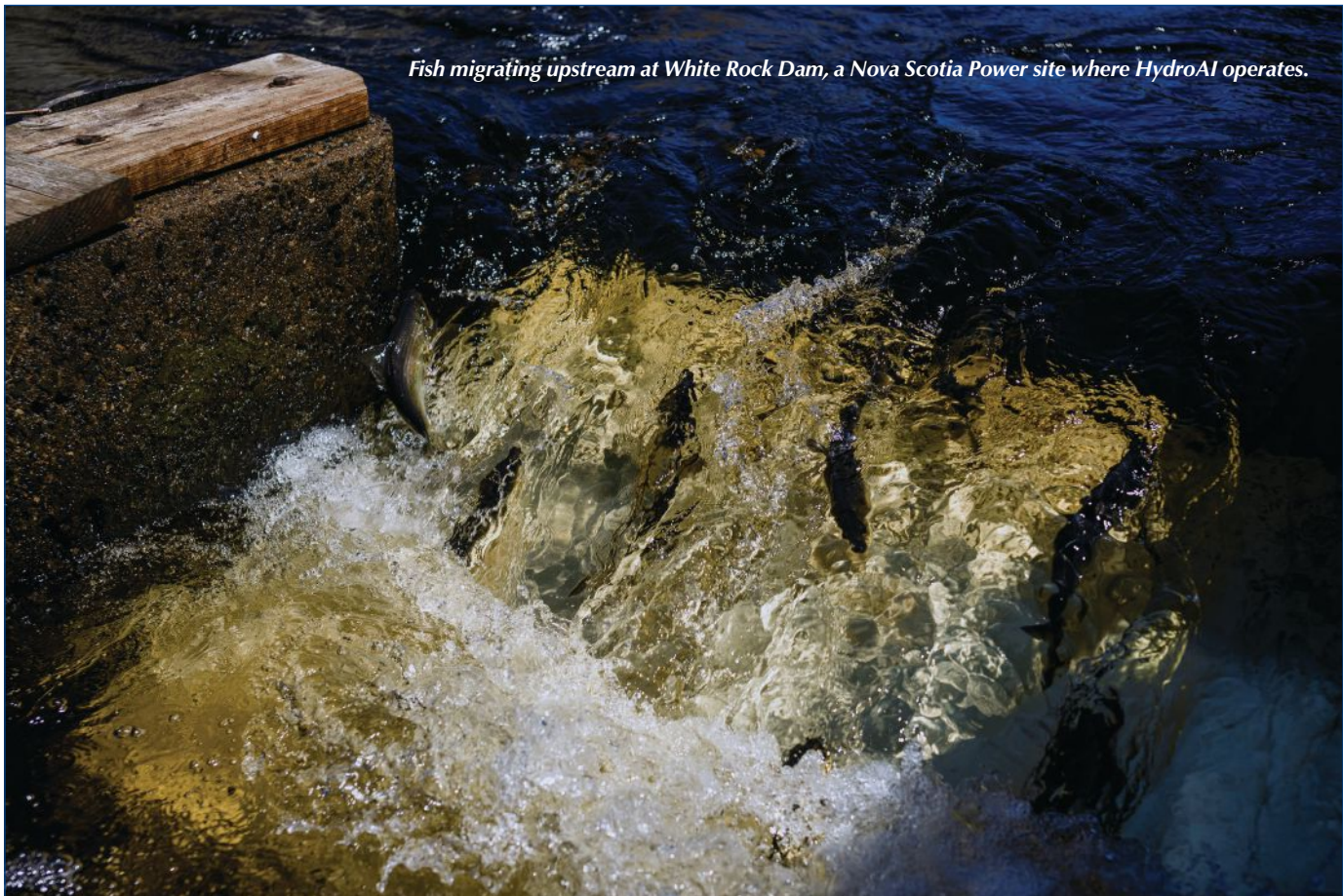
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**O**f all the many forms of renewable energy, hydropower currently provides the most reliable and predictable electricity to the grid. However, an ongoing challenge lies in monitoring fish activity to ensure safe passage through dam infrastructure.

Innovasea's fish tracking business, formerly known as Vemco, has been a global leader in acoustic telemetry

for aquatic animal research for nearly 40 years. The company's products have proven to be essential instruments, cited in hundreds of published scientific research papers. The company is committed to developing innovative technologies that advance our understanding of ocean and freshwater ecosystems.

Today, Innovasea is positioned to play a key role in



*Fish migrating upstream at White Rock Dam, a Nova Scotia Power site where HydroAI operates.*



improving hydropower operations in North America with its newest fish monitoring solution, HydroAI.

### Canada's Growing Hydropower

Canada is well known as a global leader in hydropower, trailing only China and Brazil in the amount of hydroelectricity it generates each year. Hydropower accounts for 62 percent of all the electricity generated in Canada today. And there is room for growth, as electricity only fulfills about 20 percent of Canada's overall energy needs.

The country needs to double down on hydropower if it has any hope of meeting its ambitious goal of net-zero emissions by 2050. According to Waterpower Canada, achieving that net-zero goal will only be possible if the country produces two to three times as much clean power as it does today. And while solar and wind power get a lot of the headlines, hydropower is the clean energy workhorse that can get the country across the finish line.

Hydropower's future growth will rely on having efficient and compliant operations today. Environmental regulators need comprehensive data on fish activity to assess a dam's impact on migrating fish and other wildlife. Meeting these requirements has been a key challenge for regulators to date, as existing methods of manual counting are labor intensive, susceptible to human error and based on limited data. Because of this uncertainty, operators can face costly shutdowns to meet regulatory environmental impact mitigation and licensing demands. A better understanding of how operations impact fish could potentially decrease shutdowns and enhance transparen-

cy with regulators and NGOs. That's where Innovasea comes in.

### Introducing HydroAI

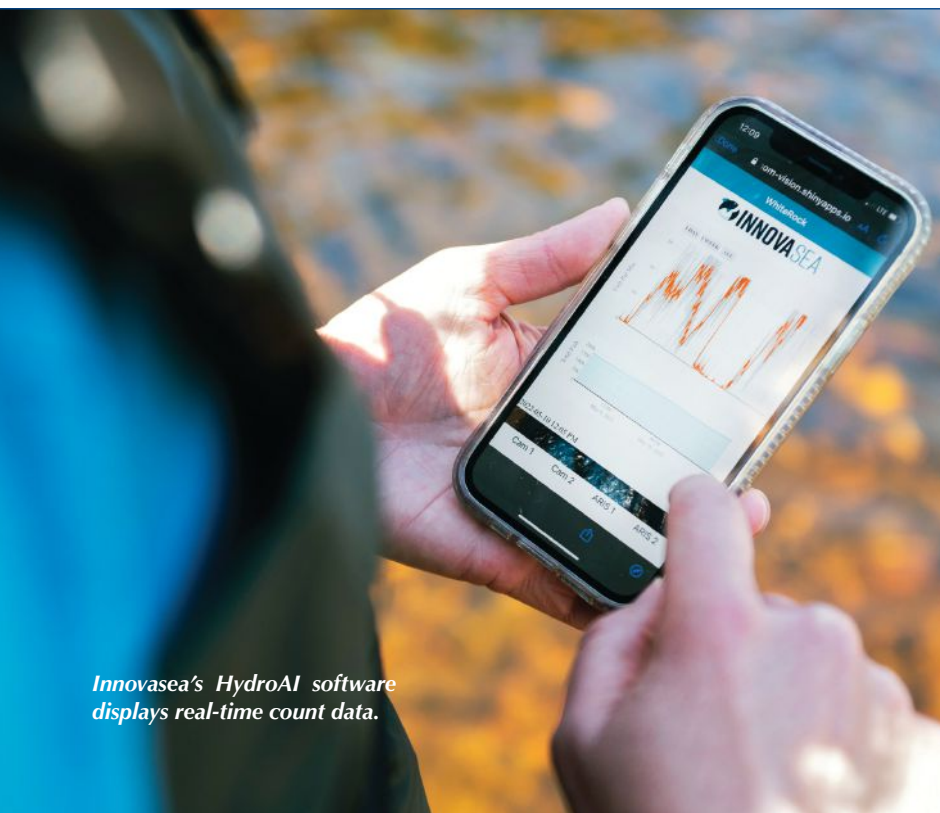
Innovasea recently launched HydroAI, an automated fish monitoring solution that provides unprecedented insights into fish activity around hydro facilities. HydroAI is focused on expanding the use of artificial intelligence in fish monitoring to help hydro dam operators improve environmental compliance and efficiency. The AI-powered camera solution autonomously counts and identifies fish around the clock with 95 percent accuracy, so dam operators can better and more easily understand fish activity around their operations with faster access to more accurate data than they've ever had before. Furthermore, when paired with Innovasea's long-standing acoustic telemetry equipment, regulators can gain an even stronger understanding of fish migrations at their operations.

By enhancing mitigation efforts, the technology can also better protect ecosystems while providing hydropower dam operators with the data they need to satisfy regulators, extend operating hours and generate more power.

### The Power of Quantifiable Outcomes

Innovasea's HydroAI solution offers several benefits. It provides better data via high-resolution cameras and AI that monitor the presence of fish 24/7 with greater accuracy than existing methods of manual counting, and post-processing allows real-time access to data.

HydroAI also ensures regulatory compliance and im-



*Innovasea's HydroAI software displays real-time count data.*

proves transparency. It pairs a proprietary algorithm with hands-on support and maintenance. By reducing uncertainty about fish timing and presence, this technology can help avoid unnecessary shutdowns and enable hydropower operators to generate more power.

In addition, HydroAI enhances environmental impact mitigation efforts. Existing methods have prevented operators from knowing precisely where and when fish move through their sites, which has made it difficult to take timely action for impact mitigation. HydroAI helps solve this problem with hardware that seamlessly integrates with existing upstream and downstream fish passage infrastructure.

"HydroAI technology speeds up the time to getting insights by providing real-time information about the number of fish passing by a camera, as well as other events of interest, with much greater resolution than ever before possible," said Jean Quirion, Innovasea's vice president of research and development.

### **A Successful Partnership**

The technology behind HydroAI was initially developed through an earlier Innovasea-led Ocean Supercluster project called OceanAware to develop and commercialize world-class solutions for monitoring fish health, fish movement, and the environment, and supporting both profitable and sustainable practices in the ocean.

Building on the early success of the technology, Innovasea then launched the HydroAware project, a \$10.5 million R&D initiative under the auspices of Canada's Ocean Supercluster that aims to improve aquatic animal research in dynamic water environments—the types of locations ideal for hydropower and tidal power. Joining

the HydroAware project are Nova Scotia Power, New Brunswick Power, FORCE and Big Moon. HydroAware, which runs through March 2026, is underway and Innovasea is in the process of working with its partners to collect data in various aquatic environments. The data will be used to continue to enhance and train the AI models in HydroAI.

"This is an important project that aims to provide hydro and tidal power operators with new tools to monitor fish in harsh environments and help them in their regulatory process so they can generate clean energy for our planet," said Quirion.

### **HydroAI's Momentum**

HydroAI has proven highly effective based on its ability to deliver around-the-clock data on fish activity around fish ladders and other dam infrastructure—exponentially more data than humans can produce manually by counting fish on video for a few hours each week. Having access to instant

data has helped dam operators better manage their day-to-day operations, and the analytics make it much easier for them to make assumptions for the future as part of decision making.

