

ON&T

oceannews.com



JANUARY / FEBRUARY 2023

OFFSHORE EXPLORATION

RELENTLESS



The power you need to get tough jobs done

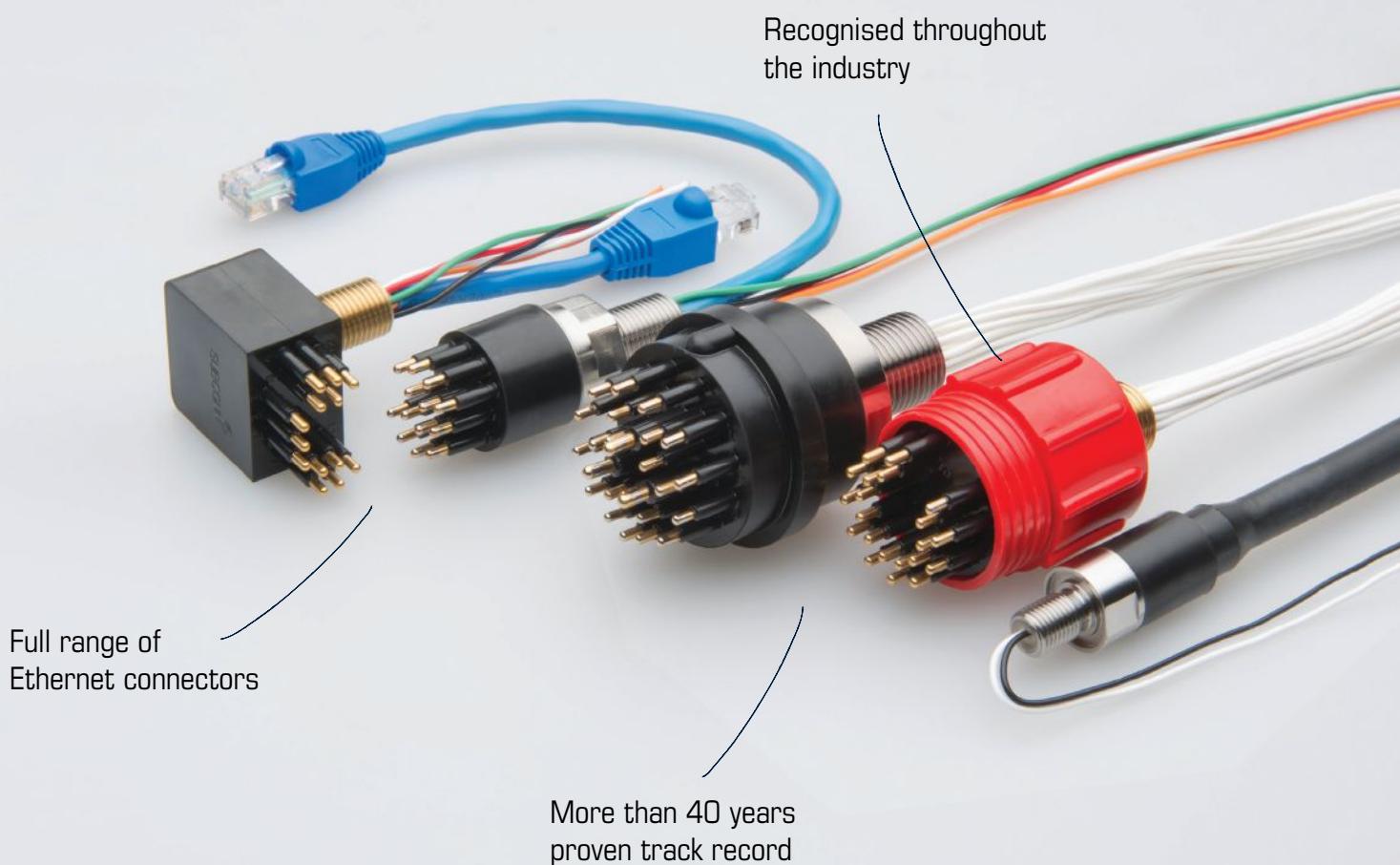
Mission Specialist underwater robotic systems are engineered to work hard. With powerful thrusters to handle currents up to four knots. A modular platform built to handle heavy payloads and a wide array of accessories. And durable construction that can take a beating and keep on working. That's how we're redefining "inspection class" to give you the performance you really need.

videoray.com | +1.610.458.3000

VideoRay
RELENTLESS RELIABILITY



Wet-mate connectors



Available worldwide

Denmark | Norway | Sweden | Finland | United Kingdom
Netherlands | Germany | Poland | France | Spain | Portugal
Italy | UAE | Israel | Turkey | Africa | USA | Canada | Mexico
Colombia | Chile | Brazil | Singapore | China | India
South Korea | Japan | Taiwan | Australia





Connecting What's Needed with What's Next™

Visit us at IPF
Booth 512

SUSTAINABLE SOLUTIONS

We're engineering solutions for the future of energy. Our autonomous and remote technologies help solve critical challenges in some of the toughest environments around the world.



■ Connect with what's next at [oceaneering.com](https://oceanengineering.com)

Copyright © 2023 Oceaneering International, Inc. All rights reserved.



We make lazy waves work.

- Only US manufacturer of Subsea Buoyancy for Floating Offshore Wind Cables
- Decades of oil & gas experience with distributed buoyancy for flowlines, cables, and umbilicals
- US-owned and operated



deepwaterbuoyancy.com | +1.207.502.1400



10**16**

DEPARTMENTS

- 12** OCEAN SCIENCE & TECHNOLOGY
- 28** OFFSHORE ENERGY
- 38** SUBSEA INTERVENTION & SURVEY
- 46** DEFENSE & SECURITY

IN EVERY ISSUE

- 22** CHECK THE TECH
- 30** ENERGY MARKETWATCH
- 52** EVENTS
- 54** OCEAN MILESTONES
- 59** OCEAN INDUSTRY DIRECTORY

FEATURES & SPOTLIGHTS

10 WEATHERING THE STORM: MULTIBEAMS THRIVE IN THE WORLD'S HARSHEST CONDITIONS

16 MISSION SUCCESS IN THE HANDS OF AUTONOMY INNOVATIONS

22 SWOT ANALYSIS: A SEA CHANGE FOR MODERN-DAY OCEANOGRAPHY

26 DEEP-SEA H2-POWERED AUVs PROVIDE UNDERWATER CLARITY

[WITH THANKS - Ed.]

Welcome to the first edition of ON&T in 2023, with Offshore Exploration as our chosen theme.

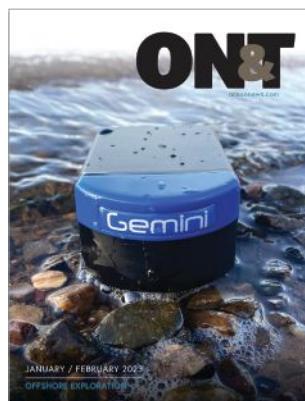
The need to explore ever further offshore in pursuit of critical ocean data, untapped energy sources, and breakthrough subsea discovery will always be tempered by our technical facility to extend these proverbial horizons in an increasingly safe, efficient, and carbon-conscious way.

In other words, progress will hinge on the successful sector-wide trial, adoption, and integration of innovative, real-world solutions brought to market by the world's leading ocean technologists.

As this month's line up of editorial contributions amply demonstrates, when it comes to fusing offshore ambition with the available operational capacity afforded by new products and services in the field, there is plenty to be excited about in 2023.

Happy reading! editor@oceannews.com

Ed Freeman



ON THE COVER:

The Micron Gemini is a small but powerful multibeam imaging sonar from Tritech, weighing less than 0.5 kg and measuring less than 120 mm in length. (Photo credit: Tritech)



From shallow to deep-water

sites, our experienced engineering team develops and deploys innovative *in situ* seabed investigation methods and custom technologies that guarantee best-quality geotechnical, geophysical, and environmental data and analysis.

With an established track record of partnering with the offshore energy, marine mining and trenching industries, we're helping redefine geoscientific exploration.

Find out how at bluefieldgeo.com

Bluefield Geoservices
Geoservices | Engineering | Technology

Managing Editor

ED FREEMAN

Art Director

EMILLE RODRIGUEZ

Production Manager

JESSIE LEWIS

Events Manager

WHITNEY SCHWERIN

SeaState ON&T Podcast

seastate@oceannews.com

Published by

Technology Systems Corporation

ADVERTISING SALES

LISA CHILIK

Tel: 574-261-4215

Lchilik@tscpublishing.com

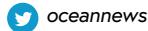
MIMI KING

Tel: +44 (0) 777 6017 564

mking@tscpublishing.com

FOLLOW US:

oceannews



oceannews



OceanNewsandTechnology

TO SUBSCRIBE:
www.oceannews.com/subscribe
subscriptions@oceannews.com
Ocean News & Technology ISSN# 1082-6106

is published 11 times a year in print and digital by Technology Systems Corporation, 8502 SW Kansas Ave, Stuart, FL 34997, telephone 772-221-7720. Copyright ©2023 Technology Systems Corp. All rights to editorial content are reserved. No article, photograph, or illustration may be reproduced in whole or part without the written permission of the publisher. Unless otherwise stated in writing by the contributor, all images submitted to TSC may be used in other promotional materials belonging to TSC without permission. Subscriptions are free to qualified individuals or companies. For all others, call TSC for subscription information.

PRINTED IN THE USA



A COMMITMENT TO THE FUTURE OF ENERGY



By Rod Larson,
President & CEO, Oceaneering



Two years ago, I wrote in this publication that the future of offshore operations is automated, and that the next decade will see a future energy industry that is safer, more integrated, and more remote. Since then, as an industry and a world community, we've experienced rapid, unprecedented change pushing us further into the future than many of us could have imagined.

As our industry evolves, we are committed to helping our customers solve the unique challenges of the energy transition. We are directing our efforts to help our customers safely and effectively produce and maintain renewable energy sources. We also recognize that the energy reality is not the same for all people around the world. Renewables alone will not be sufficient to meet global energy needs from reliable, affordable sources. We expect strong demand for our oil- and gas-focused products and services to continue well beyond this decade. Carbon resources are still needed in the energy mix to ensure that no one is left behind.

REMOTE SERVICES

At Oceaneering, one way that we are lessening the environmental impact of offshore oil and gas operations is through remote services. Our global Onshore Remote Operations Centers (OROCs) allow us to run operations, such as piloting our underwater vehicles, from shore-based facilities, thereby reducing the need to send workers offshore to monitor and assist operations in person. From any of our OROC facilities, ROV (Remotely Operated Vehicle) pilots can connect to any of our systems around the world quickly and securely—and with built-in redundancies. To date, we have completed 350 remote piloting and over 100 remote survey missions from Stavanger, Norway, Morgan City and Lafayette, Louisiana, and Aberdeen, Scotland.

SUBSEA VEHICLES

Our battery-powered Liberty™ E-ROV has completed 152 missions since we began deploying the resident system in 2019, accumulating 13,000 operational hours. This vehicle performs a range of light inspection, maintenance, and repair scopes that enables more cost-efficient and

environmentally friendly subsea operations because it does not need a vessel to stay onsite while tasks are performed. Liberty E-ROV can be deployed on vessels of opportunity and use its mobile docking system to recharge and transmit data back to shore.

Our Freedom™ AUV (Autonomous Underwater Vehicle) system achieved Technology Readiness Level 6 (on a scale of 1-9) for pipeline inspection last summer. Reaching this level demonstrates that our Freedom AUV can carry out low altitude inspection and survey on pipelines of different diameters, autonomously, then dock, charge, and send the data back to shore for evaluation before moving onto the next work scope.

We are also growing our businesses for the future of energy with advanced data analytics for improved decision making.

FUTURE INVESTMENTS

Our Integrity Management and Digital Solutions segment signed two collaborative agreements in 2022 aimed at developing advanced inspection solutions for the offshore and onshore energy markets with a view of anticipating failures with predictive analytics.

In the renewable energy market, we continue to evaluate areas where we can utilize our existing expertise in the areas of floating and fixed wind, hydrogen, carbon capture, and more.

We are also responding to increased customer demand by introducing new units of our work-class Isurus™ high-speed, high-current-capable ROV for offshore wind projects. We're also focused on helping renewables developers meet federal regulations regarding marine wildlife with our remote marine mammal mitigation system, Ocean Perception™.

We believe the future of offshore energy will continue to thrive for years to come. With a laser focus on creating technologies that make energy safer, cleaner, and less expensive, the industry will lead the way to a brighter future for people around the world.



SMART SUBSEA SOLUTIONS

Delivering data in most adverse conditions: underwater acoustic modems with advanced communication technology and networking

Accurate USBL and LBL positioning of underwater assets

Modem emulator and other cost-saving developer tools

Autonomous surface vehicle for bathymetry, monitoring, search & rescue, and AUV support



Meet us at
OCEAN BUSINESS!
18-20 April 2023
Southampton, UK
STAND M4

sales@evologics.de
sales-us@evologics.com

EvoLogics.de

WEATHERING THE STORM: MULTIBEAMS THRIVE IN THE WORLD'S HARSHEST CONDITIONS



By Rachel McAlpine
Marketing Manager, Tritech



The Tritech Gemini range of multibeam imaging sonars was designed to withstand the extremes this planet can bring with each product going through extensive testing and qualification to ensure they are the most robust sonars of their class in the industry.

The Gemini 1200ik dual frequency multibeam imaging sonar has been designed to operate in extreme temperatures (the sensor is still operational

at -10°C and 35°C) and at depths of up to 350 m. Tritech's commitment to producing extremely robust and reliable sensors sees the Gemini 1200ik completing shock and vibration testing as a standard part of the product's qualification, as well as multiple rounds of pressure testing and open water tests. Despite its impressive durability, the sonar comes in at less than 1.5 kg in air and less than 0.5 kg in water.

The Gemini 1200ik offers users the ability to switch between high and low frequency

manually or automatically through the software. Whether the sonar is operating at high or low frequency, it maintains the 120° horizontal field of view and offers an outstanding range resolution on high frequency of 2.4 mm.

Tritech is committed to continual product development and gains user feedback to understand what improvements and developments should come next. Alongside the improved image quality users have seen following the last firmware update, in

▼ Measuring 116 x 63 x 40 mm, the Micron Gemini is the smallest multibeam sonar in the world. (Photo credit: Tritech)



2023 further improvements to the Gemini 1200ik will be implemented including a greater depth rating and an optional built-in AHRS.

MICRO SONAR

Last year, Tritech launched the latest addition to their product range: the Micron Gemini.

Designed specifically with small and micro ROVs and AUVs in mind, the Micron Gemini is the smallest multibeam sonar in the world measuring a tiny 116 mm x 63 mm x 40 mm and weighing less than 0.5 kg in air and less than 0.25 kg in water.

The Micron Gemini is also an excellent sonar to transition into multibeam for those who have previously used small mechanically scanning sonars like the Tritech Micron Sonar. The Micron Gemini offers obstacle avoidance and navigation in low to zero visibility water conditions at low power requirements. This small but mighty machine also includes an integrated pressure sensor, depth readings, and a temperature sensor: reducing the need for additional payload on small vehicle bodies.

As well as these built-in sensors, the Micron Gemini has the optional addition of an Attitude Heading Reference system (AHRS). The AHRS provides users with readings of heading and pitch and roll to help pilots keep the ROV steady even when visibility is an issue.

Following its release in March 2022, the Micron Gemini has seen a great deal of success and popularity with integration into multiple small vehicles including Blueye Robotics' underwater drones.

DIVER MOUNTED DISPLAY

The Micron Gemini has also been integrated, alongside the Gemini 1200ik and the Gemini 720ik multibeam imaging sonars, into Tritech Diver Mounted Display system (DMD). The DMD, which first

launched in 2020, is popular with military and search and recovery divers. The system is comprised of a sonar, viewing monocle, subsea computer, and connecting cables, with the addition of either a battery pack or a topside Surface Control Unit (SCU), depending on the set up. The sonar is mounted at eye level with the monocle covering the diver's non-dominant eye meaning the diver's hands remain free. The system then allows a diver to locate targets, navigate towards them, and avoid obstacles along the way, all in zero visibility water conditions.

The DMD comes in two configurations: Tethered (DMD-T) and Untethered (DMD-U). The Tethered version connects the diver and the topside box by a 100 m tether and allows the topside team to communicate in real time with the Diver. The sonar data which is displayed on the diver's monocle is also projected onto the SCU so the topside team can view and record the data while assisting the diver in their mission.

The Untethered version (DMD-U) gives the diver total freedom as the system is powered by battery packs which are pony-mounted so no tether is required. The untethered system is ideal for covert missions where there is a high risk of diver entanglement. The DMD-T can be converted into an DMD-U with the right additional equipment. Both Diver Mounted Display options are proving highly popular with multiple units already sold and large orders being prepared to ship in early 2023.

WORK CLASS ROV

As well as the Gemini 1200ik and the Micron Gemini, Tritech's more established products include the Gemini 720ik and Gemini 720is. The Gemini 720is offers a depth rating of up to 4,000 m and is seen as the industry standard multibeam imaging sonar for Work Class ROVs.

The Gemini 720is is available in two housings: aluminium and titanium. The titanium housing makes the sonar even more robust for hazardous water conditions where extra protection to the sonar is required. Tritech also offers Titanium as a housing option for many of their other sensors, outside of multibeam sonar range.

While the industry is typically seeing lead times for sensors of six months



» The integration of Tritech's multibeam imaging sonars into diver display systems have proven popular among tactical divers. (Photo credit: Tritech)

and beyond due to the whiplash of the COVID-19 pandemic and more recently Russia's invasion of Ukraine, Tritech is usually able to supply within two months or shorter. This is in no small part thanks to the supplier relationships Tritech's Supply Chain team have built up over the past 30 years and which they continue to work hard to maintain throughout these challenging times.

Tritech's commitment to continual product development means that 2023 will lead to several new and exciting product enhancements, supporting Tritech's mission to continuously improve the capacity to work in subsea environments by mitigating some of the risks that make underwater operations so hazardous.

For more information, visit:
www.tritech.co.uk

ROBOTS TO DRIVE THE OIL & GAS INDUSTRY'S GROWTH

The single major advantage of robotics is automation, which drives other improvements in efficiency, productivity, and safety. Automation enables extensive inspection and maintenance tasks to be conducted while feeding back data to help limit operational costs and improve efficiency. Advances in modular and customizable robots is expected to result in growing deployment of robotics in the oil and gas industry, according to GlobalData, a leading data and analytics company.

GlobalData's thematic report, 'Robotics in Oil & Gas', notes that, while robotics has been a part of the oil and gas industry for several decades, growing digitalization and integration with artificial intelligence (AI), cloud computing, and Internet of Things (IoT), have helped diversify robot use cases within the industry.

Anson Fernandes, Oil and Gas Analyst at GlobalData, said: "A huge number of robots are now being deployed in oil and gas operations, including terrestrial crawlers, quadrupeds, aerial drones, Autonomous Underwater Vehicles (AUVs), and Remotely Operated Vehicles (ROVs)."

Robots have applications across the oil and gas industry in various tasks ranging from surveys, material handling, and construction, to inspection, repair, and maintenance. They can be customized for various tasks to ease the work and improve efficiency. During the planning phases of an oil and gas project,

robots can be deployed to conduct aerial surveys, or they can be employed to conduct seismic surveys during exploration. Aerial or underwater drones can be adopted depending upon the project location and work requirements.

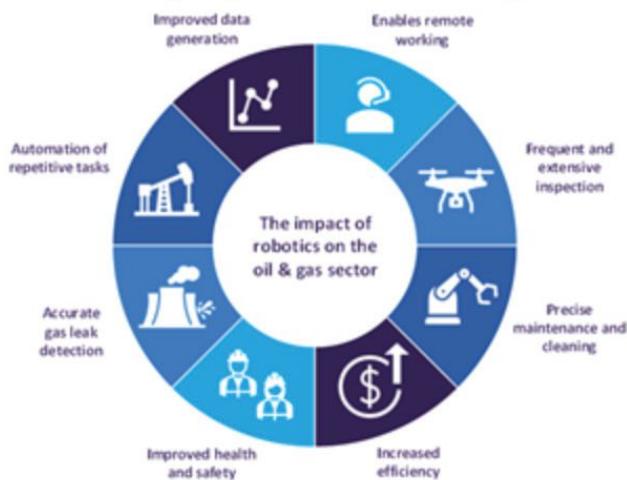
Fernandes added: "Robotics is a fast-growing industry. According to GlobalData forecasts, it was worth \$52.9 billion in 2021 and will reach \$568 billion by 2030, recording a compound annual growth rate (CAGR) of 30%. Robots will be the industry's growth engine, and the oil and gas sector will greatly benefit from emerging use cases."

Data analytics and robotics improve insight obtained from surveys and surveillance exercises. This symbiotic relationship between robotics and wider digitalization technologies is expected to be further evolve through collaborations between technology providers and oil and gas industry players.

Fernandes concluded: "The volume of robotics use cases in the oil and gas industry is expected to grow rapidly, in tow with digitalization. Industrial robots with analytical support from digital technologies is expected to become the mainstay across the oil and gas industry, especially in the upstream sector, where personnel safety and operational security concerns are heightened."



Robotics has far-reaching impact on the oil and gas industry



Source: GlobalData Disruptor Intelligence Center

GlobalData



» DIU collaboration to build a new tetherless ROV technology. (Photo credit: Greensea/SeeByte)

COLLABORATION FOSTERS AUTONOMY AND MACHINE LEARNING INNOVATION IN OCEAN ROBOTICS

The two largest software companies in ocean robotics, Greensea Systems, Inc. creator of the open architecture platform OPENSEA®, and SeeByte, with their mission-level autonomy system Neptune and embedded Automatic Target Recognition (ATR), have continued their collaboration to provide a comprehensive solution for ocean robotics operators, from vehicle platform to operation center.

The two companies are working together to provide advanced autonomy and sensor processing solutions that complement each other and push the cutting-edge of underwater robotics.

"I have had a long history with Greensea Systems. First, I was a customer of theirs at SeaBotix. Then I became a competitor to them in my early days with SeeByte. Now, I am proud to partner with them to advance the cutting-edge underwater robotics technology. Autonomy and advanced sensor processing go hand in hand. The tetherless ROV technology that we are building together under DIU will be game changing," said Leverett Bezanson, SeeByte Engineering Manager US operations.

The two companies first came together in 2021 to field an EOD (Explosive Ordnance Disposal) solution under a DoD OTA (Other Transaction Agreement) led by the DIU (Defense Innovation Unit). This collaboration has resulted in a comprehensive solution built by two industry leaders. The tetherless ROV shown below will feature

Greensea Autonomy built in EOD workspace, and SeeByte AI/ML Sensor processing with their video and forward-looking sonar ATR.

Over the last two years the partnership has grown to the point that Greensea and SeeByte are presenting complementary concepts.

US MCM and EOD Defense Units will not be the only ones to see the benefit of this integration, as the resulting vehicle perception, over the horizon command and control, and ML and AI ATR pipeline will also be available in the new commercially available OPENSEA Edge system from Greensea and the ATR system from SeeByte.

In common with the development of many autonomous maritime systems, the initial funding that enabled fast-paced roll-out has come from the military, but the rest of the undersea industry now gets to benefit, as Ben Kinnaman, Greensea CEO stated: "Thanks to defense funding, and our willingness to enter into partnerships such as the one here with SeeByte, OPENSEA products will accelerate the viability, reduce the risk and cost, and increase the uptake of subsea autonomy in the commercial marine sphere. The more rapid development of capabilities such as tetherless, over-the-horizon operation, enhanced object recognition and mission-based AI will provide a huge boost in slower autonomy adopting industries, such as offshore energy and ocean science."

SUBSTANTIAL RESOURCES OF SEABED MINERALS ON THE NORWEGIAN SHELF

The Norwegian Petroleum Directorate (NPD) has prepared a resource assessment of the seabed minerals on the Norwegian shelf. The report concludes that substantial resources are in place on the seabed.

For several of the metals, the mineral resources are sufficient to cover many years of global consumption. The Ministry of Petroleum and Energy (MPE) gave the NPD the assignment to assess the resource potential of seabed minerals when the opening process for mineral activity started in 2020.

The MPE is responsible for stewardship of seabed minerals, and is leading the work on the opening process. The report is included as part of the opening process for seabed minerals.

"The NPD has built up expertise over many years, in part through a number of expeditions. We've mapped relevant areas, collected data and taken large volumes of mineral samples," said Kjersti Dahle, NPD Director, Technology, Analysis and Coexistence.

"In this resource assessment, we've estimated how much of the various minerals might be found on the seabed in the studied area. Going forward, we will continue to reinforce the source data and the way we evaluate these resources."

Important in the energy transition

The transition to a low-emission society enhances the need for specific elements. These elements occur, for example, in deposits on the seabed. They are important raw materials in the energy transition, and they are in demand in relation to industry.

Dahle points out that technology development, together with more and better data, will yield even better understanding of the resource potential: "The volume of recoverable resources depends on technology and economy. It remains to be seen whether the areas will be opened, and whether production can be profitable from a financial standpoint."

Collecting, managing and making data from the Norwegian shelf accessible is one of the NPD's most important tasks.

Since 2011, the NPD has collected data in the deepwater areas in the Norwegian Sea and the Greenland Sea in cooperation with the University of Bergen (UiB). The University of Tromsø (UiT) has also been included since 2020.

During the period from 2018-2021, the NPD itself conducted four expeditions to collect high-resolution seabed data over the most interesting mineral deposits; drilling operations and collection of mineral samples were also carried out.

Data from these expeditions, supplemented with data from scientific institutions, form the basis for this resource assessment.



» NPD Director Kjersti Dahle

"We have extensive experience in mapping the subsurface and assessing petroleum resources. I'm glad that we, with the expertise we bring, can also contribute to identifying resources that could be important in the energy transition," added Dahle.

Sulphides and manganese crusts

There are three types of mineral deposits on the seabed; manganese nodules, manganese crusts and sulphides. All three types contain multiple metals, and they are located at significant sea depths, mainly between 1,500 and 6,000 meters. On the Norwegian shelf, manganese crusts and sulphides have been found at depths around 3,000 meters.

The NPD's resource assessment for seabed minerals provides estimates of the resources in place; in other words, resources that have been proven, or that are expected to be present.

To confirm whether the mineral resources are recoverable, and can be recovered with acceptable environmental impact, this will require further investigation of the seabed and technological development surrounding recovering methods.

Several international organizations, such as the IEA and IRENA, are pointing to the significant and growing need for metals. As recently as in 2020, the European Commission prepared an overview of critical input goods for the Union.

"Of the metals found on the seabed in the study area, magnesium, niobium, cobalt and rare earth minerals are found on the European Commission's list of critical minerals. Costly, rare minerals such as neodymium and dysprosium are extremely important for magnets in wind turbines and the engines in electric vehicles," concluded Dahle.