To date, the technology is in operation at four hydro sites belonging to partner Nova Scotia Power, and there are plans to expand deployments across three additional sites by the end of 2025. Thanks to the ongoing success and momentum driving this partnership, Innovasea is now offering HydroAI throughout Canada and the United States, another top producer of hydropower worldwide.

AI-generated insights are enormously valuable to regulators or anyone else concerned about protecting wildlife around hydro facilities. When the HydroAI technology launched in Canada earlier this year, Innovasea's partners saw the benefit of having access to an abundance of insight-producing data.

"First of all, it's a step up on the detection and counting and tracking of fish," noted Terry Toner, former director of environmental projects at Nova Scotia Power, during site trials. "This type of technology could be tailored for several of our other sites to give us really good information."

### **Opportunities Beyond Hydropower**

In addition to the growth of hydropower dams in Canada, tidal power offers another exciting opportunity to generate renewable energy.

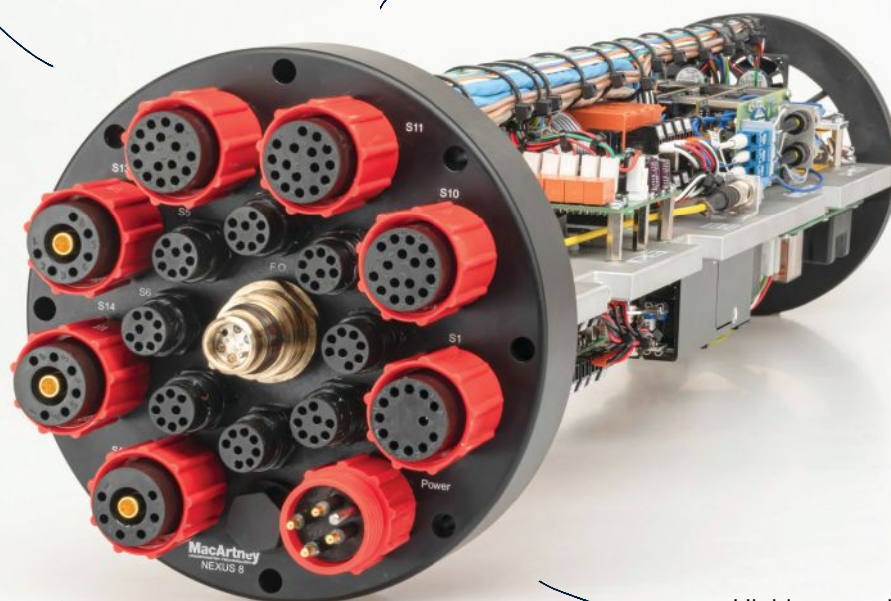
Tidal power generation involves capturing kinetic energy from the rise and fall of oceanic tides and then converting it into electricity. It requires strong currents or a large tidal range but is more predictable than wind

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*Researchers collaborating at White Rock Dam.*

and solar power and can generate electricity around the clock.

Canada's Bay of Fundy has a tidal range of 52 ft., the largest in the world, making it ideal for tidal power generation. Proponents believe its Minas Passage could one day produce 7,000 MW of energy, enough to power all 2 million homes in Atlantic Canada.

However, monitoring fish activity in this harsh and remote environment poses challenges, potentially hindering proper environmental assessments and permit acquisition for tidal power projects. Innovasea's HydroAI could serve as a solution for tidal power operations as well, simplifying fish detection and analysis in challenging tidal zones, thereby enabling more seamless project implementation.

## Conclusion

Though it's already a global leader in hydropower, Canada has enough water resources to double its hydropower generating capacity. But as dam projects can significantly impact migrating fish and other wildlife, energy companies and regulators need comprehensive, real-time data to ensure their safety. Uncertainty in where and when fish are located has resulted in slow and often contentious permitting processes, in addition to costly shutdowns.

A fully autonomous solution for monitoring fish activity, the HydroAI system equips dam operators with faster and more accurate data than ever before, allowing them to meet regulatory requirements with ease and streamline their operations.

Innovasea will continue to play a key role in unleashing the power of artificial intelligence to improve and accelerate aquatic animal research in Canada and the rest of North America. With innovative technology solutions such as HydroAI, operators will have the tools they need to draw the most comprehensive and accurate conclusions to maintain operations that are sustainable and efficient.

Contact Innovasea to learn more about the latest in its fish tracking solutions at: [www.innovasea.com/contact-us](http://www.innovasea.com/contact-us). **ST**

---

*Stephanie Smedbol is the director of product management and customer success for Innovasea's fish tracking business. She has over 15 years of experience helping researchers get the most out of their acoustic telemetry studies. Smedbol holds a B.S. in biology from McGill University and a bachelor's in electrical engineering from Dalhousie University.*

*Aaron Legge is the group product manager of Innovasea's fish tracking team. With a track record of driving impactful solutions in product management, he is dedicated to advancing technology to explore and protect our marine ecosystems.*

# Cybersecurity Offshore

*Software to Ensure Data Integrity, Security in Operations*

By Jonas Røstad • Aurelia Paraschiv



For as long as people have been navigating the seas, they have been subject to the forces of waves, currents and weather. For many years, the potential impacts of these factors were a game of chance, but the development of sensors and monitoring software means that is no longer the case. Real-time ocean insights into various sea state aspects are now essential for ensuring safe and efficient offshore operations, with technology advancement enabling the availability of up-to-the-minute data.

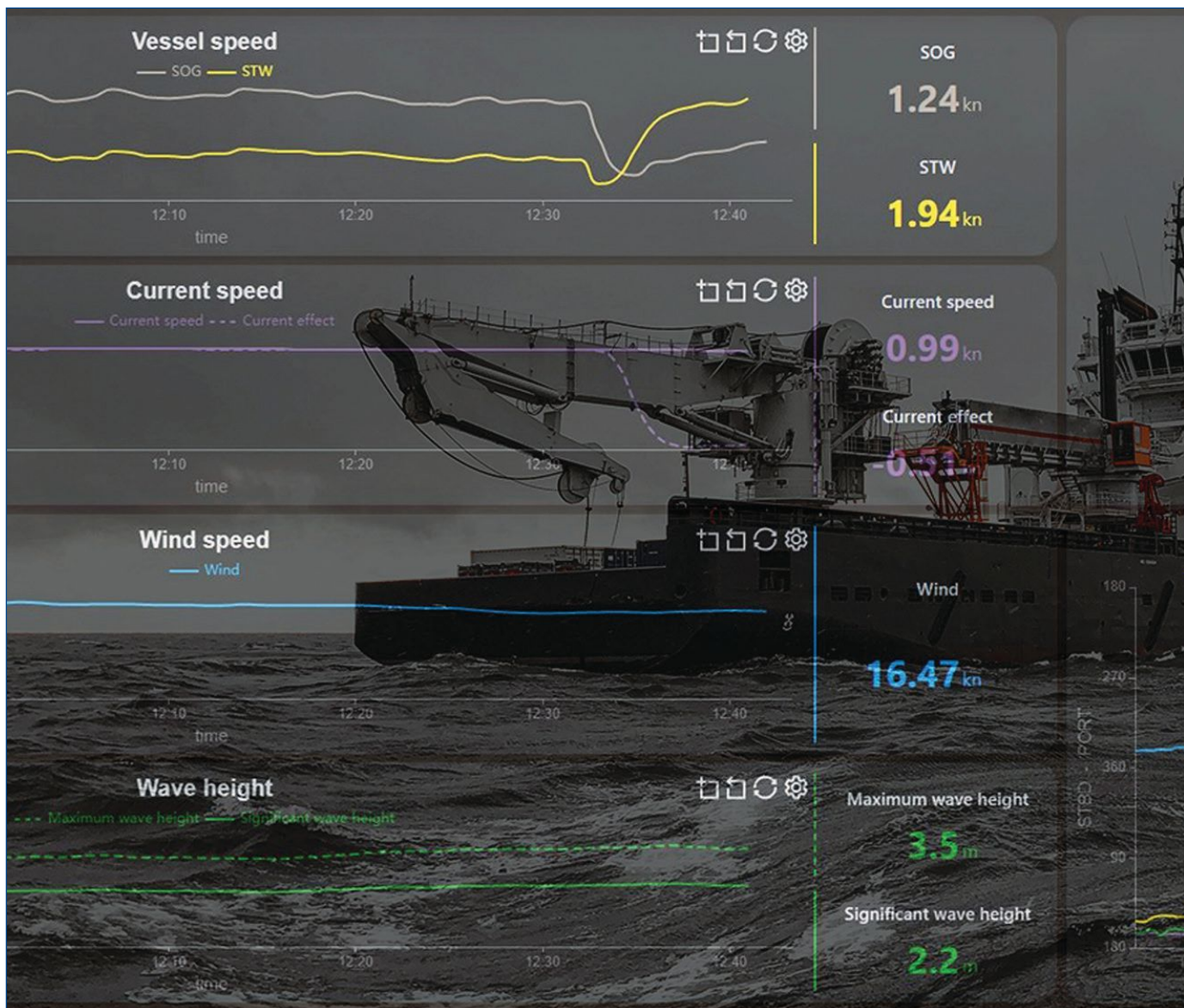
However, simply generating vast quantities of data is not enough, and while the focus may traditionally have been on accuracy and readability, it's become evident that ensuring the security of information is equally cru-

*Miros ensures that the entire data flow, from detection to all stakeholders, is tamper proof. (Credit: Adobe Stock)*

cial as ensuring the security of an asset. And as digitalization, interconnectivity and cloud-based systems become more common place in offshore sectors, the discussions around cybersecurity will continue to take center stage.

## **Miros Collaboration with Microsoft**

In Miros Group's conversations with companies around the globe, from oil majors to offshore wind farm



*Real-time ocean insights into various sea state aspects are essential for ensuring safe and efficient offshore operations, with technology advancement enabling the availability of up-to-the-minute data. (Credit: Miros)*

developers, it's evident that cybersecurity sits atop the priority list. At Miros, our ambition is to make data available anywhere, at any time, and in the most secure way possible. But in a world where protection is increasingly important, it's understandable that there are misconceptions and apprehensions regarding the security of cloud services.

Cybersecurity should not be a mere buzzword: It's the cornerstone of Miros's operations. We have Microsoft authentication, and our security systems are the same ones used by banks. Our work extends beyond ordinary data processing, or the security of information transfer, to fortifying the architecture of our software.

Putting the correct partnerships in place is a prerequisite

for safe data processing, especially for smaller businesses. Miros likes to collaborate, and, given the size, reputability and reliability of Microsoft, it made sense for us to utilize Microsoft's Azure platform and existing expert work on cybersecurity. There are large parts that Miros tailors and manages, but the building blocks come from Microsoft.

Advancements in technology has enabled data processing to happen within the sensor, so there is no need for extra servers or new computers to access the data. That's a cost saving that also minimizes the environmental impact of applying new technology and, crucially, adds another level of protection, because information is secure before it leaves the sensor.

Of course, the safeguarding of software from development to delivery is just one piece of the puzzle; managing who can access the data is equally as important.

Beyond safeguarding software and encrypted communication, there is also an obligation on companies to make sure they have the correct stringent processes and employee training to protect sensitive data and assets.



User access control is one of the methods that Miros uses, and ensuring the right data are only accessible to authorized individuals is a priority. It goes beyond software and security measures, such as Microsoft Azure; it encompasses the overall security controls and management system that a company has in place.

At the heart of our approach is collaboration—with partners, customers and regulatory bodies—to uphold the integrity of data transmission. By leveraging technological advancements and strategic partnerships, Miros ensures that the software is robust and users are well-educated on security practices.

### Lack of Cybersecurity: The Risks

Offshore businesses must consider the potential ramifications of failing to properly secure systems and devices installed on a vessel. Increasingly, cyberattacks can pose risks to crew safety, environmental integrity and operational efficiency. One of the most critical consequences could potentially be for attackers to manipulate essential systems, such as navigation, propulsion and dynamic po-

sitioning systems, leading to loss of control over a vessel's movement.

Many asset owners opt to retain data locally due to concerns over the lack of security in available web services, even though obtaining data locally can be challenging. This approach allows them to maintain control over cybersecurity risks. However, it may limit integration with other onboard systems, necessitating a trade-off between data accessibility and security.

There are other incentives for operators to get their cybersecurity in order beyond simply protecting themselves from potential threats. Research published by DNV last year revealed that less than half (40 percent) of maritime professionals think their organization is investing enough in cybersecurity. This statistic comes at a time when vessels and other critical infrastructure are becoming increasingly networked and connected to IT systems, and authorities around the world now have rules in place designed to safeguard data against tampering.

We are witnessing an increasing emphasis on cybersecurity, particularly in well-established offshore industry regions with concrete standards and regulations, such that manufacturers of devices or telemetry software are required to take certain steps. One of the key requirements currently is compliance with ISO 27001 and IEC 62443, international standards for information security management and cybersecurity of control systems, in the same way there are other safety certificates needed for devices to ensure they don't interfere with each other.

Further regulations are inevitable, and it is likely that the European Commission will roll them out in the upcoming year because there are no uniform standards at the moment, which is creating confusion for operators. DNV warned last year that the sector must prepare to comply with a raft of new, stricter cybersecurity requirements to defend against emerging threats.

### Petrobras Shores up Cyber

One country that is further ahead than most on getting its regulatory house in order is Brazil. The Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) recently introduced rules designed to ensure data or alarms from oil spill detection monitoring software offshore cannot be tampered with.

With the rules in place, Miros secured a contract with local oil major Petrobras to install a cloud-based add-on to Petrobras's existing kit, allowing data to be safely shared with multiple stakeholders in real time.

Cybersecurity and data integrity are two sides of the same coin. Monitoring systems observe oil platforms, looking for potential spills. The data are then stored in the cloud, and the operator needs to acknowledge and possibly take action based on what information is presented to them. But there are many ways to get into a system and sabotage or alter data to cover up incidents.

This is exactly what Petrobras wanted to avoid, so the company asked Miros to deliver monitoring software that is tamper proof at points where data are readily available and actionable, with data integrity ensured.

Petrobras as the operator and IBAMA as the environ-



*From oil majors to offshore wind farm developers, it's evident that cybersecurity sits atop the priority list. (Credit: Miros)*

mental agency both need access to the same secure, reliable data, and Miros ensures that the entire data flow, from detection to all stakeholders, is tamper proof.

## Conclusion

There are differences between cybersecurity and data integrity, but the two go hand in hand. As the world becomes more interconnected and collaboration in the offshore sector becomes more commonplace, data sharing is now the norm, rather than the exception. Within any given project or operation, information flows between multiple endpoints, which opens up communication and collaboration opportunities but also increases cybersecurity risk.

All the data must also be archived for later access and backed up for recovery if a glitch occurs. At Miros, we take full control of these processes and manage them through our system, so the client has one fewer thing to worry about. These processes enable us to guarantee uptime because we know what mode the sensor is in, and we have control of the digital chain.

While digitalization and the ease of generating, using, and transmitting data mean companies need to spend time putting the required barriers to cybersecurity risk in place, the benefits of adopting such systems are obvious. In a previous era of the offshore industry, multiple mon-

itoring systems required manual inputs. Processes that are now relatively straightforward, such as data input and backup, all took a long time, and there was the risk of human error. Technical advancements have revolutionized and streamlined the offshore sector in the last few years, automating tasks that were once laborious. The resulting efficiency enhances operations, safety and workers' wellbeing. **ST**

*Jonas Røstad is the COO of Miros. With nearly 20 years immersed in leading-edge technology, Røstad bridges sales, service and support. His proficiency drives Miros's mission of bolstering safety, sustainability and performance in offshore operations. Leveraging extensive experience in electronics and systems, he plays a key role in advancing Miros's real-time, cloud-integrated ocean surface measurement solutions.*



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# The Threat of Spoofing

## *Protecting Against False Navigation Data*

By Xavier Orr

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Contemporary maritime transportation and offshore operations rely greatly on global navigation satellite systems (GNSS) for precise navigation. However, the recent proliferation of GNSS signal spoofing incidents is raising questions about the vulnerability of this navigation method.

GNSS spoofing is set to dominate discussions across the positioning, navigation and timing (PNT) and GNSS fields. The threat occurs when a counterfeit radio signal overrides a legitimate GNSS satellite signal, feeding the receiver with false information regarding a vessel's actual location.



*Without proper protection, vessels are vulnerable to spoofing, which can have national security implications.*

**DFOG enables navigation underwater, including identification of and disregard for false data.**



This phenomenon has been deemed a “growing menace” in industries that are reliant on GNSS-based navigation. Specifically in maritime, there have been increasing attempts to spoof vessels, taking them off course and into territorial waters; for example, a U.K. tanker was spoofed in the last few years and ended up seized by Iran, as reported by Lloyd’s List. There have also been reports of businesses leveraging fake coordinates to engage in murky and even illegal activities, such as Russian entities trying to get around oil sanctions, *The New York Times* reported. The problem will continue to exacerbate with global conflicts occurring in Eastern Europe and the Middle East.

### **A Threat to Navigation**

Spoofing first gained major headlines in 2013 when University of Texas Assistant Professor Todd Humphreys and his students successfully spoofed an \$80 million superyacht. A subsequent major incident occurred in 2019 when an Israeli firm experimentally spoofed a Tesla Model 3.

The topic is now trending more frequently into mainstream news as ordinary citizens are also experiencing ripple effects, such as when erroneous data were transmitted through Waze—a turn-by-turn GNSS vehicle navigation app—informing Israeli drivers that they were approaching the Gaza Strip amid the ongoing regional conflict.

With the increasing sophistication of electronic and cyber warfare, coupled with the dramatic reduction in the cost, complexity and threshold needed to conduct spoofing, it is no longer a possibility but rather a certainty that critical industries will face disruption. There is now an imperative to expand dialogue beyond the current industry scope and offer viable solutions.

### **Protection Technologies**

Thankfully, advanced technology to combat this evolving threat is available. To fortify against spoofing, industries need to be equipped with the necessary means of protection. There are several layers of protection that can be put in place to address this threat.

At a minimum, maritime industries should look to integrate a multi-GNSS approach, coupled with advanced receiver autonomous integrity monitoring (RAIM) and fault detection and exclusion (FDE) techniques, to enhance positioning integrity.

As a step further, assured PNT (A-PNT) solutions should be integrated as a reliable counterpart to existing GNSS-only approaches. A prime example is high-performance inertial navigation systems (INS), which assess comprehensive data gathered from multiple sensors using a method called inertial integrity monitoring. This method allows the INS to identify spoofing and disregard it, ensuring the completeness, reliability and accuracy of data at any given time.

Newer INS systems that utilize an artificial neural network (ANN) based filter can provide major improvements to spoofing detection and A-PNT backup, compared to older systems that rely on the Kalman filter. This capability can be found in Advanced Navigation’s Digital Fibre-Optic Gyroscope (DFOG) INS.

DFOG is patented technology that has been developed over 25 years. It is integrated into Advanced Navigation’s Boreas series. Featuring ultrafast gyrocompassing, the system is able to determine a highly accurate heading, without any reliance on magnetic heading or GNSS.

DFOG is being utilized for marine applications that require always available, ultrahigh accuracy orientation and navigation. In a recent case, we provided a DFOG

## *“GNSS spoofing is set to dominate discussions across the positioning, navigation and timing (PNT) and GNSS fields.”*

system to a customer manufacturing submersibles. As GNSS signals do not penetrate in water—therefore, rendering GNSS-based navigation useless—DFOG is able to support the customer’s vessels with precise underwater navigation in depths beyond 100 m.

### **Regulatory Bodies Play a Key Role**

Whether industries come out the other end unscathed will depend on how fast they move at leveraging available technologies such as INS to combat emerging spoofing threats. It is imperative for the private sector to take the lead in minimizing the impact of spoofing by swiftly assessing and deploying systems that can keep pace with this growing concern.

Equipping new technologies into maritime vessels can be a costly and long-winded process. Regulatory bodies must collaborate with the private sector to establish frameworks that facilitate rapid technological integration. Accelerating certification processes, without compromis-

ing safety standards, will ensure that equipment remains at the forefront of defense against the ever-evolving threat landscape.

As we navigate the complexities of an interconnected world, where technology is both a boon and a potential liability, our collective vigilance and proactive measures will determine our ability to secure critical industries against the looming threat of spoofing. **ST**

*Xavier Orr is the CEO and co-founder of Advanced Navigation, an AI-based robotics and navigation technology company ([www.advancednavigation.com](http://www.advancednavigation.com)). Orr earned his mechanical engineering and computer science degrees from the University of Western Australia, where he developed a neural network AI approach to inertial navigation. Advanced Navigation’s expertise lies in several deep-technology fields, including underwater sonar, GNSS antennas and receivers, radio frequency systems, inertial sensors, robotics, and quantum-enhanced inertial navigation.*



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# Smart Structural Monitoring

## *Condition-Based, Preventative Strategies Enhance FPSO Life Cycle*

By Niklas Hallgren

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A floating production, storage and offloading unit (FPSO) in an oilfield off Australia suffered an oil spill in 2022, the circumstances of which demonstrate why time-based maintenance schedules are being replaced with more sophisticated strategies. The FPSO was a converted oil tanker that had been stationed at the field since 2009. The oil flowed from a 30-mm hole in the 10th and last of the vessel's tanks to undergo routine five-year maintenance, and it occurred just before that scheduled maintenance.

Rather than relying on specific time cycles, condition-based strategies schedule maintenance work based on the condition of the asset. Predictive strategies take that concept a step further by using algorithms to predict in advance when a system is likely to fail so that maintenance can be scheduled before the situation becomes critical, so that downtime can be minimized.

A GlobalData poll published in February 2024 found that approximately 40 percent of respondents believe that, of all the uses for artificial intelligence (AI) offshore, its use in predictive maintenance is having the greatest impact on oil and gas operations—more than smart emissions monitoring or power forecasting, for example.

Offshore, much of the AI effort put into predictive maintenance is directed at rotating equipment, such as pumps and engines, but the hull and tanks of an FPSO are the front line of defense against oil spills. Fatigue of metal structures can occur as a result of flexing due to repeated cycles of stress, and it often starts at welded joints. Corrosion can increase vulnerability to fatigue, and cracks or structural failure can occur without warning.