ROYAL NIOZ ACQUIRES THREE NEW TELEDYNE WEBB SLOCUM GLIDERS

Teledyne Marine recently announced the sale of three Webb Slocum gliders to the Royal Netherlands Institute for Sea Research (NIOZ). NIOZ conducts multidisciplinary applied marine research to address major scientific questions about our oceans and seas. After completing a competitive tender procedure, NIOZ acquired three Teledyne Webb Research G3 Slocum gliders.

NIOZ Scientists, engineers, and ship technicians recently underwent operational and maintenance training on the systems with field support staff from Teledyne Webb Research and the UK's National Oceanographic Center (NOC), which are Teledyne's European Slocum Service Center. This training was conducted in Spain at SOCIB facilities in preparation for the glider science

project to be undertaken initially by the RV *Pelagia* in the North Sea in the spring of 2023.

The Nose project will study the absorption of CO₂ in the North Sea. Slocum gliders were acquired with a grant from the NWO Large-scale Scientific Infrastructure (NWO-GWI), awarded in 2020 to a broad nationwide marine research consortium of universities, institutes, and TO2 institutions.

"After tendering, we opted for cooperation with Teledyne Webb Research in the United States of America. For us, the G3 Slocum Glider proved to be a flexible platform with long endurance and an acoustic data transfer capability," said Marck Smit, NIOZ Sea Research.



» On deck with Slocum Webb Gliders after successful sea trials. (Photo credit: Royal NIOZ)

METRON

OBSERVE. PREDICT. PLAN. EMPOWER.

RESILIENT MISSION AUTONOMY
INSIGHTFUL DATA ANALYTICS
PROVEN DECISION SUPPORT TOOLS
EXPERIMENTAL CAPABILITY DEVELOPMENT

MISSION SUCCESS IN THE HANDS OF AUTONOMY INNOVATIONS

By **METRON**

The ability to deliver on the promise of autonomy goes beyond the execution of a single focused, geo-localized application. Rather, autonomous solutions need to be adaptable to different platforms, vehicles, sensors, payloads, and missions. However, until autonomy is proven resilient and reliable, trust in uncrewed assets such as AUVs, UUVs, and ASVs, real world applications will be largely reliant of human supervision.

ESTABLISHING TRUST

Today, there are very few companies that have proven autonomous solutions in the water, but those that do—like Metron—usually have a background in developing safe, reliable, and resilient tech solutions for defense markets. But establishing this trust in the operational efficacy

of autonomous systems is a multifaceted challenge and one that is further compounded when we consider the prospect of multiple platforms and vehicles working seamlessly as a network of assets. Ultimately, marine autonomy is a fast paced and emerging market, so traditionally, as with any nascent industry, this is the phase in which technologies can fail.

Mounting regulatory issues have also proven burdensome. As is often the way with breakthrough technologies, regulation often struggles to keep pace with the technological developments it is decreed to govern. Suffice to say, the path to the full integration of autonomous marine operations is cloudy at best and somewhat blurred by the fact that the terminology—autonomous vs. automated—is often misunderstood or used interchangeably.

AUTONOMOUS vs. AUTOMATED

A simple way to distinguish between "autonomy" and "automation" is by the nature of how a control system's action policies are generated and managed. Both autonomous and automated systems work to govern the actions of a system operating in some environment, to accomplish one or more goals. In automated systems, the control system's actions are governed by a set of rules (i.e. action policies) established by the system designer prior to the system being deployed. If the system, environment, or system demands change appreciably, this generally requires the system rules to be updated by a human.

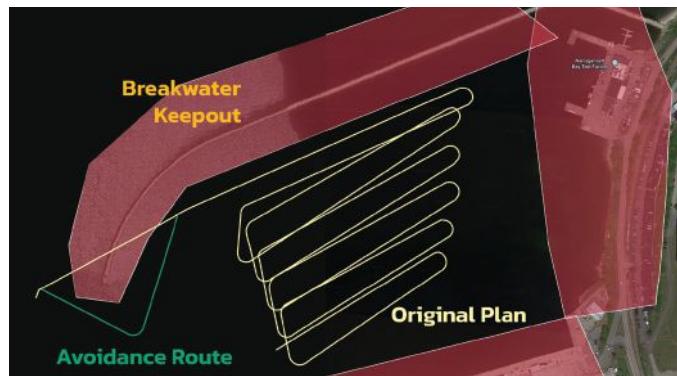
In fully autonomous systems, the control system is bestowed with the ability to adapt its own action policies to better handle unforeseen changes to the



environment, system demands, or the system itself. An ideal resilient autonomous system can make optimized adjustments in situ without human intervention. For vehicles, autonomy applies to control systems that make decisions about the vehicle actions in its external environment (i.e. extrospective autonomy for route planning, hazard avoidance, payload usage, etc.), but it also applies to action decisions for the systems driving the platform itself (i.e. introspective autonomy for system alignments, mode changes, etc.).

LESSONS FROM DEFENSE

Understanding the real-time interplay of the internal and external dynamics of autonomy remains a key driver for software development at Metron. What began in 1984 as a defense and national security focused business, has evolved into an



» ANCC autonomy software will allow uncrewed assets to make non-scripted decision-making to ensure responses like object avoidance rerouting. (Image credits: Metron)



award-winning, trusted provider of advanced solutions for government and commercial markets. Today, Metron is developing the next generation of autonomous system software to equip customers with more impactful tools across the sea, air, land, and space programs.



» ANCC's autonomy route planning: *in situ* - planning and pruning.
(Image credit: Metron)

Metron's long history of collaborating with DOD programs—including working on the development of LD-UUV and XL-UUV class vehicles for the US Navy—has afforded the team some unique and extensive involvement with lengthy and dynamic AUV missions. This in-field experience has been fundamental in shaping the company's autonomous vehicle philosophy—one underpinned by the principles of utility, reliability, and adaptability—and multi-domain approach to the fielding of next-generation autonomy.

DEPLOY & FORGET

In the context of present-day offshore exploration, Metron's

expertise across AI, machine learning, data analytics, and decision support has triggered a fresh focus on software technologies that significantly increase the reliability and longevity of uncrewed vehicles in some of the planet's most demanding and remote waters.

In an attempt to integrate improved prognostics, intelligent planning, and adaptive decision making, the team launched the Resilient Mission Autonomy™ family of solutions. Sensor, vehicle, and payload agnostic, as well as directly applicable to a wide range of marine survey and inspection programs, Metron created a high level, two-product portfolio defined by the concepts of "Mission Autonomy" and "Introspective Autonomy."

With the first product, ANCC (Autonomy, Navigation, Command, and Control), autonomy maximizes operational success through intelligent, mission-driven, adaptive, non-scripted decision making without the need for human operators present. ANCC was created under the philosophy that each mission or application's success is measured by achieving results of the mission tasks and objectives—in other words, "Mission Autonomy."

While both products were designed to support the needs of offshore survey and inspection service providers

and their respective vehicle manufacturers, Metron's "Introspective Autonomy" offering, SAHM-IAMM (Self-Adaptive Health Management via Intelligent Autonomous Monitoring and Mitigation), introduces a further dimension to autonomous operations in which health status monitoring enables system adaptation, preventative maintenance, increases operational availability, reduces sustainment costs, and minimizes critical mission failures.

SAHM-IAMM is able to observe and manage the action policies of the systems that govern all of its inner workings and ultimately detects anomalous behaviors and predicts faults before they occur.

FUTURE IMPLICATIONS

Autonomy of this degree will prove instrumental to establishing a true paradigm shift for offshore activities. Today, as operators increasingly trial, adopt, and integrate uncrewed assets, human engineers are still required to routinely provide intelligent oversight of hardware systems, using automation as an aid to enable fewer humans to control ever larger and more complex hardware systems.

However, SAHM-IAMM autonomy is designed to serve as a genuine stand-in for the cognitive functions of the human operating engineer, working in concert with lower-level automation controllers to make plans, enable tradeoffs, predict and prevent issues, and facilitate any necessary repairs. Coordination between SAHM-IAMM and ANCC autonomy solutions will for the first time provide a holistic Resilient Mission Autonomy solution for industry.

The implications are far-reaching. While the commercial market has fully incorporated the notion of full autonomy into marketing communications, true autonomy—and the promise it must fulfill through genuine performance trust—remains a high bar for uncrewed assets.

The industry has arrived at an inflection point, whereby autonomy can independently consider not only the performance of an asset and mission but run full risk analysis and any subsequent interventions on long-duration deployments. This is the core capability needed to unlock the true potential of uncrewed vehicles, and Metron's capacity to implement custom Resilient Mission Autonomy software brings the offshore exploration community one step closer to this operational reality.

For more information, visit:
www.metsci.com.



NEW FUNDING ALLOWS ROBOT FLEET TO INVESTIGATE OCEAN CARBON CYCLE

The UK is at the forefront of a global shift to using high-tech robots to explore the ocean. The Natural Environment Research Council (NERC) BIO-Carbon programme is investigating how marine life stores CO₂. Alongside the ship-based research in 2024 a fleet of autonomous robots, funded via NERC's Net Zero Oceanographic Capability (NZOC) program, will collect data in a different way that is both low-carbon and novel in its approach to marine science.

NZOC has been established to reduce the CO₂ emissions associated with ocean research which often takes place in remote and challenging environments. BIO-Carbon is an exciting and ambitious research program that seeks to understand how marine life allows the ocean to store CO₂ that may otherwise be in the atmosphere.

Leigh Storey, NZOC lead, commented: "NERC's marine research fleet has a target to be net zero in carbon by 2040. To achieve that, new technology must be adopted, alongside scientists developing new techniques that can fully exploit all that robots can provide. The BIO-Carbon program presents an opportunity to show how autonomous platforms might reduce the need for ship-based experiments in the future."

The BIO-Carbon program seeks to confront three challenges.

- **How does marine life affect the potential for seawater to absorb CO₂?** The ability of oceans to absorb carbon dioxide is determined by the alkalinity of the water. Calcium carbonate is the main influence on alkalinity, but we are unsure which organisms are producing carbonates and where.

- **At what rate does marine life convert CO₂ into organic carbon?** Carbon dioxide is removed from the ocean by being converted to organic matter by phytoplankton—microscopic single-cell plants which form the basis of the food chain. Whether global phytoplankton growth will increase or decrease under climate change is unknown.

- **How does climate change affect the future storage of carbon in the ocean?** The creatures forming the marine ecosystem eventually respire the organic carbon as CO₂. To determine the speed at which this CO₂ is returned to the atmosphere, we need to understand where and when this respiration process in the ocean.

Dr. Adrian Martin, the BIO-Carbon Champion from the National Oceanography Centre, added: "The BIO-Carbon NZOC science mission will add considerably to what we can achieve, providing a new set of powerful tools while pioneering a low carbon emissions approach to environmental science. It is great to see the UK leading the way in this responsible approach to research given the UK's drive to net zero carbon emissions."



HYDROMEA IS LEADING THE DEVELOPMENT OF THE GLOBAL UNDERWATER WIRELESS OPTICAL COMMUNICATION STANDARD

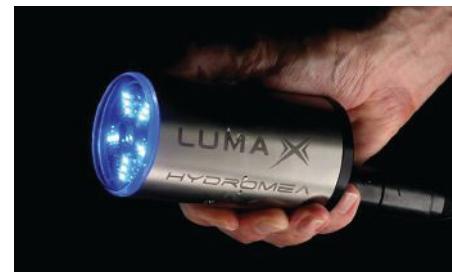
Hydromea is leading the development of the global underwater wireless optical communication standard for bandwidths up to 10Mbps within the Subsea Wireless Group (SWiG), of which Hydromea has been a member since 2019. SWiG is an international industry network of manufacturers and users of subsea wireless communication equipment (radio frequency, acoustic, free-space optic, inductive power, hybrid) and it promotes their interoperability.

Hydromea is an emerging leader in the field of wireless optical communication systems that can send data through water at speeds of up to 10Mbps using dispersed LED light. This assures wide-angle communication coverage as opposed to laser systems that require fine alignment. Hydromea's technology enables wireless, high-speed, low-

latency communication between two or more communication nodes at depths down to 6,000 meters. Currently, there is no industry standard, which makes the deployment of such systems less attractive for the end users.

Felix Schill, co-founder and CTO of Hydromea, said: "We are very proud that our work on underwater wireless technology earned us a prominent place within the Subsea Wireless Group and that the industry players have entrusted us with leading the development of the standard."

Chevron, Equinor, and TotalEnergies became members of SWiG to drive interoperability of underwater wireless technologies in the energy sector. They welcome initiatives that take a lead on development of industry standards. This will positively affect the



» LUMA is a line of optical modems that can operate in depths to 6,000 meters. (Photo credit: Hydromea)

adoption of underwater wireless technology by the industry.

Shreekanth Mehta, SWiG project manager, added: "Hydromea have been a key party in the development of SWiG standards. In co-operation with an operator, they are drafting an open standard that will facilitate interoperable 1-10mbps FSO (free-space optical) communications for the industry. This standard will be donated to SWiG for review and will significantly accelerate the SWiG timeline. End users will be able to deploy high speed FSO technology that adheres to a SWiG standard. Standardization initiatives require collaboration and cooperation between vendor competitors. We are lucky in SWiG to have a high level of cooperation between vendors. Hydromea are a great example of this collaborative spirit."