### **Fatigue Calculations**

Both condition-based and predictive maintenance strategies rely on data, and that is what the Light Structures' SENSFIB system provides: real-time stress mea-

surements, the algorithms to analyze them and the ability to deliver them to digital systems such as digital twins.

Real-time data, rather than time-based snapshot data, bring greater accuracy to any maintenance strategy. ABS, for example, in its 2021 Advisory on Fatigue Monitoring of Floating Production Installations, noted how real-time data can benefit fatigue calculations by providing more accuracy than interval-based approximations, potentially leading to higher remaining fatigue life for structural connections.

Fatigue calculations involve measurement of environmental factors, such as wave height and direction, and structural and operational factors, such as draft, bending moment, rolling angle, loading and offloading sequences, and tank levels.

The functional scope of SENSFIB for FPSOs includes global structural monitoring, which measures forces running through the hull, and low-cycle fatigue monitoring, which is the variation between ballast and loading. When an FPSO is loaded, there is pressure on the tanks in one direction, but when the tanks are emptied, the pressure is in the opposite direction. The walls therefore bend both ways, and this can cause material fatigue over time.

Light Structures is working closely with classification societies to ensure that its structural monitoring data can provide value to a wide range of offshore assets. As ABS noted in its 2022 publication "Enhancing Safety on FPSOs: Practical Considerations for Operations and Maintenance," the global FPSO fleet is the most diverse it has ever been.

"Operations and maintenance challenges vary widely across the global fleet of FPSOs," according to the publication. "With many assets well over 40 years since their keel laying date, hull integrity and maintenance require a large portion of the available maintenance resources."

Alternatively, newer FPSOs are some of the largest

*Structural stress and fatigue monitoring solutions can prevent failures instead of relying on scheduled maintenance.*



ever built and are equipped with the most modern digital condition monitoring and maintenance systems. “While the requirements for these units are similar, the challenges faced in operations and maintenance are quite different,” the publication states.

It’s prudent to note that there is no legislation that mandates the use of structural stress and fatigue monitoring on an FPSO or indeed any other maritime asset. However, with the advent of more intelligent oilfield operations, ABS has introduced a new SMART Structural Health Monitoring (SHM) notation, with Light Structures’ SENSFIB being the first solution to receive certification for use as part of a connected digital system.

### **Sensors and Configuration**

There are two basic sensor types used for measuring the structural health of ships and offshore platforms: electromechanical and fiber-optic.

Electromechanical structural health monitoring systems use long-base or LVDT sensors to measure stress on a hull or superstructure. They have several drawbacks, including the need to weld sensors in place and the requirement to use a Zener barrier circuit or galvanic separation to be explosion proof and intrinsically safe.

Conversely, short-base fiber-optic sensors, such as those used in the SENSFIB structural health monitoring system, can be installed quickly and easily using epoxy. They are also intrinsically and optically inherently safe without the addition of Zener barriers and are unaffected by electromagnetic interference.

SENSFIB sensors are based on Fiber Bragg Grating

(FBG) technology and feature an internal stripe pattern in the core of the optical fiber that strongly reflects one wavelength (or color) of light. FBG sensors provide more accurate data than electromechanical sensors, as the stress measurements are based on the wavelength of light. They also require little or no recalibration, maintenance, repair or servicing.

The flexible placement of sensors is a key advantage of modern monitoring systems. Unlike Electromechanical sensors, short-base fiber-optic sensors can be placed in almost any location, as they require no welding or Zener barriers. This makes them suitable for submerged areas, such as water ballast tanks, which can be essential for FPSOs, where constant tank operations can induce low cycle fatigue over time.

The placement of sensors is tailored to each FPSO’s design and operational focus. Commonly, sensors are positioned on the main deck for monitoring global deformations, a critical measure for FPSOs due to their interaction with the sea and the considerable weight of their topsides. Additional sensors may be installed in significant local structures like web frames and bulkheads, especially near the waterline, to assess the effects of global deformations combined with the repetitive impact of loading/offloading cycles and fluctuating sea pressure.

Once in place, a structural monitoring system will support risk-based inspection and condition-based maintenance strategies, either by providing data directly to the network on board, via email, or to a cloud platform. The data can be provided with or without analysis, depending on a client’s in-house capabilities.



*SENSFIB's applications for FPSOs include global structural monitoring and low-cycle fatigue monitoring.*

## Data Analytics

The measured stress is analyzed in a distributed way inside the sensors. These internal analysis methods are used to identify the static, dynamic, and slow-changing temperature components from the signal and calculate different signal characteristics. The incorporation of accelerometers and motion sensors adds a comprehensive layer to this monitoring, capturing acceleration forces that could lead to material fatigue, especially in intricate on-deck structures, such as processing plants or mooring turrets.

Onboard and onshore user interfaces can be configured to show different measurement parameters, as well as the results of real-time processing. On-screen comparison of operational and environmental factors such as sea state, wind, speed and loading condition are set up where available. The various components of a typical hull stress monitoring system include strain sensors, accelerometer units, bow pressure transducers and the bridge display unit.

Digital twins provide a dynamic virtual representation of an FPSO, enabling operators to simulate scenarios under different operational strategies and are currently where any new AI processing of structural data might be applied.

Integrated into a digital twin, the data from structural monitoring sensors can be extrapolated to provide stress and fatigue information for practically any point on the vessel. This can be used to identify fatigue hotspots that may not be apparent in traditional inspections. The continuous global insights gained are made available to maintenance planners and structural engineers, enabling them to identify and address areas experiencing accelerated fatigue or undue stress.

Digital twin technology, fed with SENSFIB data, can also facilitate the simulation of various stress situations under different operational conditions. This predictive

approach would enable the FPSO engineering team to make informed decisions about load distributions and make operational adjustments to enhance overall asset integrity.

## Life Cycle Benefits

Throughout the long-term operation of an FPSO, typically spanning a life cycle of over 25 years, the vessel will encounter varying environmental conditions. Even though they are moored most of the time, they face constant exposure to environmental stresses, much like transport ships do.

The smart use of structural monitoring data ensures that changes in weather and sea states, which may deviate from initial design assumptions, are accounted for in real time. This continuous monitoring allows for the adaptation of maintenance strategies to current conditions, ensuring that components at risk of accelerated fatigue, such as process plant foundations or flare towers, are identified and attended to in a timely manner. This proactive maintenance approach significantly reduces downtime and extends the life span of FPSO structures.

To summarize, stress and fatigue data allow for condition-based maintenance, where repairs and inspections are scheduled based on condition, not on set schedules. By identifying areas of high stress or developing fatigue, necessary repairs or reinforcements can be made before a catastrophic failure occurs.

By managing stress and fatigue proactively and understanding the remaining useful life of a structure, the operational life of an FPSO or other asset can be extended, delaying the need for costly replacements. At the same time, the use of structural stress and fatigue monitoring can help to prevent similar events to the FPSO oil spill that occurred in 2022. **ST**

*Niklas Hallgren is the CEO of Light Structures.*

# Framework for Sustainability

## *Implementing Maritime Ecological Damage Compensation in China*

By Dr. Tao Wang • Dan Bai

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In 2010, Shandong Province pioneered the collection of funds for marine ecological damage compensation in China, including establishing measures for assessment. The challenge now is to implement a marine ecological compensation scheme throughout the country.

China, second only to India as the most populous developing nation, has incurred a substantial ecological cost in pursuit of economic progress. While the extent of mild marine pollution has decreased in recent years, the prevalence of moderate and severe pollution has increased.

Among China's 230 river sections, 76 had total nitrogen concentrations beyond the normal yearly average. The quantity of pollutants transported into the sea by rivers has escalated, primarily due to augmented influxes of heavy metals, such as copper, in the estuaries of the Yangtze and Pearl Rivers. The result is frequent harmful algal blooms and slower growth in marine industry. In 2022, China's marine areas had a total of 67 occurrences of red tide, which affected a combined area of 3,328 sq. km.

Adding to the problem is the ongoing practice of excessive fishing in China, which has consistently led to a decline in biodiversity and species population numbers.

Furthermore, other marine biological resources have also suffered significant damage from environmental misuse and abuse. Take, for example, mangroves, which are ecosystems located at the boundary between land and sea and characterized by a rich variety of species. Mangroves affect, and are affected by, activities in fisheries and agriculture. Mangroves also play a role in climate



*A coral reef off Hainan Province, China.*

change and coastal safety. Historically, the mangrove coverage in China once reached 250,000 hectares. In 1956, a survey of tropical and subtropical resources reported the country's mangrove coverage at 42,001 hectares. The 1960s and 1970s, a period of peak population growth in China, witnessed large-scale, organized reclamation of coastal areas for agricultural use, further significantly reducing mangrove areas.

In the 1980s, residents living near mangroves began large-scale pond aquaculture to improve their livelihoods, causing severe damage to the mangrove ecosystems. Coupled with the impact of various marine engineering projects, there was a substantial decrease in mangrove areas. The comprehensive survey of coastal and tidal resources from 1981 to 1986 reported a national mangrove area of 18,842 hectares.



In the 21st century, the ecological benefits of mangroves have gradually become recognized and valued, leading to increased attention to their protection and restoration. The national and local governments in China have implemented a series of mangrove ecological restoration projects. The first national survey of mangrove resources in 2001 showed an area of 22,872.9 hectares; by 2010, the total area of mangroves in China was 24,578.2 hectares; and in 2019, the total was at 28,922 hectares (excluding Hong Kong, Macao and Taiwan).

### **The Concept**

Ecological compensation measures, such as taxes, can facilitate the repair of marine ecosystems, leading to a reduction in pollution and preservation or restoration of biodiversity. Ecological compensation, successful in terrestrial ecosystem management, considers the resource's economic value, preservation costs and lost growth opportunities, utilizing both government and market strategies. It has economic and legal aspects, using incentives and penalties to encourage environmentally beneficial actions.

Marine ecological compensation establishes a system holding those harming marine ecosystems accountable, incorporating rewards and constraints, ensuring financial compensation for damage, and coordinating stakeholder relations for effective ecosystem management and restoration.

### **The Framework**

Establishing a marine ecological compensation mechanism requires developing a valuation system for marine resources, on which damage compensation and ecological taxes will be based. Market value methods, based on aquatic product prices, can be used but need refinement

to account for local environmental complexities and resource base.

Compensation scales and standards should be based on calculations that include habitat loss, species impact, and essential resource functions. It should also calculate losses to local governments and individuals from ecological damage or conservation measures, including industry transition and development costs. Valuations should be tailored to specific ecological zones, accounting for their unique attributes.

Marine ecological compensation aims to protect marine resources for sustainable use, balancing stakeholder interests through government and market mechanisms. Its core principle is rewarding positive ecological actions and penalizing harmful ones. Government efforts are essential, including policy development, financing and ecological tax collection.

Market-based valuation and financing are also key. The market can set marine resource value as an economic quantification, supported by legal structures. This approach charges resource users based on their environmental impact through methods such as pollution-limiting permits and ecological damage taxes and fees.

Damage compensation can also vary in kind; for example, enforcement of a local transition from fishing activities to conservation, such as breeding depleted species or artificial reef creation.

### **Funding Mechanisms**

There are three types of funding mechanisms: damage compensation, ecological taxes and environmental liability insurance.

For damage compensation, various levels of government play a central role in distributing funds. It is imperative to incorporate and prioritize this mechanism into the

fiscal budgets of national and local governments.

Ecological taxes should be levied on fisheries, oil and gas companies, and other stakeholders in maritime-related industries. Considerations include: establishing tax rates, the possibility of enterprises transferring costs to consumers, and the issue of tax evasion through unlawful disposal of pollutants.

Environmental liability insurance provides coverage for legal obligations related to environmental harm. To improve its effectiveness, it is necessary to create government incentives to encourage stakeholder participation and offer assistance to insurers.

In China, the pace of development in environmental regulation and oversight has been sluggish as a result of inadequate focus on policy and limited participation from corporations since the 1990s. It is crucial to advance environmental legislation, establish definitions for accountability, develop innovative insurance strategies, and customize these to suit specific local requirements.

### Legal Framework

Establishing a comprehensive legal and regulatory framework is crucial to the sustainable use of marine resources. Currently, China's environmental legislation, particularly concerning the marine environment, is inadequate. The country could take inspiration from the practices of Germany and the United States to improve environmental regulations.

Furthermore, if an incident takes place, it is crucial to promptly address and rectify the damage at the location. The parties should be held accountable and subject to legal and substantial financial consequences.

### Oversight

The national government has ownership over the sea within the country's boundaries, but relying exclusively on government fiscal compensation methods is not effective. An enduring framework for investment in marine ecological conservation, accompanied by a robust oversight mechanism, is needed.

For example, when utilizing the marine ecological damage compensation fund, departments must rigorously enforce the system. They must also adhere to the pre-budgeting scheme specified by national authorities. Additionally, auditing and accounting must take measures to prevent misappropriation of funds.

### Local Efforts

In 2010, Shandong Province formally raised the status of marine ecological compensation as a local environmental protection policy. However, these regulations have not yet been implemented; so far, there are only "interim" measures in effect.

Meanwhile, China's Oceanic Administration took inspiration from Shandong and initiated national marine ecological compensation efforts as pilot programs in the provinces of Shandong, Jiangsu, Hainan and Fujian, tailored to their specific regional conditions.

Shandong has three focus areas: compensation for maintaining seawater quality, regulating pollutants re-

leased into the sea and safeguarding coastal ecosystems. Jiangsu and Hainan provinces have developed mechanisms to compensate for ecological or biological resource losses in their marine environments. Fujian has initiated a preventative pilot program to protect its ecological systems.

### The Need for a National System

China has not yet established a specific national law on marine ecological compensation. Instead, it has included general measures in broader statutes such as the Marine Environmental Protection Law, which are not practical. Marine ecological compensation legislation is primarily implemented at the municipal level, with coastal provinces establishing standards, funding sources and regulations based on local conditions.

These localized systems result in limited implementation and a fragmented policy framework without national oversight. The national government could end up funding compensation schemes at the provincial level without a holistic system for maritime ecological governance. To prevent this, national regulations must be created, including systematic integration of local policies. The national government already has pilot programs in place, and it can use the results of those initiatives to create a nationwide framework.

### A Shared Obligation

Beyond government, safeguarding marine ecosystems and assets must be a shared objective of society. Public engagement is necessary. We must work toward increasing public knowledge and understanding of marine ecology to promote a collective dedication to the sustainable use of resources. This includes influencing consumer behaviors because they have a direct impact on the marine ecosystem.

Integrating environmental standards into decision-making processes and creating and adhering to strict policies enhances a sense of shared moral obligation. Engaging civic organizations in the establishment of a national marine ecological restitution fund and exposing parties that violate environmental regulations are vital measures to ensure effective implementation and oversight.

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# international

## Ashtead Buys INS/DVL Systems

Exail has secured a contract with Ashtead Technology for the initial sale of six units of its new INS/DVL system, the Rovins 9-DVL, making Ashtead Technology the first rental company in the market to adopt Exail's new INS/DVL technology.

The Rovins 9-DVL is a high-performance navigation system that delivers highly accurate and reliable subsea positioning and velocity measurements.

## UTEC Reconfigures Gavia AUV

UTEC, a geo-services brand in Acteon's Data and Robotics division, has conducted a day of Gavia AUV trials off Fremantle in Western Australia. 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 U.K.

The most significant upgrade is the addition of the module that enables subsea USBL support for the vehicle's 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 enabling the vehicle to remain subsea and on task for up to 12 hr. and 1,000-m depth.

## UTM Payload for Inspection Drone

Flyability, a specialist in confined space drones, has a new ultrasonic thickness measurement (UTM) payload for its flagship drone, the Elios 3. This payload was developed in partnership with Cygnus Instruments to create a product that supports certified UT inspectors.

The new live A-scan UT payload is designed for spot thickness measurements of steel in ship hulls, inside tanks, and between pipe racks, among other applications. With UT critical to many inspection processes, this new payload presents a safer means of accessing thickness measurement locations (TML).

The Elios 3 can enter confined spaces or easily reach TML points at height, completing wall thickness gaging or corrosion surveys quickly and safely. The ultrasonic probe is mounted on a smart arm, featuring a laser pointer that provides visual guidance to precisely aim at measurement points. Each measurement can be location tagged on a digital twin of the asset for ease of analysis.

## ClassNK Approves AI Platform

ClassNK has granted its Innovation Endorsement for Products & Solutions to a vessel and voyage performance monitoring platform called "Cassandra," developed by Deep Sea Technologies SMPC. Cassandra integrates performance data from vessels with AI and enables real-time monitoring of the ship's current status. It is cloud-based and designed to monitor fuel consumption, CO<sub>2</sub> emissions, and hull and engine performance from shore.

## Mini Echosounder Integration on Glider

Teledyne Marine and Kongsberg Discovery will inte-

grate the Kongsberg EK80 Wide Band Transceiver (WBT) Mini scientific echosounder onto the Teledyne Slocum G3s Glider.

The EK80 WBT Mini is a compact version of the highly efficient WBT used by marine research vessels worldwide. Its compact size and energy-efficient design make it ideal for installation on subsea platforms such as the Slocum Glider. The scientific echosounder is used to identify and quantify a wide range of targets, such as fish, plankton, bubbles, oil droplets and physical oceanographic features, such as turbulence.

## Auto-Drop Piston Corer Project

Feritech Global has completed a major design and build project for Oceaneering, a provider of subsea robotics to the offshore energy industry. The company has designed a next-generation auto-drop piston corer to dramatically reduce the amount of time needed for subsea geotechnical surveying.

Software enables the auto-drop piston corer to be programmed, lowered to pre-set sea depth and then automatically released. This provides much greater precision and faster speeds than traditional piston corers, which are launched manually by a trigger mechanism.

The launch and recovery system (LARS) and the winch can be operated remotely, through a control panel integrated into a lightweight wearable pack. Piston corer operations can be carried out safely by one person.

## Teledyne to Acquire Valeport

Teledyne Marine has agreed to acquire Valeport, a U.K. manufacturer of oceanographic and hydrographic instrumentation. The independent family-owned business, which was established in 1969, has a worldwide customer base that includes: subsea, hydrographic, metrological and positioning, oceanographic, ports, harbors, dredging, energy and scientific research sectors.

## Pre-Install Survey for Tyrrhenian Link East Cable

The Naples-headquartered international survey contractor Next Geosolutions (NextGeo) has successfully completed all the pre-installation survey tasks for the Tyrrhenian Link East branch on behalf of Prysmian.

The works entailed extensive marine detailed geophysical, geotechnical, UXO, archaeological and environmental survey activities along the Terna's submarine power line connecting the landing points in Sicily and in Campania with two HVDC cables, each approximately 485 km long. Additional survey tasks have been executed in the nearshore sections of the corridor, including boreholes, HDD survey, topography and geoelectrical investigations.

The Tyrrhenian Link is a key energy infrastructure in the Mediterranean. This project will connect Sicily with Sardinia and the Italian peninsula through a double submarine HVDC cable link with a power capacity of 1,000 MW and a total length of about 970 km. The connection will improve the electricity exchange capacity, promote the development of renewable sources and improve the reliability of the grid.

## EU Emissions Trading

Ocean Network Express (ONE) has announced its inaugural European Union Allowances (EUA) transaction with BNP Paribas.

Commencing January 1, 2024, under the regulations of the EU Emissions Trading System (EU-ETS), the maritime transport industry has been included, and shipping companies are mandated to monitor, report, and verify their greenhouse gas (GHG) emissions annually. The data will be utilized to determine the EUA that they need to surrender within a compliance period.

## Coring Campaign in Gulf of Campeche

TDI-Brooks, as a subcontractor of Drebbel de Mexico, has successfully and safely completed a geotechnical coring campaign at the Laguna Azul. A total of 158 gravity CPTs and eight T-bars in three pipeline corridors was performed.

## Propulsion for CCG Icebreakers

Seaspan Shipyards, Canada's long-term shipbuilding partner for the Canadian Coast Guard (CCG) and Royal Canadian Navy, has awarded ABB a contract to deliver an integrated propulsion system for the first of the CCG's new-generation polar-class icebreakers.

The vessel is expected to be one of the world's largest and most powerful diesel-electric icebreakers when it enters service in 2030.

ABB will supply vessel systems complying with IACS Polar Class 2 requirements for year-round operations in moderate multi-year ice conditions. The vessel will have 34 MW of propulsive power provided by a single shaft-line and twin Azipod units.

## JDP Develops LNG Carrier

Bureau Veritas (BV) has announced the successful conclusion of a joint development project (JDP) with Hanwha Ocean Co. Ltd. for the development of a 270K LNG Carrier.

Hanwha Ocean's proprietary hull design for a 270K LNG carrier was meticulously developed to anticipate and fulfill the future demands of the LNG market.

To verify the hull key drawings provided by Hanwha Ocean, BV performed 2D local scantling and 3D cargo hold finite element analysis, assessing the longitudinal strength of the hull, as well as the yielding and buckling of longitudinal and transverse members. Fatigue analysis was also conducted using a local fine mesh to evaluate the details of hull structures sensitive to fatigue.

## Dutch Accelerator Adds Partner

The Netherlands-based maritime startup accelerator PortXL has signed a partnership agreement with MINDbase Rotterdam, one of the hubs of the Dutch Ministry of Defence's innovation organization.

Since its founding in 2015, PortXL has facilitated the growth of more than 100 startups and scale-up companies. Partners include the Port of Rotterdam, Van Oord and Damen Shipyards. Adding MINDbase as a partner broadens the scope to include military applications. **ST**

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# offshore oil & ocean engineering

## USBL for Geotechnical Vessel

Taiwanese offshore geophysical and geotechnical investigation company PDE Offshore Corp. has upgraded its underwater acoustic positioning system on board MV *Geo Energy* to Sonardyne's Ranger 2 USBL system. This will enhance the company's capabilities in the exploration of offshore renewable energy (ORE) in Taiwan.

The new geotechnical vessel *Geo Power*, also equipped with a Ranger 2 USBL system, is now under conversion work and will join the fleet mid-2024 to provide both seabed and downhole cone penetration testing services.

PDE Offshore has been conducting geotechnical and soil investigation in the shallow waters of the Taiwanese Strait since 2017 as the country looks to replace its coal-based energy with cleaner, sustainable alternatives, such as offshore

wind energy.