TRANSFORM YOUR CAPABILITY

SIDESCAN SONAR UNITS FOR AUV/ROV INTEGRATION

bp blueprint
subsea

StarFish Sidescan Imaging Sonars

High resolution seabed imaging for survey applications. Compact, lightweight and easy to install on any platform. Available in 450kHz and 1.0MHz. Depth rated to 2000m

starfish



www.blueprintsubsea.com
enquiries@blueprintsubsea.com

HABITAT-SAVING ALGORITHM HELPED BY SEAEDGE FALCON

Scientists at the Washington Department of Fish and Wildlife (WDFW) have acquired a second Saab Seaeye Falcon underwater robot. The Seaeye Falcon is used to conduct surveys of marine fish and invertebrates in Washington's Puget Sound, where some rockfish populations were fished to levels that threatened extinction.

The surveys are used primarily to monitor the recovery of rockfish listed under the United States Endangered Species Act, but also provide information on the unique geological features in Puget Sound. The WDFW has also used their Falcon to survey the habitat surrounding US Navy bases in Puget Sound to meet Federal permitting requirements, locate and recover lost equipment and conduct special studies of sea urchins and sea cucumbers.

The new Seaeye Falcon is a 300 m rated system and equipped with a high-definition fiber-optic video system capable of collecting higher resolution imagery than WDFW's original Falcon, which has seen over 4,000 hours of use since 2007.

"The HD imagery collected with the new vehicle will greatly improve our ability to detect small and cryptic rockfishes, leading to more precise estimates of abundance, and will be used to train machine-learning algorithms being developed to partially automate the video review process, which is expected to substantially improve survey and post-processing efficiency," explained research scientist Robert Pacunski.



» *Salish Rover from which WDFW's Seaeye Falcon will be deployed.
(Photo credit: Saab Seaeye)*

Specialized equipment fitted to the Falcon includes a pair of parallel lasers and a stereo camera for assessing individual fish size and the density of fish in a measured field of view. An Imagenex multi-frequencing gyro-stabilised sonar is used to identify target habitats and avoid uncharted obstacles (for example, derelict fishing gear, subsurface electrical and telecommunications cables). Depending on survey needs, the vehicle can be fitted with a conductivity-temperature-depth meter to collect data in real-time for examining linkages between physiochemical water quality parameters and fish distribution/abundance.

Assisting the acquisition of both Saab Seaeye Falcons was the local distributor in North America, Jack Roberts of Symphtic TII Corporation.

WHY THE SOUTHERN HEMISPHERE IS STORMIER THAN THE NORTHERN

Scientists, poring over satellite data, have finally ascertained that the Southern Hemisphere is stormier than the Northern, by about 24%. But no one knew why.

A US National Science Foundation-supported study led by University of Chicago climate scientist Tiffany Shaw has offered the first concrete explanation for this phenomenon. Shaw and colleagues found two major culprits: ocean circulation

and large mountain ranges in the Northern Hemisphere. The findings are published in *Proceedings of the National Academy of Sciences*.

The study also found that this storminess asymmetry has increased since the beginning of the satellite era in the 1980s and that we can now quantify how extreme the difference is.

Scientists used a numerical model of Earth's climate built on the laws of physics; the model reproduced the observations. Then the researchers removed variables one at a time and quantified each one's impact on storminess. The first variable tested was topography. Large mountain ranges disrupt air flow in a way that reduces storms, and there are more mountain ranges in the Northern Hemisphere.

When the scientists flattened every mountain on Earth, about half the difference in storminess between the two hemispheres disappeared.

The other half had to do with ocean circulation. Water moves around the globe like a very slow but powerful conveyor belt: it sinks in the Arctic, travels along the bottom of the ocean, rises near Antarctica and then flows up to the surface, carrying energy with it. That creates an energy difference between the two hemispheres. When the scientists tried eliminating the conveyor belt, they saw the other half of the difference in storminess disappear.



OIL & GAS INDUSTRY ADOPTS CANCER AND DNA TECHNOLOGY

Applying its unique technology in one of science's most recent significant projects, identifying the human genome, the newly established Houston based biotech company, GeOME Analytics, is now making headlines throughout the energy industry.

Costing around \$3 billion over nearly 13 years, 'The Human Genome Project' has been one of science's most remarkable developments in recent times. During this project, GeOME's technology contributed sequencing of around 50% of the human genes. Decades of research have gone into developing and finetuning GeOME's algorithm and methodology. Now, the same

technology is being used by the oil and gas industry to optimize production and planning.

"We received several requests from oil and gas operators asking if we could apply our DNA sequence methodology subsurface. Even though we are in Houston, the 'Energy Capital' of the world, it was remarkable that the energy industry looked at biology as a way of optimizing its operations. We then partnered with a large global operator, and nearly three years later, we have fully qualified the technology. We are now mapping the stratigraphy in ways previously not possible," says Gunaratne Preethi, CEO and founder of GeOME Analytics.

The energy industry has years of track record in developing new and groundbreaking technology. Applying cancer biotechnology in optimizing well planning and production may appear surprising at first. When looking below the surface however, these are microbial environments developed over thousands of years that are dominant in the stratigraphic layers that exist today. Which of the operators are using this, and what the benefits and savings are, remains a mystery?

"Unfortunately, current clients and cost savings are confidential, but the technology use is not. We use subsurface microbial DNA, on- or offshore, and with our technology,



» Gunaratne Preethi, CEO and founder of GeOME Analytics.

analyze what is present, and non-existing to accurately determine production details by benches, reservoir allocation or other detailed data. If correlating to our cancer research, it is like 'Lineage Tracing' where the metastatic breast cells from the bone, helps correct the diagnosis of breast cancer. Subsurface tracing is similar, it is just less complex tracing microbes in distinct stratigraphic layers, compared to cancer cells that may have traveled all over the human body," Preethi added.

Two New ROS Innovations

One Brighter **SEASTAR™**



- LED array produces 10K+ Lumens
- All components field serviceable using standard hand tools
- 120VAC or 24VDC full range, flicker free dimming
- Depth rated to 6000 meters

One Smarter **accu-POSITIONer™**

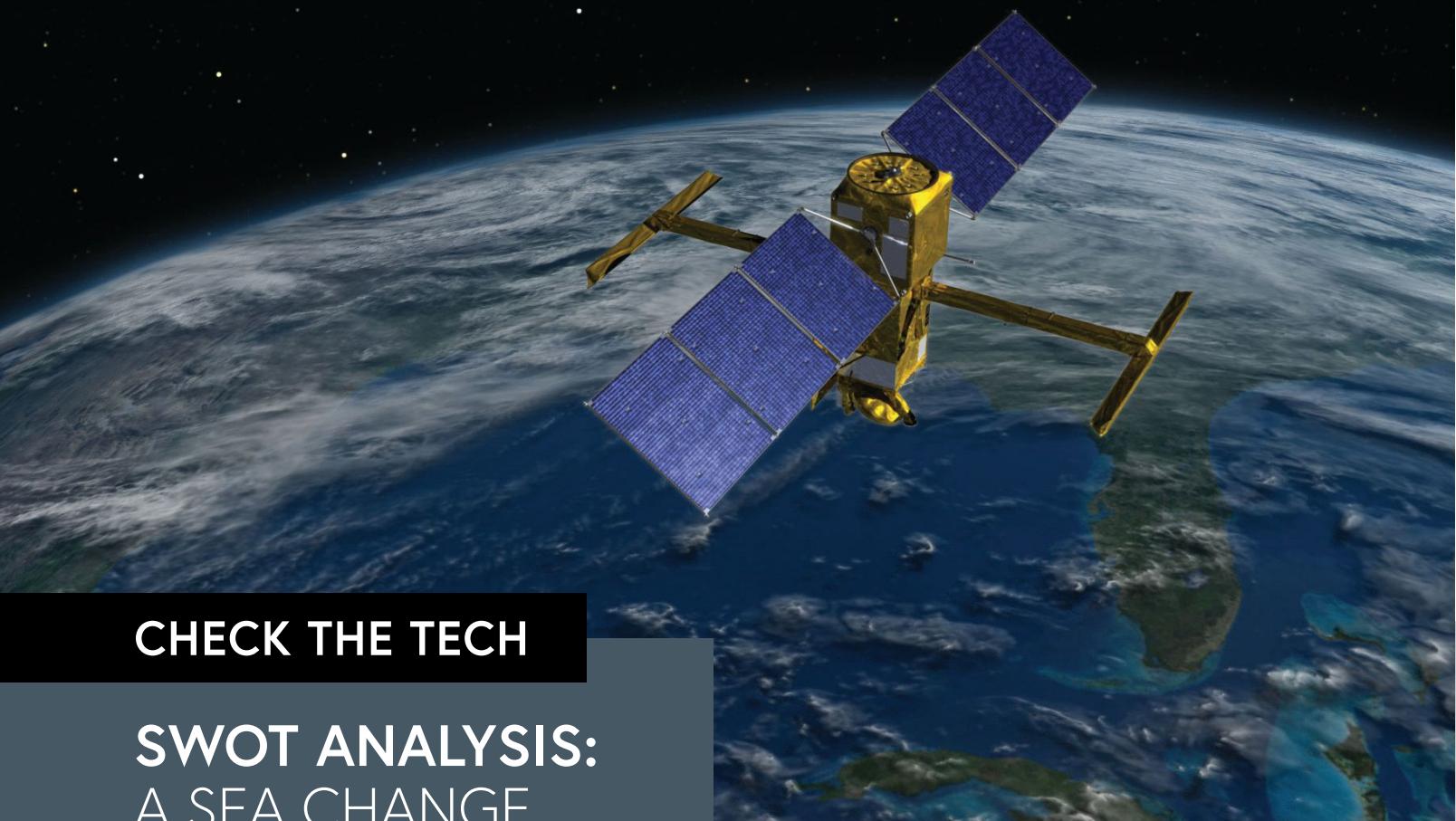
- Highly reliable design
- Controlled with COTS controllers, devices and ROS GUI
- High accuracy feedback / servo mode: +/- .1 degree
- Zero backlash
- Lightweight and compact
- Depth rated to 6000 meters



**For More Information and Technical Specifications
Contact: sales@rosys.com or Visit: www.rosys.com**



Headquarters - San Diego, CA USA
Phone: (858) 565-8500
Email: sales@rosys.com
www.rosys.com



CHECK THE TECH

SWOT ANALYSIS: A SEA CHANGE FOR MODERN-DAY OCEANOGRAPHY

Back in mid-December 2022, a mission led by NASA and the French space agency Centre National d'Études Spatiales (CNES) launched the Surface Water and Ocean Topography (SWOT) satellite into space, from where it will observe huge swathes of ocean and surface water in unprecedented detail.

The SWOT satellite's Ka-band Radar Interferometer (KaRIn) instrument is engineered to measure the height of water found on Earth, in lakes, rivers, and oceans. Until now, researchers wishing to study a body of water relied on instruments that measure at specific locations—like gauges in rivers or the ocean—or that are space-based, gathering data along narrow "tracks" of the Earth seen from orbit. From there, researchers extrapolate the data to gather a broader idea of what's happening in any given body of water.

However, KaRIn represents something of a sea change. The radar instrument uses the Ka-band frequency at the microwave end of the electromagnetic spectrum to penetrate cloud cover and the dark of night, meaning it can take measurements

» *Surface Water and Ocean Topography (SWOT) satellite took off from Vandenberg in California on December 16. (Image credit: NASA/JPL-Caltech)*

regardless of weather or time of day. By bouncing radar pulses off the water's surface and receiving the return signal with two antennas—mounted at the ends of a 10-meter-long boom—KaRIn will collect data along a swath 50 kilometers wide on either side of the satellite.

ENGINEERING FEATS

The team at NASA's Jet Propulsion Laboratory has spent years developing the KaRIn instrument and had to overcome a series of operational challenges, in particular the need to ensure the sufficient stability and precise tilt of the satellite, the solution to which involved the incorporation of a high-performance gyroscope to account for any shifts in SWOT's orbital positioning.

The amount of transmitted radar power needed to measure surface features down to centimeter accuracy—pulses of 1.5 kilowatts, a huge amount of power for a satellite like this—was also another engineering hurdle. Ultimately, this meant fabricating and incorporating materials specific to high-voltage systems to enable SWOT's electronics system to handle thousands of volts at any one time.

The net result, and the product of years of conceptual design, technology development, testing, and validation, is a satellite set to revolutionize modern oceanography thanks to its capacity to detect ocean features with 10 times better resolution than present technologies.

CRITICAL DATA

The higher resolution will allow oceanographers to better observe small-scale ocean features that contribute to the ocean-atmosphere exchange of heat and carbon—major components in global climate change—as well as providing highly detailed information on ocean circulation and the dispersion of life-sustaining nutrients and harmful pollutants.

Scientific breakthroughs will include a clearer understanding of sub-mesoscale eddies, short-lived, swirling ocean currents that are thought to be responsible for transporting half of the heat and carbon from the upper ocean to deeper layers, so are critical actors in the global climate shifts. SWOT will also reveal new details about the transport of many ocean-based nutrients—essential to the healthy balance of the marine food web and the productivity of fisheries—as well as a raft of other fine-scale pollutants such as crude oil, harmful river discharge, and debris (e.g., from extreme weather events). All these variables, alongside other SWOT data, will prove instrumental in refining ocean circulation forecasts, predictive models that help optimize offshore commercial operations and coastal planning activities.

TECHNICAL COLLABORATION

The SWOT mission is a truly collaborative effort, uniting an international cast of oceanographers and hydrologists, and while the project is jointly led by NASA and Centre National D'Etudes Spatiales (CNES), significant contributions have been made from the Canadian Space Agency (CSA) and United Kingdom



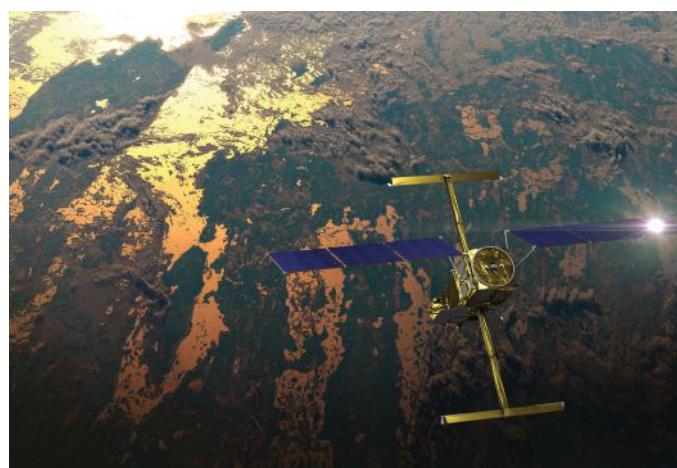
» The SWOT water-tracking satellite encapsulated in its payload fairing before launching atop a SpaceX Falcon 9 rocket on December 16, 2022. (Photo credit: USSF 30th Space Wing/Joshua Duff)

Space Agency. (This science instrument was provided by NASA's Jet Propulsion Laboratory; CNES and Thales Alenia Space built the radio-frequency subsystem; The Canadian Space Agency contributed the extended interaction klystrons; the Duplexer, a high-power switching system that is part of the radio-frequency unit, was funded by the UK Space Agency at Honeywell UK.)

One of the long-term goals of SWOT is to democratize valuable data that shapes meaningful decisions.

NASA's Applied Sciences Program are partnering with the SWOT project team to implement a strategy that promotes applications research and engages a broad community of users in the uses of SWOT data. The aim is to continue to integrate this community and encourage members to utilize science and data products in addressing broader societal issues and needs.

This is a pivotal moment for the scientific study of our planet's oceans. As we move through the implementation stage of SWOT's lifecycle, we will begin to see just how revealing detailed images of water levels and circulation are to the precise study of the patterns and shifts in the complex processes that govern the ocean and inland waters. Not only will these data unlock new scientific discoveries, but it will provide validated information with which to make vital decisions about how best to manage one of the planet's most precious natural resources.



» This illustration shows the SWOT satellite in orbit with sunlight glinting off one array of solar panels, as well as both KaRIn instrument antennas deployed. (Image credit: CNES)



» WHOI marine chemist Matt Long prepares a 3D printer to build a component for an OCIA-funded project. (Photo credit: Daniel Hentz/WHOI)

NI JOINS OCIA CONSORTIUM TO ACCELERATE SOLUTIONS TO CLIMATE CHANGE

National Instruments (NI) has announced that the company will be joining Analog Devices, Inc. (ADI) and the Woods Hole Oceanographic Institution (WHOI) as the newest member of Ocean & Climate Innovation Accelerator (OCIA). With a grant of \$1 million over four years to the consortium, NI supports research into the effects of climate change on our oceans. Founded in 2021 by OCIA members ADI and WHOI, OCIA's goal is advancing knowledge of the ocean's critical role in global environmental health.

NI, a pioneer in the test and measurement space, has committed to using the power of engineering to combat the negative effects of climate change. Through its 100-year plan and Corporate Impact Program, NI has initiatives ranging from zero waste and carbon neutrality to a defined portion of profits being donated.

OCIA is a first-of-its-kind consortium launched to generate new knowledge and accelerate solutions for climate change through a focus on our oceans. WHOI and ADI both recognized the urgent need to understand fundamental ocean processes to predict future climate impact and to inform policies that address it. The industry consortium member companies contribute resources, research capability and in-kind technology to collaborate with WHOI scientists across research innovation hubs. OCIA is intentionally designed to bring together organizations across sectors and areas of expertise to drive collective action and meaningful change.

With NI's support, OCIA will increase financial assistance to grantees creating technologies that support data collection and improve understanding of the ocean and its role in climate evolution. In addition, the grant from NI will accelerate the development of technologies incorporating artificial intelligence and machine learning.

"As engineers who are always seeking the next solution to immense challenges, we know that combining forces with WHOI and Analog Devices supports bold innovations to address climate change," said Eric Starkloff, CEO at NI. "This initiative fits into our goal of helping to engineer a healthy planet by using data and measurement to drive deeper knowledge."

"Accelerating research and technology development for ocean-based climate solutions is at the forefront of WHOI's mission to advance ocean-climate innovation for the global good," added Peter de Menocal, WHOI President and Director. "NI's climate-focused goals align closely with the philosophy and approach of OCIA and we're excited to have them join this important initiative."

"Analog Devices has seen firsthand the impact of NI's expertise in helping businesses solve some of their toughest challenges, and we look forward to the impact their support will make in achieving OCIA's goals," stated Vincent Roche, CEO at Analog Devices.

SOMAG AG JENA LAUNCHES GYRO STABILIZATION MOUNT RSM 50

SOMAG AG Jena has launched the new RSM 50, a compact and cost-effective gimbal that offers top-notch stabilization for customers who want to get the most out of their sensor to achieve a high-quality and reliable data basis. With the leap to series 5, SOMAG sets new standards in the field of gyro stabilization technology for mobile land and water applications.

The electromechanical gimbal addresses the stabilization needs of customers who want to significantly improve their data captured off-road or offshore. The Mount stabilizes in real-time movements up to $\leq \pm 20.0^\circ$ in the roll and pitch axis of land and rail vehicles caused by rough, uneven terrain, as well as angular movements of boats, ships, Unmanned Surface Vessels (USVs), autonomous platforms and buoys caused by sea swell. Advanced control

algorithms assure a stabilization accuracy that has been improved to $\leq 0.3^\circ$ rms for best sensor performance and detailed image capture.

Due to a modified mechanical design, the power consumption is even lower than that of the predecessor device. In addition, the RSM 50 comes with an energy-saving mode. This stand-by mode is advantageous for long-term applications, such as on buoys, where power supply is critical.

Additional features include extended diagnosis possibilities and a failsafe braking system to securely lock the payload during power outage. The new Ethernet communication interface allows for an integration into existing networks as well as a control and monitoring of multiple mounts within a network.

The ruggedized Mount ensures that the sensor always points exactly in the desired direction. With the modified mechanical design of the RSM 50, customers' requests for an upside-down hanging installation are now fulfilled.



» RSM 50 comes with an energy-saving mode.
(Photo credit: SOMAG)

Micron Gemini

Find what you are looking for

Multibeam imaging sonar

Depth & pressure readings

Optional AHRS



 **Tritech**

DEEP-SEA H2-POWERED AUVs PROVIDE UNDERWATER CLARITY



By Alex Johnson

Director of AUV Products, Cellula Robotics



Cellula Robotics' Solus-LR Autonomous Underwater Vehicle (AUV) offers game-changing features and capabilities for deep-sea research and exploration. Each individual component is important in its own right but when considered as a fully integrated system, the sum of this innovation-packed marine exploration platform is truly greater than its parts.

Consider range and endurance; the Solus-LR base range is 2,000 km. Power comes from a hydrogen and oxygen fuel cell with a Li-ion battery, a combination that enables hybrid operation. This high

energy density power pack allows the Solus-LR system to undertake multi-month, submerged port-to-port missions. In contrast, most battery operated AUVs are limited to one to two days underwater.

If 2,000 km isn't extensive enough, Cellula's extra-large Uncrewed Underwater Vessel (UUV), Solus-XR, is set to start sea trials in winter 2023 and promises a range of up to 5,000 km.

There are a number of highly engineered details that make the Solus-LR truly cutting-edge, and several of these technological advances are in direct

response to some of the demands from ocean-based businesses and stakeholders, from scientific research agencies to offshore energy developers.

POWERING EFFICIENCY

It is the incorporation of an H2 fuel cell that makes Solus AUVs so unique, and this is the component that ultimately delivers their unparalleled range. Solus systems can be launched from any location and transit to a predetermined target or area for monitoring or study and carry out operations for up to 45 days before returning to the launch point. To increase reliability, critical Solus systems are redundant. In short, if anything does go wrong, the AUV will successfully navigate its way home unscathed.

Autonomy, when deploying the Solus-LR, takes on another, larger meaning and conveys additional benefits. Consider the in-field resources required to support traditional AUV campaigns, during which standard, battery powered AUVs are partnered by a topside support vessel for tracking and monitoring. Not only is this expensive—a large vessel with a 100-person crew can cost upwards of \$100,000/day—but there is an environmental cost also, due to the campaign's carbon footprint. In contrast, Solus-LR enables operators to work independent of a surface vessel, resulting

» Solus-LR has a range of 2,000 km and is powered by a hydrogen and oxygen fuel cell with a Li-ion battery. (Photo credit: Cellula Robotics)



in a 10X or better cost reduction benefit for offshore clients.

There are, however, some exceptions, especially if the exploration mission has a heavy data processing requirement or physical sampling tasks. But even then, Solus-LR can still be paired with a much smaller surface vessel and operated by a far leaner team—a 3–4-person crew at most—and so operational efficiencies are all but guaranteed. There is an important distinction here, though: the crew on the smaller vessel is there for project work, not to pilot Solus-LR's autonomy allows it to be independent, but work with the team.

STRETCHING AUTONOMY

The 2,000 km range (not to mention 5,000 km with Solus-XR) significantly extends our horizons for ocean exploration and the capture of quality marine data, especially in remote, deep, and often hazardous waters. And demand for deep-ocean autonomy, a new realm in which subsea drones continue to stretch our remote survey capabilities, is on the rise.

Ocean exploration is ready for someone to disrupt the status quo, to turn the industry on its head, and a fleet of deep ocean port-to-port AUVs—Solus AUVs—that can progress, modernize, and streamline the way offshore developers work at sea.

The advent of Uncrewed Surface Vehicles (USVs) only furthers the potential for realizing new efficiency gains—Solus-LR can work with any type of USV.

INCREASED FLEXIBILITY

While the Solus-LR offers a range of benefits across a spectrum of ocean-based applications, from offshore infrastructure development to scientific exploration to defense-related exercises, increased flexibility underlines them all.

When it comes to payload and other support equipment, Solus-LR is completely modular and component agnostic. In some sense, it is easier to consider the Solus-LR as an autonomous platform; the AUV can incorporate any sensor for any typical mission. This was key to the development of our AUV offering—to offer customers maximum flexibility, especially as an AUV's mission evolves and equipment changes are required.

The "energy bank" that powers the Solus-LR (and Solus-XR) brings a new dimension to endurance. Not only is the AUV capable of extended missions, but the onboard energy source can also be used to power and recharge other battery-powered assets and equipment, such as an auxiliary ROV or a second AUV. And this speaks to the role that the high capacity AUVs like the Solus-LR could play in establishing and supporting a new era of swarm operations.

While the Solus-LR delivers industry leading, it stands to reason that the more AUVs you have working in unison, the more ground



» The Solus-LR does not require extensive port or docking infrastructure and can be launched from a boat trailer. (Photo credit: Cellula Robotics)

you can cover, and in less time. For larger ocean surveys, the opportunity to scale up operations by deploying multiple units will inevitably lead to added efficiencies and cost savings.

BETTER DATA QUICKER

Ensuring quality data with ever shorter lead times has much to do with the Solus-LR's ability to work efficiently and safely in high seas and unpredictable conditions, as can often be the case with projects related to the build out of offshore infrastructure. Take the current offshore wind projects underway in the US, in Atlantic waters off the east coast, where robust and reliable data is key to site surveys and the wind farm planning at relatively shallow depths.

Nullifying the potential impacts of poor weather is one of the keys to minimizing a customer's lead time to quality data when deploying the Solus-LR. In high seas, naturally, surface vessels will tend to get knocked around, the result of which is invariably bad data. Port-launched AUVs eliminate the possibility of weather delays and the unforeseen expense they incur. They remove the "human cost" of working at-sea, which includes a range of HSSE considerations, and just gets the task done.

The next chapter for ocean exploration is underpinned by our capacity—as an industry—to integrate automation and capitalize on the promise of remote operations. Whether in the pursuit of operational efficiency, curbing our sector's carbon footprint, or heralding a new era of health and safety practices, AUVs represent a win-win solution for ocean stakeholders. Solus AUVs and their hydrogen fuel cells are ready for this dawning reality.

For more information, visit: www.cellula.com.



» The Cellula team huddles around the Solus-LR (front) and the Solus-XR. (Photo credit: Cellula Robotics)



BIPARTISAN POLICIES TO MAKE, MOVE, AND IMPROVE AMERICAN ENERGY

American Petroleum Institute (API) President and CEO Mike Sommers recently gave remarks during the 19th Annual State of the Energy Industry Forum, hosted by the US Energy Association. Sommers emphasized API's plan for policymakers in Washington to secure a sustainable, reliable energy future and make, move, and improve American energy.

"Independent experts agree that global oil and natural gas demand will increase over the next 30 years. And nearly half of the world's energy is expected to come from natural gas and oil in 2050. That demand will be met one way or another. If America does not meet it, it will be met by countries that do not share our security interests, environmental standards, or values," said Sommers. "The solutions are right here in America, and we need to seize them."

Sommers outlined the three components of API's policy plan unveiled during its annual State of American Energy event, during which members of Congress from both sides of the aisle voiced support for American energy leadership, including durable permitting reform to unleash energy development and an all-of-the-above approach to building a lower carbon future.