PDE Offshore chose Sonardyne's Ranger 2 system because it can track a subsea asset, position or communicate with an underwater vehicle and dynamically position a vessel simultaneously. It can be used for both survey and construction phases of ORE, and it supports complex tracking scenarios, such as structures and vehicles with multiple transponders and multiple remote offsets.

## Progress on CSOVs

The two Ulstein-designed commissioning service operation vessel (CSOV) newbuilds under construction for Bernhard Schulte Offshore have reached important milestones. The steel-cutting and keel-laying ceremonies took place in Poland earlier this year.

These CSOVs are characterized by the TWIN X-STERN feature, im-

plementing fore and aft main propeller units for excellent dynamic positioning characteristics.

The hulls will be towed to Ulstein Verft in Norway for the final phases, which include outfitting, paint work, electrical installation, equipment integration, commissioning and sea trial. Delivery is planned for 2025.

## Subsea Cranes for Offshore Construction Vessels

Huisman has been awarded a contract from VARD, a designer and shipbuilder, for the delivery of a full electric 250-mt hybrid boom subsea crane and a 100-mt knuckle boom crane destined for integration into Toyo Construction Co. Ltd.'s latest cable-lay and construction vessel.

Toyo Construction Co. Ltd., an expert in offshore construction, will welcome this ship as the latest addition to its fleet, designed for the flourishing Japanese offshore wind industry. The purpose-built VARD 9 15 design signifies a milestone

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in advancing capabilities for cable-laying and turbine foundation installation works in the Japanese offshore wind sector.

Huisman's hybrid boom crane has a fully electric traction and storage winch design that ensures secure storage of large-diameter subsea wire rope. It is equipped with both passive and active heave compensation systems. The 250-mt hybrid boom crane combines the high height lifting of a conventional lattice-type boom crane with the operational advantages of a knuckle boom crane.

The 100-mt knuckle boom crane, part of Huisman's recently launched subsea crane range for offshore construction vessels, is a compact yet powerful subsea-rated crane. Featuring active heave compensation, this crane is designed to assist in subsea work and handle cargo efficiently across the deck.

Both cranes will be manufactured at Huisman's production facility in Zhangzhou, China.

### Subsea Infrastructure Build In Scotland

Harland & Wolff has signed a five-year master services agreement for the fabrication of large structures with a global oil services company supplying subsea infrastructure around the world. The work will be carried out at its Arnish yard, on the Isle of Lewis in Scotland.

The company has now received its first purchase order under that agreement to fabricate six subsea structures. These highly specialized structures are used in oil and gas platforms and surrounding infrastructure. Each is capable of withstanding pressures of 430 bar (6,235 psi).

These structures will be built over 18 months in a staged delivery program with an expected completion date in 2025.

These specialized subsea structures are a new product area for Harland & Wolff. The company expects that successful delivery of this contract will open up significant opportunities for additional contracts in subsea infrastructure in the future.

### Salamanca Subsea Development in GOM

LLOG Exploration has chosen ABL to provide marine warranty survey services for the subsea development of the Salamanca project in the Gulf of Mexico (GOM). The project will build-out the Leon and Castille oil fields in water depths ranging from 1,800 to 2,000 m.

The subsea portion of the project includes the installation of three infield subsea pipeline systems and

the design and fabrication of subsea structures. The pipelines will run from the well site to the Salamanca floating production facility.

ABL will provide technical document review and approval of all critical procedures, drawings and documentation, and suitability inspections of the proposed fleet for subsea operations. ABL will also provide on-site review and approval of transportation and mobilization operations of project assets. **ST**

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### Ammonia Fuel Supply System



AFSS is available for liquid and gaseous fuel to enable the use of ammonia as a marine fuel. AFSS is suitable for newbuilds and retrofits. It can be installed as an integrated cargo-handling and fuel supply system on ships carrying liquefied gas, especially those able to trade ammonia as cargo. It can also be installed as a self-standing fuel supply system on IGF-coded vessels with either low- or high-pressure systems, or a combination of both. Wärtsilä Gas Solutions.

### Sonar Vertical Detection

Vertical Detection Mode (VDM) is a free upgrade for all SeaBat T-Series sonar systems. Each detection is processed to stand on its own merit, independent of adjacent beams or historical data. This versatile mode is designed to work flawlessly across any frequency, pulse, or beam mode and is suitable for single- or dual-head configurations. Teledyne Marine.

### Sea State Data

The Sea-State-as-a-Service subscription provides real-time measurements of the local sea state for optimizing cable and pipe lay, offshore installations, heavy lift, IRM, and drilling activities. Real-time data can be tailored to the specific requirements of operators. Miros AS.

### CTD Sensor

This sensor addresses an increasing demand for smaller, more capable UUVs. By eliminating the internal

electronics board, sensor integration, routine calibration, spares management and field replacement are simplified. Customers can get direct sound speed and ocean density data in real time with the precision pressure sensor, ensuring accurate data without burdening a vehicle's CPU. Neil Brown Ocean Sensors Inc. (NBOSI).

### Alloy for Subsea Umbilicals



SAF 3007 is a super-duplex stainless steel grade developed for subsea umbilicals. The new tube offers a safe, lighter, stronger and more efficient alternative to SAF 2507, the current standard. The seamless tubing was developed specifically for the offshore oil and gas industry. With superior strength, fatigue properties and excellent corrosion resistance, SAF 3007 delivers superior performance in harsh deepwater environments. Alleima.

### Low-Drag AUV

The Quadroin is engineered for monitoring and surveying, featuring a low-drag bionic design. Based on penguin locomotion, the AUV's hydrodynamic properties enable speeds of up to 10 kt. New enhancements expand its instrument payload capacity and add AI-powered object recognition. Side scan sonar enables acoustic seafloor imaging, and the AUV has two full-HD underwater cameras. EvoLogics GmbH.

### Compact Connector

The space- and weight-saving 12.7-mm SubConn Nano has enhanced

sealing capability, ensuring reliable performance even in challenging underwater environments. This splash- and wet-mate connector is manufactured from high-grade titanium and neoprene to withstand ocean depths and open-face pressure ratings. MacArtney A/S.

#### Multibeam Sonar



C550d opens up a realm of possibilities for search and recovery teams, inspection contractors, marine researchers, and underwater exploration. It enables identification of solid structures, even in low-visibility environments. Users can conduct thorough inspections to verify targets, assess underwater assets, or ensure safety with clarity and detail. C550d is compatible with the DTG3, PHOTON, PIVOT and REVOLUTION ROV models. Deep Trekker Inc.

#### AUV INS

Phins 9 Compact is a high-performance inertial navigation system built around a fiber-optic gyroscope-based inertial measurement unit with advanced accelerometers. With a DVL-aided position accuracy of 0.1% TD and a power consumption of less than 7 W, it is suitable for survey-grade coastal and offshore seabed mapping; inspection, repair and maintenance; and defense applications. Exail.

#### 3D Asset Inspection

Voyis VSLAM, powered by EIVA NaviSuite, expands the capabilities of surveyors by integrating visual inspection operations directly into the standard NaviSuite software workflow. The VSLAM solution is a data acquisition and visualization software for the Voyis Discovery Stereo

camera that generates a real-time 3D reconstruction of the survey environment. EIVA a/s and Voyis Imaging Inc.

#### Surveyor-Class USV

Designed for long-range, long-endurance autonomous deepwater mapping missions and maritime domain awareness (MDA), this USV measures 20 m long. It is ideal for persistent wide-area coverage. Saildrone Inc. and Austal USA.

#### High-Amperage Connector

The 225-amp Meridian dry-mate connector series is open-face rated to 6 km and suits battery packs and thrusters for crewed and uncrewed subsea vehicles that require high amperage power transfer. The connectors are compact, with several pin configurations. BIRNS Inc.

#### Electric Work-Class Manipulator

eM1-7 is a robotic manipulator arm designed to operate in challenging underwater environments. With compact modular electric joints, it

achieves lifting capacities from 122 kg at 2 m to 454 kg at minimum extension. Crafted from durable, lightweight aluminum, it weighs 116 kg in air and 84 kg underwater. It operates up to 4,000 m, with optional reach to 7,000 m. Saab UK.

#### Sub-Bottom Profiler

GeoPulse 2's applications include pipeline detection, geological surveys, dredging surveys, environmental assessments and buried object detection. It is available in four, nine or 16 transducer configurations; has a depth range to 5,000 m; achieves resolutions up to 6 cm; and penetrates depths to 80 m in fine clay and 20 m in sand. GeoAcoustics Ltd.

#### Hydrocarbon Detection

Hyperion Crude Oil is an optical sensor to detect concentrations of hydrocarbons in water, with 6,000-m-rated titanium housing. Data output up to 32 Hz and low power requirements enable extended time in situ. Valeport Ltd. **ST**



# environmental monitoring

## Fleet Management Tech Partnership

ZeroNorth will acquire and manage Euronav's Fleet Automatic Statistics and Tracking (FAST) platform. As part of the deal, Euronav also becomes a customer of ZeroNorth's full platform offering.

FAST collects advanced high-frequency data in real time from sensors across Euronav's fleet. Euronav has successfully implemented the FAST platform across its fleet, using ship reporting, voyage optimization and ship optimization through the use of high-frequency data. FAST has significantly improved collaboration between ships and all shore departments, optimized vessel and fleet utilization, reduced fuel consumption, and lowered OPEX. These improvements have had a tangible positive impact on Euronav's bottom line results and have improved its sustainability strategy.

The data support voyage and vessel optimization decisions, enabling crew and shore-side teams to collaborate in making the most detailed live adjustments to improve sustainability and profitability for Euronav's diverse fleet of globally operating vessels.

Over time, the plan is for ZeroNorth and Euronav to integrate FAST's data and full functionality with the ZeroNorth platform.

## Sea Level Rise Linked to Seagrass Habitat Loss

A new long-term study from marine scientists at The University of Texas at Austin, published in *Communications Earth & Environment*, has found rising sea levels can be linked to a loss of valuable seagrass habitats in Texas.

Seagrasses are recognized globally as foundation species with a key role in supporting fisheries and mitigating climate change, efficiently storing substantial amounts of carbon. Meadows occur in shallow waters. The species depend on light for photosynthesis and growth.

The researchers are the first to find that sea level rise is yet another

human impact that is responsible for the worldwide decline in seagrasses. The Gulf of Mexico is experiencing sea level rise two to three times as fast as the global average due to a combination of warmer waters and wind circulation patterns.

Professor Ken Dunton and doctoral student Kyle Capistrant-Fossa made the discovery while examining a 30-year database of observations that Dunton had collected at his study site in the Laguna Madre next to Padre Island. Capistrant-Fossa found that the slow loss of vegetation at the site during the past decade was also coincident with an unprecedented rise in sea level. They also found that seagrasses were disappearing from their historical deeper water ranges throughout the Upper Laguna Madre. But they noted these losses could be compensated by plant expansion into areas that were once too shallow. Under all sea level rise scenarios, newly flooded land was greater than lost habitat, the research shows. The study emphasizes the importance of long-term multidecadal studies that capture the often slow effects of climate change on valued ecological systems.

Although areas in the Texas Gulf Coast provide seagrasses space for expansion, the authors noted that globally, seagrass expansion into shallow waters is probably more limited because of artificial hardening of shorelines. Ensuring suitable space for seagrass colonization in coastal areas, by limiting construction, for example, may prove increasingly important as sea levels rise around the world, the scientists said.

Seagrasses have received attention in recent years as a tool for climate change mitigation because they offer a low-risk, nature-based solution to help offset carbon emissions and reduce the effects of global warming.

## Harbor Monitoring System

OceanWise will supply and install a marine environmental

monitoring solution in Langstone Harbour, a site of special scientific interest in Hampshire, U.K. This installation will provide the harbor with tide and weather equipment and a cloud-based data platform to support ongoing harbor operations and environmental monitoring.

This historic harbor is afforded a tranche of environmental designations. It is a special protection area, a special area for conservation and a Ramsar site. As a business, the harbor successfully manages commercial shipping, fishing and leisure boating operations.

Understanding local tidal and wind conditions is critical to safe navigation in a shallow natural harbor such as Langstone. All the data from the equipment installed will be delivered in real time via the cloud-based Port-Log platform, which will enable harbor operators to closely monitor the ever-changing tide and environmental conditions.

## Advancing Coastal Monitoring Techniques

PML Applications' Centre for Coastal Technologies has been working with Thales on new advanced techniques for coastal monitoring as part of a proof of concept for new techniques of mine detection and sensors for autonomous vessels. PML Applications led the marine component of the trial.

PML Applications has been working with Thales for over four years on a range of projects involving marine deployment and recovery for the purpose of testing surface and subsurface detection capabilities.

During the recent sea trial held off Whitsand Bay, Cornwall, U.K., which utilized PML research vessels *Plymouth Quest* and *PML Explorer*, PML Applications was tasked with the safe deployment and recovery of targets, used to assess the viability of a cutting-edge system for identifying floating objects.

The *Plymouth Quest* was also used as a platform to trial sensors that will be used to inform the potential use of machine learning for the safe deployment of autonomous vessels. **ST**

## Advanced Planning for Nuclear Carrier

Hill's Newport News Shipbuilding division has been awarded an advanced planning contract for the refueling and complex overhaul of the nuclear-powered aircraft carrier USS *Harry S. Truman* (CVN-75). The contract includes engineering, design, material procurement and fabrication, documentation, resource forecasting and pre-overhaul inspections.

## Unmanned Combat Underwater Vehicle

DGA has awarded Naval Group a framework agreement for the design, production and testing of an Unmanned Combat Underwater Vehicle (UCUV) demonstrator. A first follow-on contract was also signed for the design and development of Naval Group's Autonomous Decision-Making Process (ADMP) and secure autonomous navigation.

This framework agreement follows on the contract awarded to Naval Group in 2023 for the study of the main use cases and system architecture of a UCUV. The objective is to conduct studies and evaluate the technologies identified to meet the French Navy's main use cases, and thus design and develop the UCUV demonstrator.

## OPV Maintenance for Irish Navy

Wärtsilä has signed a five-year optimized maintenance agreement with the Irish Naval Service for four offshore patrol vessels (OPVs). The scope of the agreement includes maintenance planning and 24/7 remote operational support, including Wärtsilä's Expert Insight, a digital predictive maintenance solution that uses artificial intelligence (AI) and advanced diagnostics to monitor on-board equipment and systems in real time.

The agreement provides close coverage of the ships' engines, propulsion machinery and shaft seals. It also includes crew training services, a technical advisor, maintenance planning, full operational support, and all scheduled maintenance spare parts. Unplanned downtime will be reduced significantly, and nearly all issues can be resolved remotely.

Each of the four vessels operates with two Wärtsilä

26 engines, two Wärtsilä controllable pitch propellers, two Wärtsilä gearboxes, two Enviroguard shaft seals and three Floodguard shaft seals.

## Mexican Navy Orders Waterjet SXL Wear Rings

Thordon Bearings has secured a second major Mexican Navy contract for the supply of its water-lubricated SXL wear rings for retrofit installation to the waterjet propulsion nozzles on 25 interceptor patrol vessels.

The contract follows the success of extensive trials in which the SXL material replaced the use of other anti-corrosive coatings in waterjet impeller housings, resulting in increased resistance to cavitation-induced corrosion.

Rotary Parts, Thordon's authorized distributor in Mexico, is supplying the housings for 25 Polaris and Polaris II fast patrol boats. The scope of supply is for 440-mm outside diameter, 160-mm-long SXL wear rings for each impeller housing.

## Sonars for Indian Navy Survey Vessel

The Indian Navy has commissioned the advanced survey vessel INS *Sandhayak*, with three more to follow. The vessel is equipped with sophisticated sonar systems from Teledyne Marine. It is a 110-m-long ship with a displacement of 3,400 tons, powered by two diesel engines and can exceed speeds of 18 kt. Built by Garden Reach Shipbuilders & Engineers, the vessel is the first to join the Indian Navy's fleet as part of this program.

The Teledyne advanced sonar systems include four HydroSweep DS deepwater multibeam echosounders (MBES), eight SeaBat T-Series shallow-water MBES and 36 DESO 5DS single-beam echosounders. These sonar systems will bolster the Indian Naval Hydrographic Office's capabilities in surveying, researching and charting the Indian Ocean.

## Electric Power for Singapore MRCVs

GE Vernova's Power Conversion business has been awarded a contract by Singapore shipbuilder ST Engineering Marine Ltd. to supply its Ship's Electric Grid with Integrated Full Electric Propulsion (IFEP) equipment for the Singapore Navy's six-ship Multi-Role Combat Vessel (MRCV) program. The system can share electric power to any load on the ship's power network, so it is more energy efficient and cost effective versus mechanical drive. **ST**



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## SuperNova LiDAR Maps Great Lakes

Tetra Tech Inc. has purchased a Teledyne Optech CZMIL SuperNova Topobathymetric LiDAR system to successfully complete a project for NOAA.

NOAA has an ongoing effort to update all its bathymetric maps in the Great Lakes region, which includes refined maps of the marine ecology. This necessitates obtaining accurate digital elevation models and reflectance products. The updated information enhance the understanding of the Great Lakes hydrography and ecosystem.

The CZMIL SuperNova enabled mapping of the lake bed to a maximum depth of 31 m. The intensity raster product, crafted with input from NOAA, served as a valuable tool for benthic habitat modeling, and the full waveform data will contribute to further research. At the end of the project, Tetra Tech delivered classified point clouds and gridded products.

## Second Offshore Wind Auction in GOM

The U.S. Department of the Interior has announced its proposal for a second offshore wind energy auction in the Gulf of Mexico (GOM). The proposed lease sale includes four areas offshore Louisiana and Texas, totaling 410,060 acres, which have the potential to power 1.2 million homes.

BOEM seeks feedback on various aspects of the proposed lease areas, including size, orientation, and location of the four lease areas and which areas, if any, should be prioritized for inclusion or exclusion from this lease sale.

BOEM also seeks comment on potential lease revisions to include the production of hydrogen or other energy products using wind turbine generators on the lease.

BOEM is considering lease stipulations to ensure that communities, particularly those historically underserved, are considered and engaged early and often throughout the offshore wind energy development process. Proposed bidding credits include funding for fisheries compensatory mitigation and workforce development.

BOEM proposes to conduct simultaneous auctions for each of the four lease areas using multiple-factor bidding. BOEM will use new auction software for enhanced efficiency, with minor adjustments to auction rules used in previous offshore wind lease auctions.

The public comment period will close on May 20, 2024.

## Cetacean Protection Program

U.S. Coast Guard Sector Puget Sound has introduced a cetacean desk pilot program. The goal of the four-year program, which is hosted in the Puget Sound Vessel Traffic Service (VTS), is to mitigate adverse impacts of maritime vessel traffic on endangered and threatened large cetaceans (whales) in the Salish Sea.

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The pilot program will receive reports of whale sightings from mariners in the vessel traffic system managed by the VTS and provide near-real-time data about the location of whales to these mariners through the Whale Report Alert System (WRAS). In providing situational awareness, the program aims to reduce instances of ship strikes and whale disturbances in the Puget Sound region. It also aligns operations with the Canadian Coast Guard Marine Mammal Desk, providing a consistent whale reporting and notification regime for operators of large ships throughout the Salish Sea. The cetacean desk will continually evaluate its performance and look to improve effectiveness in protecting at-risk whales.

## Rules to Standardize Climate Disclosures

The Securities and Exchange Commission (SEC) has adopted rules to enhance and standardize climate-related disclosures by public companies and in public offerings. The final rules reflect the SEC's efforts to respond to investors' demand for more consistent, comparable, and reliable information about the financial effects of climate-related risks on a registrant's operations and how it manages those risks while balancing concerns about mitigating the associated costs of the rules.

The final rules will require a registrant to disclose, among other specifics, information about a registrant's climate-related targets or goals, if any, that have materially affected or are reasonably likely to materially affect the registrant's business, results of operations, or financial condition. Disclosures would include material expenditures and material impacts on financial estimates and assumptions as a direct result of the target or goal, or actions taken to make progress toward meeting such target or goal.

## Pacific Salmon, Steelhead Conservation

The U.S. Department of Commerce and NOAA will allocate \$60 million in funding to advance tribal priorities and address the impacts of climate change on Pacific salmon and steelhead in the Columbia River.

These funds from the Inflation Reduction Act will also address deferred maintenance and repairs at Mitchell Act-funded hatchery facilities across the Columbia River Basin. NOAA Fisheries worked closely with hatchery operators to identify critical deferred maintenance and repairs.

The Inflation Reduction Act provides a historic \$3.3 billion for NOAA to invest in climate change preparation, adaptation and resilience throughout the U.S.

In December 2023, there was an historic agreement between the four lower Columbia River Treaty Tribes, the states of Oregon and Washington, and the relevant agencies and departments of the U.S. to restore these species in the Columbia Basin. This effort aligns with the Columbia Basin Restoration Initiative.

Since 1938, the Mitchell Act promotes the conservation of salmon and steelhead fishery resources in the Columbia River Basin, given hydroelectric, irrigation and flood control projects. It has authorized hatchery facilities and other fishery conservation activities. **ST**

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## Fuel Management Partnership

Kongsberg Digital has entered a partnership with Royston to bring together Kongsberg Digital's Vessel Insight and Royston's engine*i* electronic fuel management system. This will enable shipowners to optimize fuel consumption, enhance transparency, and promote decarbonization of vessel operations.

engine*i* is a modular fuel management product that incorporates advanced tools to provide valuable insights to ship crew and onshore operational staff. It offers reliable data and dynamic reports, which are recorded and visually represented on a touchscreen bridge display and online dashboard.

As regulations and industry demand more accurate fuel consumption data, the combined solution delivers a reliable and centralized source of important information, fulfilling reporting needs and enabling data-driven decision making.

## Mapping Collaboration

Fugro and PlanBlue are teaming up to advance habitat mapping technology that will be integrated within Fugro's existing systems.

The aim is to enhance and broaden Fugro's hydrographic solutions by incorporating advanced imaging and AI-based processing in remote and autonomous underwater vehicles.

This collaboration aims to improve 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 these ecosystems' ecological importance, assessing their condition, monitoring changes over time, and informing conservation and management efforts.