Sommers highlighted the need increased support for energy production, including calling on the Biden administration to open areas offshore and onshore for responsible energy development.

But, Sommers added, "More energy development counts for little if we can't get resources to where they are needed. That means new pipelines, natural gas terminals and fuel infrastructure, and cutting

the years it takes to bring them online." He criticized recent NEPA guidance as running contrary to the bipartisan permitting reform we need, warning the new guidance could harm the development of critical energy projects.

"Our industry is leading the innovation race. API's Climate Action Framework, our industry's plan to tackle the climate challenge, details how we're doing it and what we're doing next," Sommers said while highlighting API's plan to improve American energy. "The best thing we can do for the climate is produce more of America's oil and natural gas—and share our energy and innovations with the world."

"API and our industry are here for it. Ready to do the work. Ready to put in the time—this year, with this administration, with this new Congress—to craft and enact bipartisan policies to make, move, and improve American energy," Sommers concluded.

API represents all segments of America's natural gas and oil industry, which supports more than 11 million US jobs and is backed by a growing grassroots movement of millions of Americans. API's 600 members produce, process and distribute the majority of the nation's energy, and participate in API Energy Excellence®, which is accelerating environmental and safety progress by fostering new technologies and transparent reporting. API was formed in 1919 as a standards-setting organization and has developed more than 800 standards to enhance operational and environmental safety, efficiency and sustainability.

MIROS STRENGTHENS ITS SOLUTION OFFERING FOR OFFSHORE WIND

Miros, an ocean insights leader, has released new applications to optimize operational efficiency and reduce downtime in offshore wind projects.

The company's real-time cloud service now includes a unique offshore wind map that enables operational teams to effectively visualize sea state and weather data received from individual turbines across a site. In addition, it grants operators a global view of their wind farms, removing the need to access multiple dashboards.

Miros has also launched Data Explorer, a new solution allowing the easy creation of purpose-oriented all-in-one sharable dashboards to real-time and historical data from one or multiple offshore wind sites.

Data Explorer removes the need to access and maintain several data sources. Decision-makers get an immediate and complete preview of the most crucial information, empowering

them to make the best sense of the data, analyze trends, and easily share historical and real-time sea-state insights with different stakeholders.

The offshore wind map and Data Explorer are easy to use and intuitive tools to help operations and maintenance teams to significantly reduce energy consumption levels and emissions caused by cancelled offshore operations due to uncertainties around weather conditions and site access. This supports organisations to reach their environmental and sustainability targets.

A recent Miros study with Trios Renewables and the University of Strathclyde provided evidence of the potential benefits of direct wave measurements for offshore wind farms, estimating that minimising turbine downtime by using live data can save offshore wind operators approximately one million pounds per year.

Maggie McMillan, Miros' VP - Renewables said: "Accurate,



» Better, real-time data will empower offshore wind developers to optimize operations. (Photo credit: Miros)

reliable data is critical to driving environmental impact reduction efforts and developing more effective strategies to reduce operational cost."

"One of the key challenges facing offshore wind operators is accessing turbines at the optimum time to ensure crew safety and operational efficiency and to avoid lost production. Our solutions support operators to access and interpret the right data, at the right time, and in the right way, which is essential to enable informed decision-making for their assets."

Aurelia Paraschiv, IoT Product Manager at Miros, added: "Analyzing data can be a costly and often overwhelming process. Our Data Explorer solution is secure, robust, and intuitive to configure, making it useful in all situations from daily operations to long-term life extension studies, especially for stakeholders engaged in time-sensitive tasks needing to impart critical information quickly."



Ocean Engineering

pCO₂ Underway
Modular, easy to use and reliable monitoring systems

Li-Ion Batteries
Highly reliable, efficient and safe underwater power solutions

API17F Offshore certified

SubCtech

SubCtech GmbH
www.subctech.com
info@subctech.com

SURPRISING SLIDE IN COMMODITY PRICES MAY NOT REFLECT THE FUTURE



By G. Allen Brooks
*Expert Offshore Energy Analyst
 & ON&T Contributor*

CRUDE OIL:

In the accompanying chart, WTI and Brent oil prices are seen sliding almost steadily since peaking in early June of last year as the market's hysteria over Russia's invasion of Ukraine and its meaning for oil supplies eased. The rapid climb in oil prices during the first half of 2022 was driven by traders who normally bid up the prices of crucial economic resources when uncertainty about their supply increases.

Our other chart shows the track of daily crude oil prices for January and the early days of February. The track has been a roller coaster, marked by waves of optimism and pessimism about the future course of the economy and oil demand. The sudden reversal of China's COVID-shutdown policy spurred optimism that a chunk of missing global oil demand would return and global supplies would be tested. This development came after the market realized that Russia and its customers had successfully navigated the introduction of western sanctions against purchasing Russian oil output keeping global supplies high. We are about to see whether the same success can be achieved as sanctions against purchasing Russian refined oil products, especially diesel, go into effect in early February.

The sharp drop in oil prices during the first three days of February would suggest that oil traders are betting there will be little supply impact from these new sanctions. Additionally, the surprisingly strong labor force data announced on February 3 signaled that the Federal Reserve will likely continue raising interest rates with the odds for a US recession growing with oil demand implications.

Oil market signals have been disrupted by two events—the large release of oil from the Strategic Petroleum Reserve and the unseasonably warm winter in Europe. While the oil release was politically motivated—to drive down gasoline pump prices prior to the November elections—it artificially expanded supplies. Attempts to purchase oil to replace the supply drawdown have proven unsuccessful because the market price remains above the government's price target.



» Oil prices continue on a downward trend but for how long?

The warm winter months in Europe and the US have reduced demand for all forms of energy putting further pressure on the seasonally weak oil demand period. Weather changes, but the true health of the global oil market will not be known until this spring when seasonal economic activity increases and China's reopening is further along. Saudi Arabian oil officials continue to warn of their limited capacity additions should demand rise suddenly.

The global economic uncertainty for the balance of 2023 dominates commodity market thinking currently, but those concerns could evaporate with a geopolitical event. Furthermore, we have yet to see what if any impact the new Russian sanctions going into effect will have on refined product markets and consumer prices. Buckle up for a bumpy ride in the early months of 2023, but keep your eyes focused on the long term for seriously challenged global oil markets.

NATURAL GAS:

Last fall, the growth in domestic natural gas production arrived as the Freeport LNG terminal was out of commission following a fire. The terminal was programmed to be back in operation during

September/October but the need for regulatory approval and testing of the plant's equipment has delayed its return to service until early this year. The result is that less feed gas has been needed by LNG export facilities, leaving more supply to boost domestic storage.

Even the bitterly cold weather at Christmastime has not derailed the rapid recovery of gas storage. As of the end of January, gas storage volumes are matching the 5-year average, which is good news for future supply challenges. Not surprisingly, a more adequate supply has eroded natural gas prices, as shown in our accompanying chart.

After nearly touching \$10 per thousand cubic feet last August, gas prices are now barely above \$3, a price level that has prevailed for the past seven years (orange line). The warm winter in Europe has reduced the demand for US LNG supplies, although there was truly little room for the industry to ship additional gas. Now, the lower global gas price has spurred a return of Asian buyers to the market.

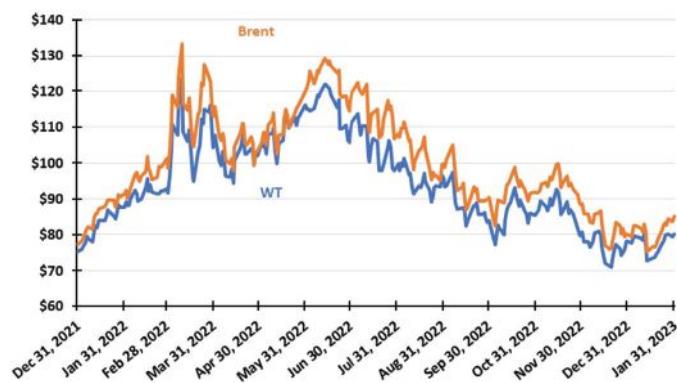
With the return to service of Freeport LNG, feed gas volumes for export will increase by 11 percent. That should help stem the slide in gas prices. Possibly we may see the early start-up of new LNG export capacity by the end of 2023. Projections show that when the three new terminals under construction reach full capacity in 2026, US gas export capacity will have grown by 40 percent, establishing the country as the world's largest exporter.

Having seen what happens to gas markets when demand soars, as happened when Europe rushed to replace Russian pipeline gas supplies last year, prices are now reflecting underlying US supply/demand fundamentals. Government and climate activists' attacks on natural gas continue with policies eroding potential demand growth (banning gas hookups in new buildings, mandating heat pumps, and banning gas stoves). However, natural gas is the preferred backup fuel for intermittent renewable energy, which continues to grow. The blackouts this winter have highlighted how people now value energy security over clean energy. That is good news for natural gas—the go-to-fuel for winter storms.

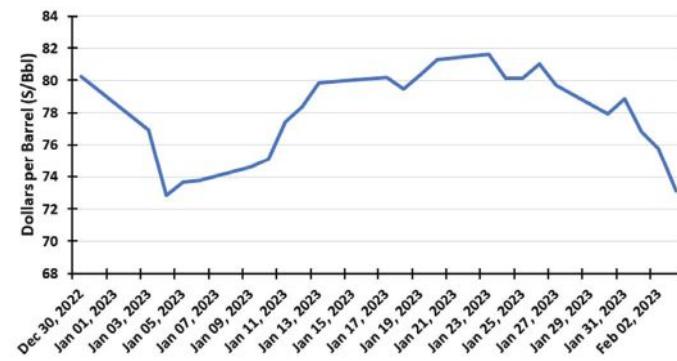


» In the current global context, people place increased value on energy security over clean energy.

2022-23 WTI and Brent Spot Oil Prices

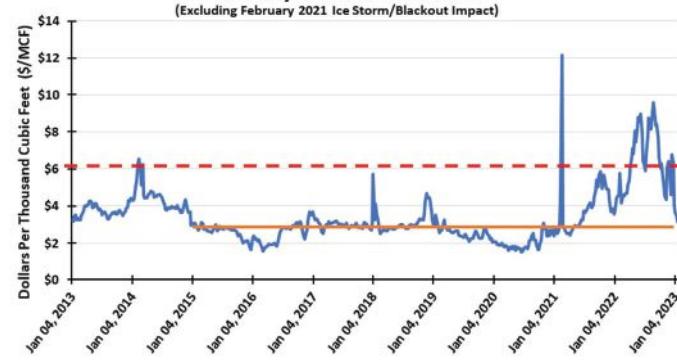


The 2023 Oil Price Roller Coaster

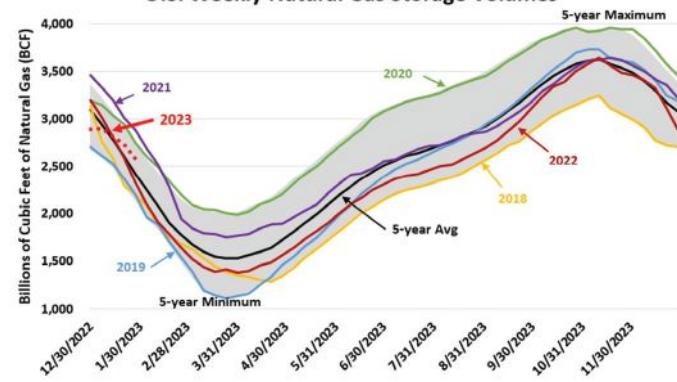


Weekly Natural Gas Prices

(Excluding February 2021 Ice Storm/Blackout Impact)



U.S. Weekly Natural Gas Storage Volumes



BUREAU VERITAS DELIVERS AIP TO OCEAN OF ENERGY FOR HIGH WAVE OFFSHORE SOLAR SYSTEM

Bureau Veritas, a world leader in testing, inspection and certification, has delivered an Approval in Principle to Oceans of Energy, a market leader in offshore solar farms, for their system design of a high wave offshore solar farm system.

The Oceans of Energy's offshore solar farm system is the world's first offshore solar farm proven in high waves, operating in the North Sea since 2019. This system is modular and scalable to any size.

The farm currently installed has a size of 0.5 MW. It has a unique design: rather than heavy structures above sea, which are normally used for offshore technology, the offshore solar farm system is lightweight. It uses the sea surface directly as support, like a waterlily resting on the water surface. In order to withstand high waves and rough seas, it uses an innovative system combining rigid and flexible structures that allows it to ride on waves.

Such a novel system had not been used before in offshore high wave application, nevertheless, the system has recently entered its 4th year of successful operation in high waves. Since its deployment, the system has withstood many heavy storms, with waves up to 9.9 meters high. The system was successfully basin-tested with 13-meter-high waves. Over the last couple of years, Oceans of Energy has worked closely with Bureau Veritas on the

Approval in Principle of their offshore solar farm system.

The Approval in Principle includes all aspects and products needed for the production of an Offshore Solar Farm system. This includes Oceans of Energy's design base, the designed floaters, the mounting of the solar panels, scale model testing reports and mooring system design. The rough North Sea conditions were used in the reviewed tests on the system and load cases determined all the structural calculations that had to be fulfilled.

"Oceans of Energy is very proud to receive this Approval in Principle as we realize

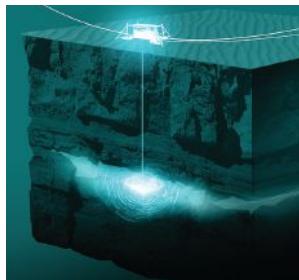
it is a testimony of sound engineering, a feasible and sound concept choice and a recognition as a leading technology with a promising future," said Allard van Hoeken, founder and CEO of Oceans of Energy. "It is of great reassurance to our stakeholders that the design of the floating farm and mooring system have been reviewed and approved by Bureau Veritas."

Laurent Leblanc, Senior Vice President Technical & Operations at Bureau Veritas Marine & Offshore, added: "We have extensive experience in the marine and offshore market that helps us to provide relevant and efficient support to pioneers such as Oceans of Energy. Our mission of "shaping a better maritime world" is all about enabling these innovative solutions that support society's new demands and aspirations. We would like to congratulate Oceans of Energy for this AiP and we look forward to collaborating on the next steps of their venture."



» The high wave offshore solar farm system is proven to operate successfully in high seas. (Photo credit: Oceans of Energy)

SIX COMPANIES APPLY FOR CO2 STORAGE ACREAGE ON THE NORWEGIAN CONTINENTAL SHELF



The Norwegian Ministry of Petroleum and Energy (MPE) has received applications from six companies in connection with the announcement of an area in the North Sea for potential storage of CO2 on the Norwegian shelf.

According to the plan, acreage will be awarded before summer this year.

The MPE has been contacted by commercial players who are interested in securing the award of specific acreage for CO2 storage, located in the North Sea. As of the

application deadline on January 3, applications were received from the following companies: Aker BP ASA; Altera Infrastructure Group; Horisont Energi AS; Neptune Energy Norge AS; OMV (Norge) AS; Wintershall Dea Norway ASA.

AKER SOLUTIONS TO UPGRADE FPSO FOR EQUINOR'S ROSEBANK FIELD

Aker Solutions has been awarded a substantial contract from Altera Infrastructure for the complete upgrade of the Petrojarl Knarr floating production storage and offloading vessel (FPSO) to be redeployed at Equinor's Rosebank field development, offshore UK. The selected development concept for the Rosebank field includes redeployment and reuse of the existing Petrojarl Knarr FPSO owned by Altera.

The work will be performed in a joint venture (JV) with Drydocks World-Dubai, and the upgrade

will take place at the company's yard in Dubai, UAE. The Engineering, Procurement and Construction (EPC) contract is a combination of work with new build, demolition, and life extension (hull, marine systems and topsides) required for the FPSO to be kept on the field for 25 years without drydocking. The detail design will be done in Norway by Aker Solutions in collaboration with Citec Norway AS, ABB Norway AS, OneSubsea Processing AS.

The EPC work is planned to start up during the first half of 2023 and is scheduled to



» Petrojarl Knarr FPSO. (Photo credit: Aker Solutions)

be completed at end-2025. The Petrojarl Knarr FPSO was transported to Aker Solutions yard at Stord in August 2022 and will be stored there until the planned tow to Dubai during the second half of 2023.

Aker Solutions expects to book an order intake of around NOK 2.5 billion related to this contract in the first quarter of 2023 in the Renewables and

Field Development segment, pending final investment decision and regulatory approvals. This order intake would reflect Aker Solutions part of the JV's scope.

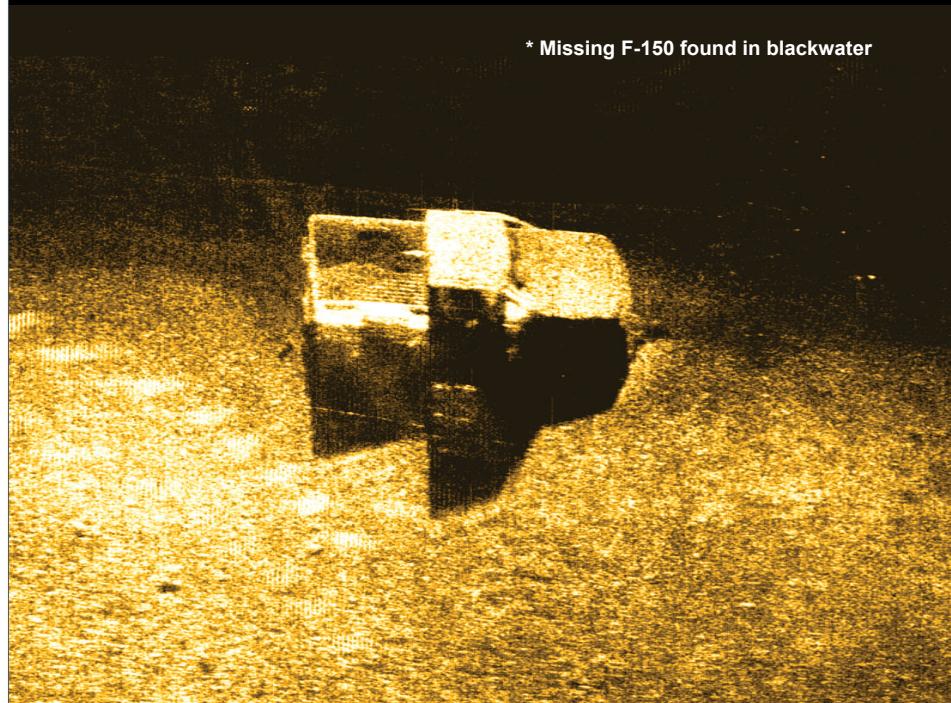


Remove the water

with the help of a JW Fishers Side Scan Sonar



- Simple to operate
- Intuitive software
- Up to 2,000' range on each side
- Displays images on laptop or tablet
- Single or dual frequency fish
- 500' depth capability
- Commercial construction
- Starting at \$20,999



* Missing F-150 found in blackwater



JW Fishers Mfg., Inc

(800)822-4744

(508)822-7330

Email: info@jwfishers.com

www.jwfishers.com





OCEANNEWS.COM 33

DNV COMPLETES VERIFICATION FOR BALTIC PIPELINE

Energinet, the Danish national transmission system operator for electricity and natural gas has received Certificates of Conformity (CoC) from DNV, the independent energy expert and assurance provider, for its section of the major offshore Baltic Pipe project. The CoCs were handed over at a ceremony in Energinet's office in Ballerup, Denmark in December 2022. The £2 billion gas pipeline is a strategic infrastructure project with the goal of creating a new gas supply corridor for the European market.

With an annual capacity of 10 billion cubic meters, the Baltic Pipe Project will allow gas transport from Norway to Denmark and Poland. DNV was contracted early in the project to deliver technical assurance services, and ultimately support the Authority with the permitting needed to take the new infrastructure into use. The contract scope included independent verification, complex independent modelling and submarine pipeline certification to the DNV certification regime DNV-SE-0475. Acceptance criteria comprised of the Danish Continental Shelf Law, the world recognized standard DNV-ST-F101, and the suite of underlying DNV standards and recommended practices. Work took place during the engineering, procurement, construction, installation, hook-up, and commissioning phases of the project.

The Baltic Pipe achieved final investment decision in 2018 and was partly funded by the EU. By providing Poland with a new energy supply, enabling the country to move away from coal fired powerplants and reduce its overall CO₂ emissions, the project aligns with the objective of the subsequent REPowerEU plan.



» Baltic Pipe certificate transfer in Denmark. (Photo credit: DNV)

This scheme sets out a series of measures to fast forward the green transition while increasing the resilience of the EU-wide energy system, in order to accelerate the move away from Russian fossil fuels.

DNV's 2022 Energy Transition Outlook launched recently in Copenhagen forecasts that natural gas will peak in 2036, then slowly taper off to end some 10% below today's levels by 2050. Gas has staying power owing to its diversity of uses: half of the demand for gas is as final energy in manufacturing, transport and buildings, and the other half through transformation for other final uses such as electricity, petrochemicals and hydrogen production.

Mick Cramer Jakobsen, Project Director, Energy Systems at DNV, said: "The Baltic Pipe project is extremely complex with many stakeholders. DNV is proud to work on projects that support energy security, reduce CO₂ emissions, and align with EU's energy transition. We are pleased that Energinet selected DNV as an important partner in our role to provide assurance services to avoid risks for this capital infrastructure project."

Energinet's part of the large-scale project consists of 105 km pipeline in the North Sea, approximately 210 km pipeline underground across Denmark, an expansion of the receiving Nybro gas terminal, and a new compressor station at Everdrup in Southern Zealand. DNV also assisted with professional services to Energinet on the onshore pipelines, compressor station and gas terminal.

TOTALENERGIES TO LAUNCH THE LAPA SOUTH-WEST PROJECT OFFSHORE BRAZIL

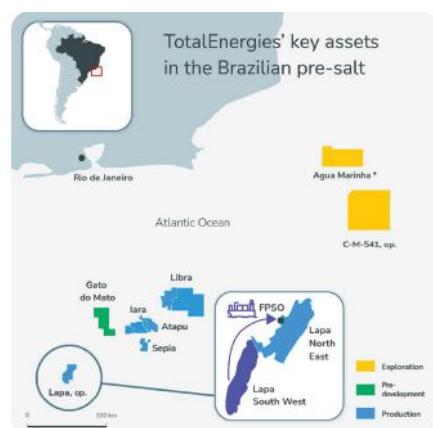
TotalEnergies has approved the final investment decision of the Lapa South-West oil development located in the Santos Basin, 300 km off the coast of Brazil.

TotalEnergies operates the project with a 45% interest, in partnership with Shell (30%) and Repsol Sinopec (25%). Lapa South-West will be developed through three wells, connected to the existing Lapa FPSO located 12 km away and currently producing the North-East part of Lapa field since 2016.

At production start-up, expected in 2025, Lapa South-West will increase production from the Lapa field by 25,000 barrels of oil

per day, bringing the overall production to 60,000 barrels of oil per day.

This development represents an investment of approximately \$1 billion. "This latest development is an important milestone for TotalEnergies in Brazil that will increase its operated production in the pre-salt Santos Basin, a key growth area for the Company," stated David Mendelson, Senior Vice President, Americas at TotalEnergies Exploration & Production. "With its efficient engineering approach and synergies with existing facilities, this project illustrates TotalEnergies' strategy of focusing on low cost, low emissions assets."



*ANP 1st Cycle of the Permanent Production Sharing Auction, awarded on December 16, 2022. Contract yet to be signed.

TECHNIP ENERGIES AWARDED FEED CONTRACT FOR WORLD'S LARGEST LOW-CARBON HYDROGEN PROJECT

Technip Energies has been awarded a contract for the front-end engineering and design (FEED) of the world's largest low-carbon hydrogen project for ExxonMobil in Baytown, Texas, USA.

The integrated complex will produce approximately one billion cubic feet of low-carbon hydrogen per day and capture more than 98%, or around 7 million metric tons per year of the associated CO₂ emissions, making it the largest project of its kind in the world.

Technip Energies has strong experience in blue hydrogen projects which remove carbon and replace natural gas or other higher-carbon fuels with low-carbon hydrogen to support decarbonization. As a result, Scope 1 and 2 emissions from

Baytown complex can be reduced by up to 30%.

Loic Chapuis, SVP Gas and Low-Carbon Energies of Technip Energies, said: "We are very excited to be engaged with ExxonMobil Low Carbon Solutions to help design their low-carbon hydrogen production facility. We are committed to advancing the energy transition and this project will be a hallmark in contributing to the decarbonization of existing facilities and capturing significant volumes of carbon emissions."



» The Baytown complex will produce one billion cubic feet of low-carbon hydrogen per day. (Photo credit: ExxonMobil)



FIBER OPTICS

POWER

LOW-NOISE

ARMOR

DURABILITY

BUOYANCY

WEIGHT

What do you need in a cable?

Celebrating **65** Years in Business

(951) 659-2183
sales@southbaycable.com
southbaycable.com

U.S. Manufacturer Based in Idyllwild, Calif. | Est. 1957

ROV Tethers | Umbilical Cables
Towed Array Cables | Mux BOP Control Cables
Video Inspection | Faired Cables

**Highly Engineered,
Customer-Specific Cable Manufacturing**



BOSKALIS TO CONSTRUCT OFFSHORE WIND- FARM OFFSHORE US COASTLINE

Boskalis has acquired the contract to construct a large offshore windfarm off the US coastline. The Boskalis project scope includes the transportation and installation of the wind turbine foundations and power cables for which two crane vessels, several transport and cable-laying vessels will be deployed. The contract marks a special milestone for Boskalis as this is the 100th offshore windfarm project that Boskalis has worked on over the past decade.

The award of this project follows a busy year for Boskalis in the offshore wind market. The crane vessels Bokalift 1 and 2, as well as the fallpipe vessel Seahorse were active on various projects in Taiwan, and with the survey fleet site investigation campaigns were carried out for numerous offshore wind projects in the US and Europe, where Boskalis was also active with its cable-laying vessels.

Peter Berdowski, CEO Boskalis: "We are proud to have reached the milestone of our 100th offshore wind farm with the award of this wonderful project. It illustrates the leading role we have established in the offshore wind market over the past decade. In those ten years, we were involved in the realization of almost half of all offshore wind farms worldwide, excluding the Chinese market. With our combination of hydraulic engineering and offshore activities, we are making a unique contribution to the global energy transition."



» Bokalift 2 has been upgraded to support offshore wind build out. (Photo credit: Boskalis)



NEW RESEARCH COULD CUT THE COST OF OFFSHORE WIND FARM FABRICATION

New research, investigating single-sided welding for offshore wind foundations, could cut the cost of wind turbine fabrication.

If found to be successful, this new welding methodology could help ease bottlenecks as governments around the world seek to deliver on ambitious renewable energy targets, often stalled by construction times.