Roughly 75 percent of the ocean floor remains unexplored. Even the parts we have explored lack detailed information, especially regarding the ocean's impact on climate and food security. The partnership aims to improve the speed, accuracy

and scope of underwater mapping, leading to better decisions for ocean conservation and use.

This collaboration is particularly vital considering initiatives such as the recently awarded Italian government's Marine Ecosystem 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).

## OTG Acquisition

Ocean Technologies Group (OTG), a global provider of human capital management solutions for the maritime industry, has acquired Danish software company DanDocs.

Through its flagship digital MarineRegulations portal, DanDocs provides the world's most comprehensive collection of relevant marine rules and regulations onshore or on board, according to the company. The digital platform comprises smart features that help users navigate vital documentation, saving time, minimizing risks, and ensuring that ship operators are constantly updated and notified with the latest regulatory information.

## Corvus Offers SOH Battery Testing

Corvus Energy has developed a DNV-accepted method for data-driven state of health (SOH) testing. Corvus Energy is the first marine ESS supplier to provide this to customers.

SOH tests for marine battery systems are mandatory and give an overall assessment of the condition, performance, and safety of the batteries over time. These tests help determine the battery's capacity, efficiency and remaining life. Using data-driven approaches in these tests enhances accuracy and efficiency in monitoring and maintaining marine battery systems. In addition, the test can be done with minimal disruption to normal op-

eration, thus significantly reducing costs and off-hire time for a vessel.

## Simulator for Training

Wärtsilä has supplied its latest simulator technology to the Sharjah Maritime Academy in the United Arab Emirates. The advanced simulation facility, which was recently inaugurated, represents a sustainable development that will strengthen the position of the Sharjah Maritime Academy as a global maritime center for training, innovation, research and development.

The comprehensive suite of navigation, engineering, communications and vessel traffic services simulators includes full-mission, part-task, and classroom trainers for all levels of training and research, as well as modeling and content creation tools to enable the highly skilled maritime faculty team to offer a complete range of services to national and international clients. The scope includes two full-mission navigational bridge simulators with 360° visualization, state-of-the-art offshore specific bridge systems, and the first installation of Wärtsilä's new simulation bridge equipment configuration that represents the very latest and highest digital navigation operational standards.

The advanced simulation facility also features the world's first commercial maritime mixed reality chromakey vessel handling application in the form of two integrated offshore vessel and tug simulators with motion platform for absolute immersion in the synthetic learning environment.

## Carbon Capture Infrastructure

TechnipFMC has been selected to deliver the first all-electric integrated project by the Northern Endurance Partnership (NEP), a joint venture between bp, Equinor and TotalEnergies.

The NEP is building carbon dioxide transportation and storage infrastructure for carbon capture projects in the U.K.'s East Coast Cluster.

TechnipFMC's all-electric solution will collect and feed the pressurized gas into an aquifer for permanent storage. **ST**

# contracts

**ABB, Helsinki, Finland**, will supply a shore connection solution for visiting ferries and cruise ships. The installation will serve two ferry berths, each with five connection points, and an additional berth shared by ferries and cruise ships. Portsmouth International Port.

**Trelleborg Marine and Infrastructure, Dubai, United Arab Emirates**, has finalized an exclusive licensing agreement to distribute the eMPX application worldwide. The software-as-a-service platform enhances the maritime pilotage planning and execution process, offering a seamless toolkit for planning, sharing, reviewing, updating and managing master pilot exchanges (MPX). Port of Auckland Ltd.

**Fugro, Leidschendam, Netherlands**, will bring its ROV Induction Course to Australia. This four-week course covers piloting an ROV to support offshore renewable energy projects; offshore scientific or environmental work; offshore energy inspection, repair, maintenance or construction; underwater search and recovery; and wreck investigation. Commercial Dive Academy and AMC Search.

**Alfa Laval, Lund, Sweden**, has collaborated with a Korean shipbuilding company by signing the first memorandum of understanding for OceanGlide installations in new-build projects, such as MR and LR1 tankers. OceanGlide integrates fluidics with air lubrication to enhance a vessel's propulsion power savings by up to 12%. K Shipbuilding.

**MIND Technology Inc.'s Seamap unit, The Woodlands, Texas**, will provide a SeaLink 2D and 3D ultra-ultrahigh-resolution seismic streamer system to de-risk offshore wind farm installation by detecting subseafloor boulders and other geohazards. ATLAS MARIDAN ApS.

**Metron Inc., Reston, Virginia**, has signed a partnership agreement to

expand UUV capabilities in the defense and offshore energy markets, especially for long-duration, multi-payload missions where communications are often denied or restricted. Cellula Robotics USA Inc.

**Hill, McLean, Virginia**, has received an order for a REMUS 620 UUV from a customer in the Indo-Pacific region for monitoring and data collection missions. Undisclosed.

**Exail, Paris, France**, has concluded its first sale of the Phins 9 compact INS, to be integrated into an AUV for geophysical surveys and monitoring. Bedrock.

**Strategic Marine, Singapore**, has entered the fast-growing Thai crew boat market by delivering the first of two 42-m Gen 4 Fast Crew Boats to a Thai offshore services provider. Truth Maritime Services.

**FORCE Technology, Brøndby, Denmark**, has signed a strategic frame agreement to launch a compact, highly portable, immersive VR and XR training solution that can be transported and deployed anywhere. Varjo.

**GeoAcoustics Ltd., Great Yarmouth, U.K.**, has sold 15 GeoPulse 2 sub-bottom profiler systems to end-customers across the Middle East. MER-Subsea.

**Eni, Rome, Italy**, will develop joint initiatives for the energy transition, with the goal of net zero by 2050. Additionally, the establishment of a permanent global observatory regarding future technological, regulatory and market developments will be evaluated. Fincantieri and RINA.

**Eliis SAS, Clapiers, France**, will develop and commercialize advanced AI algorithms for seismic interpretation, subsurface characterization, and modeling. Chevron Corp.

**Scantrol, Bergen, Norway**, will deliver control solutions for electric and hydraulic winches for the fisheries industry. Nordkontakt. **ST**

# meetings

## JUNE

**June 4-6—Capitol Hill Ocean Week, Washington, D.C.** <https://marinesanctuary.org/chow-2024>.

**June 6—Offshore Carbon Capture & Storage Symposium, Houston, Texas.** [www.noia.org](http://www.noia.org).

**June 10—Speed@Seawork, Cowes, U.K.** <https://seawork.com/about/speed>.

**June 11-13—Seawork, Southampton, U.K.** [www.seawork.com](http://www.seawork.com).

## SEPTEMBER

**September 11-12—Oil Spill India, New Delhi, India.** <https://oilspillindia.org>.

**September 17-19—South America Offshore Wind, Rio de Janeiro, Brazil.**

**September 23-26—OCEANS 2024 Halifax, Halifax, Canada.** <https://halifax24.oceansconference.org>.

## OCTOBER

**October 7-10—Marine Imaging Workshop, Monterey, California.** <https://miw2024.org>.

## NOVEMBER

**November 4-7—EURONAVAL, Paris-Nord Villepinte, France.** [www.euronaval.fr](http://www.euronaval.fr).

**November 7-10—Europort, Rotterdam, Netherlands.** [www.europort.nl](http://www.europort.nl).

**November 12-14—International WorkBoat Show, New Orleans, Louisiana.** [www.workboatshow.com](http://www.workboatshow.com).

**November 19-21—Marine Renewables Canada Conference, Halifax, Canada.** <https://marinerenewablesconference.ca>.

For more industry meetings, visit [sea-technology.com/meetings](http://sea-technology.com/meetings). **ST**

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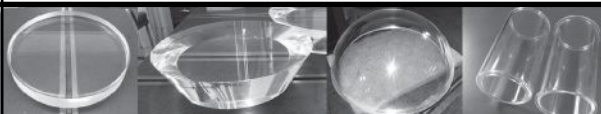
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The first Global Maritime Distress and Safety System (GMDSS) was a milestone in the development of maritime communications, and progress has accelerated in the 2.5 decades since. Today, shipping companies rely on satellite connectivity not only to protect their vessels and people but also to enable the digitalization, decarbonization, and crew-welfare initiatives on which success relies.

In this context, the new generation of low Earth orbit (LEO) networks has entered the maritime market to great fanfare and expectation from shipowners—and their excitement is justified: LEO satellite coverage has the potential to span the globe, providing exceptional reliability and speed, even during long voyages in the most remote locations. This in turn facilitates real-time communication and efficient coordination between vessels and onshore personnel, ultimately supporting more profitable and sustainable fleet operations.

LEO's introduction into the maritime sphere has been equally well received by seafarers, who stand to benefit from a level of connectivity that keeps them better connected to family and friends than ever before, as well as to richer entertainment options at sea to boost their morale. Moral obligations and regulatory requirements aside, providing high-quality crew internet

represents a wise investment from a competitive standpoint because it enhances an organization's ability to attract and retain the brightest talent.

In another advantage to seafarers and their employers, LEO connectivity offers stable onboard access to non-leisure services, including mental health support, telemedicine and online learning resources, helping to keep crew happy, healthy and up to speed with the evolving requirements of their job.

For all the benefits of LEO networks, it is important to acknowledge their limitations. For instance, LEO's promise of delivering worldwide coverage remains to be realized, with certain countries yet to authorize its use in their territorial waters. This means that, depending on the trading route, a ship may encounter multiple LEO-coverage blackspots during its voyage.

Like many satellite technologies, LEO networks are also susceptible to interference from atmospheric conditions that can cause disruption to communications, while network congestion at hotspots and dropout at satellite handover may present additional connectivity challenges.

Regardless of the network type being used, vessels still need to compress and throttle data on certain occasions, such as while in port, but LEO networks currently cap utilization and, therefore, already limit connectivity and availability from the outset.

In addition, maritime organizations should consider whether their LEO system is for both crew and commercial use. For a vessel deploying LEO connectivity to cover crew and business communications simultaneously, even a terabyte of data is unlikely to go far. Divided among a crew of 25, it equates to 40 gigabytes per person—enough for 13 hr. of HD streaming—with nothing remaining for commercial requirements.

To ensure reliable and consistent connectivity, support enhanced GMDSS communications, and meet the bandwidth needs of all stakeholders, a vessel will require multiple satellite provisions. This means that maritime software, including critical communications-based services, will need to be compatible with both LEO and more traditional, low-bandwidth networks, and capable of switching between connections automatically to ensure uninterrupted service. Software should provide secure and efficient data transfers, irrespective of the service, or combination of services, a shipowner or manager uses. If disruptions do occur, data transmission should resume from the point of interruption, for example.

As crew freedoms on the internet increase and more onboard devices are connected to the network, the risk of breaches to cybersecurity are also rising dramatically: Effectively, the vessel becomes a larger attack surface. There have already been several reported cases of shipowners falling victim to significant cyber incidents after adopting LEO systems without having taken the necessary security precautions.

Given that ships transfer diverse types of data that often contain critical and sensitive information, the consequences of any breach for vessel operations, safety, and privacy can be severe. Cybersecurity solutions must continuously evolve to ensure robust, intelligent and scalable network protection for owners. AI-based next-generation anti-virus technology with end-point detection and response capabilities are just one example.

LEO networks have the power to transform connectivity at sea. However, there are several factors to consider before adopting a LEO system. The focus should be on a holistic solution to enable critical communications and data transfer while ensuring security. **ST**

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