The Fatigue Assessment of Single-Sided Welds in Tubular Joints for Offshore Wind Foundations (ASSISI) project is led by the Belgian Research Centre for Application of Steel (OCAS) and delivered in collaboration with their research partner Iemants (Smulders) as part of the Carbon Trust's Offshore Wind Accelerator (OWA) program.

The research project will look at the viability of single-sided welds in tubular joints for offshore structures and run until 2025.

If the fabrication method is found to be effective for offshore wind structures, it could replace the preferred double-sided welding method used across the industry. It could also cut fabrication and manufacturing times for future windfarm sites.

Philippe Thibaux, Staff Manager Application and Solutions from OCAS said: "We are looking forward to determining the fatigue performance of single-sided welds in their full scale, whereby we aim to increase productivity and reduce cost of offshore wind foundations further, on both monopile attachments and jacket foundations."

It's hoped a successful outcome will instill confidence and see single-sided welding become industry standard, potentially speeding up and cutting the costs of fabrication for offshore wind foundations.

The three-year project will conduct 15 fatigue tests across different types of large-scale structures, in addition to a number of small-scale fatigue tests to determine detectable flaw size. This will include numerical simulations and physical testing to replicate the impact on the weld over a structure's 25-year lifespan.

US OFFSHORE WIND SEES STRONG FOURTH QUARTER AHEAD OF CHALLENGES IN 2023

The American offshore wind industry closed 2022 strong despite impending challenges and economic uncertainty, according to the U.S. Offshore Wind Quarterly Market Report released by the Business Network for Offshore Wind, the leading non-profit working to accelerate offshore wind development and build a dedicated manufacturing supply chain in the United States.

The last three months of 2022 are notable for the first-ever federal offshore wind auction along the US west coast and key port investments, yet the combination of supply chain bottlenecks and rising commodity prices could hamper progress in 2023.

Below are four key takeaways from this quarter's report on US offshore wind activity:

- The California lease auction marked the US' entry in the floating offshore wind market and an important opportunity to pioneer cutting-edge technology here at home;
- Domestic supply chain development was buttressed by key growth in the offshore wind steel sector and major investments at US ports in four key states—California, Connecticut, Massachusetts and New York;
- The same inflationary conditions disrupting the European

offshore wind industry finally reached US shores, resulting in project delays; and

- With a capable workforce, critical infrastructure components, and the potential to generate nearly 9 GW of offshore wind that could power nearly 3 million homes, the Gulf region is primed for an offshore wind boom.

"The US offshore wind industry remains on solid footing, even with the speed bumps and setbacks we saw emerging at the end of 2022," said Liz Burdock, President and CEO of the Business Network for Offshore Wind. "We cannot rest on the long-term promise of this industry, however, and we must work to overcome our known challenges—from port infrastructure to transmission and supply chain shortages—that rising global inflation and surging demand have only been amplified."



Ocean Data-as-a-Service

LONG ENDURANCE AUV

- Hybrid-electric recharge
- Multi-vehicle autonomy
- Long duration

AGILE DATA COLLECTION

- Low-logistics operations
- High-resolution data
- Nimble and agile

OPERATIONAL EFFICIENCY

- Near real-time delivery
- Reduce time and cost
- Low carbon

ABSOLUTE OCEAN



DATA MANAGEMENT

- Visualize and analyze data
- Share and collaborate
- Compare changes over time



TERRADEPTH

EXPLORE END-TO-END SOLUTIONS AT TERRADEPTH.COM
OR EMAIL CONTACT@TERRADEPTH.COM • 844.982.3282

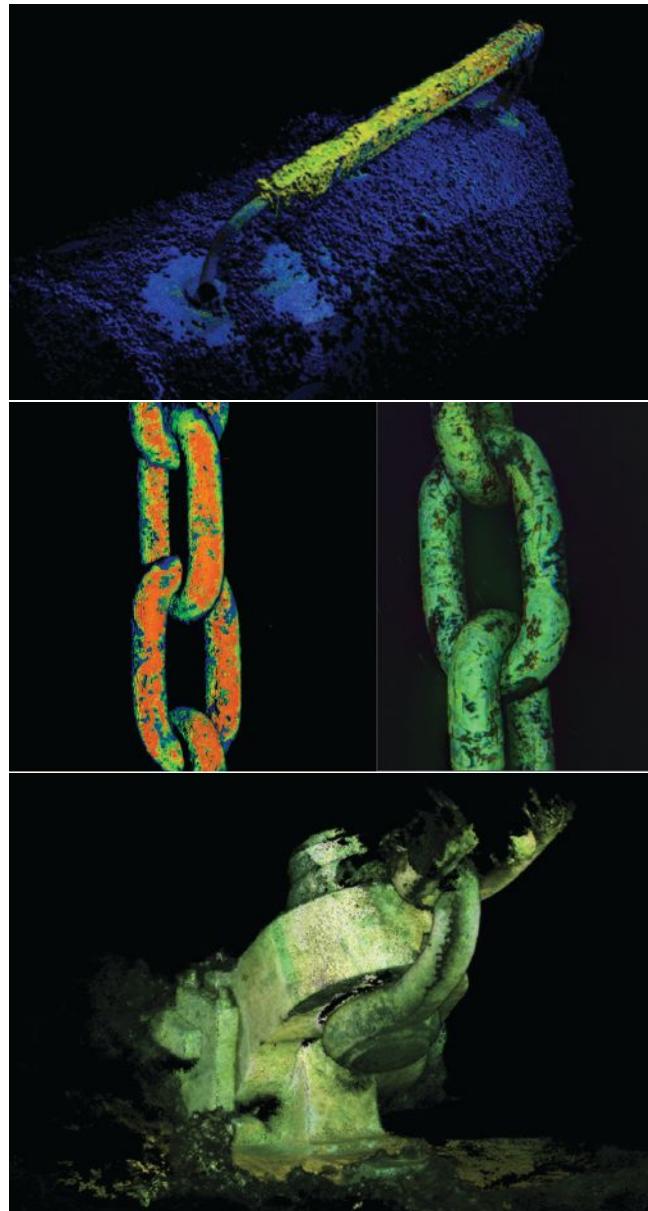
KRAKEN PROVIDES UPDATE ON SUBSEA LASER SCANNER SERVICE ACTIVITIES

Kraken Robotics recently provided an update on its SeaVision® 3D underwater laser scanning technology and related service activities. Kraken's SeaVision inspection technology is primarily used in assisting the offshore energy sector to acquire higher quality subsea asset integrity information, more quickly at a lower cost than competing solutions. This enables offshore energy operators to make timely, informed decisions regarding asset integrity.

Specific examples include providing critical measurements to help clients avoid unscheduled interruption of production and enabling reverse engineering of damaged subsea equipment to enable repairs in-place. During several recent offshore deployments, Kraken's SeaVision technology has shown clients that as-built 3D dimensions of installed subsea structures differ from their existing documentation, especially when servicing aging assets.

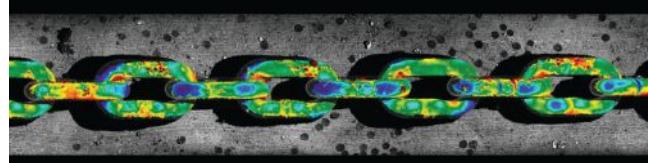
Kraken's SeaVision business unit continues to make progress across a variety of fronts including:

- 1) In 2022, Kraken acquired over 10 terabytes of subsea data for offshore oil and gas and renewable energy customers across several countries including Brazil, Canada, Denmark, Estonia, Germany, Nigeria, Norway, and Poland. Applications included anode volumetric measurements for offshore wind farms, mooring chain inspection for offshore oil and gas infrastructure, and subsea metrology services. In 2022, SeaVision services have delivered over one hundred (>100) 3D models and metrology for offshore wind and oil & gas clients. Kraken's SeaVision technology is expected to become part of several clients' yearly asset integrity campaign.
- 2) Kraken is continuing the commercialization of a unique, non-contact SeaVision® Mooring Chain Inspection Tool (MCIT). This tool can be used to support existing offshore oil and gas inspection requirements, as well as upcoming offshore wind inspection requirements by providing millimetric accuracy 3D digital twins of critical subsea infrastructure. The SeaVision MCIT will also significantly reduce the cost of mooring chain inspections, as Kraken has also developed extensive data analytics capabilities to process mooring chain data efficiently into corrosion and dimensional measurements requirements for mooring integrity analysis.
- 3) In 2023, Kraken's SeaVision technology will be certified for DNV class inspections as well as accreditation of performance as per ISO standards. Delivering an accredited measurement according to international standards is important to clients that rely on SeaVision measurements to make critical decisions regarding asset integrity, life extension, and repairs.
- 4) In 2022, Kraken developed automated calibration, measurement and report generation tools as well as a real-time workflow based on deep learning which enables automatic structural tracking and measurement of mooring chains. These tools have reduced the turn-around of models and measurements by a factor of ten times.



» SeaVision offers higher quality subsea asset integrity information to offshore energy operators. (Image credits: Kraken)

SeaVision®
3D Underwater Laser Scanning



Underwater. Understood.™



GRANDEUR SUBSERV LTD ACQUIRES EXAIL GAPS M5 USBL SYSTEM FOR SHALLOW WATER OPERATIONS

Grandeur Subserv Ltd, a company specializing in underwater and environmental engineering services, recently acquired Exail Gaps M5 USBL system for shallow water geophysical surveys on the Nigerian coast. Looking for an agnostic acoustic positioning system compatible with third-party transponders and capable of accurately tracking any asset in very shallow water, the Gaps M5 USBL system was particularly recommended.

"As part of a survey to determine the location of pipelines or hazards that could impede drilling on the Escravos field, we have to track sensors in water depths ranging from 8 to 100 m, which is a real challenge, especially since our client expects centimeter accuracy in positioning these sensors. We recently discovered and acquired the USBL Gaps M5 system for this purpose and we are fully satisfied! With exceptional horizontal tracking capabilities, the Gaps M5 has met and exceeded our customers' expectations by accurately tracking sensors

to a layback of 100 m in water depths of 40 m with centimeter accuracy," said Oge Dangogo, Project Coordinator at Grandeur Subserv Ltd.

Embedding a motion sensor based on Exail FOG technology for stable heading roll and pitch compensation and a true north reference, Exail's Gaps M5 offers a positioning accuracy of 0.2% up to 995 m operating range. It achieves maximum reception and transmission power levels, as well as interference cancellation capabilities to ensure optimal positioning data even in demanding underwater environments. Especially suited for subsea positioning needs of 1,000 m or less, it is extremely efficient in shallow water and horizontal conditions and is suitable for any tracking operations, from diver to multiple subsea assets or inspection ROV tracking. Pre-calibrated, compact, and lightweight, it is easy to integrate and operate from any small vessel with reduced crew onboard or even deployed on instrumented buoys. This



» The Gaps M5 USBL system offers a positioning accuracy of 0.2% up to 995 m operating range. (Image credit: Exail)

makes it ideal for nearshore oil and gas applications.

"Since its launch in 2020, Gaps M5 has been met with great success worldwide and has proven its capabilities for shallow water operations. It is increasingly requested by our customers for nearshore and offshore applications in West Africa, who particularly value

its outstanding positioning performance in very shallow waters, but also its ease of deployment, handling, and maintenance in the field. On top of that, Gaps M5 is export free, so units can be delivered worldwide within a few days to meet urgent needs," said Rahim Kadir, Business Development Manager at Exail.

Saab Seaeye

EMPOWERING

World leading electric underwater robotics
saabseaeye.com



SAAB

CGG AND TGS ANNOUNCE FOZ DO AMAZONAS PHASE II 3D SURVEY OFFSHORE BRAZIL

CGG, a global technology and HPC leader, and TGS, a global provider of energy data and intelligence, has announced the second phase of the Foz do Amazonas 3D multi-client survey, located in the offshore Brazil Equatorial Margin. This survey, covering 11,425 sq km, will broaden the region's 3D coverage and deliver additional high-quality data essential for the exploration efforts in the basin.

Existing 2D data and adjacent 3D data indicate the presence of reservoir depositional fairways in this location which overlies a source interval contemporaneous with the Guyana Basin petroleum system. Basin model studies predict a mature Early Cretaceous petroleum system with extensive regional reservoir distribution. The nearby Zaedyus discovery in French Guiana and the Narina and Venus wildcat discoveries on the conjugate margins of Liberia and Sierra Leone support resource potential in the Foz do Amazonas Basin.

Sophie Zurquiyah, CGG CEO, said: "With our established leadership in geoscience solutions and unmatched experience in the Equatorial Margin, spanning Guyana, Suriname and Brazil, our geoscientists will apply their deep regional insight and cutting-edge imaging technologies such as time-lag FWI and least-squares migration to provide the high-resolution, high-fidelity data and images necessary to better understand this frontier basin."

Kristian Johansen, CEO at TGS, commented: "We're pleased to announce the Foz do Amazonas 3D Phase II project with our partner CGG. For TGS, this project further strengthens our data library position in the Equatorial Margin and will be instrumental in enabling exploration companies to have a robust subsurface understanding in advance of future Permanent Offer rounds."

Early-out PSDM products will be available in Q4 2023, with final products available from Q3 2024.



» The EMA 5 is a five-function electric manipulator module.
(Photo credit: TMI-Orion)

OCEANTOOLS TO PROVIDE MANIPULA- TOR ARM TO TMI-ORION DYNAMICS

OceanTools has signed a collaboration agreement with TMI-Orion Dynamics for Ocean Tools to sell their EMA-5 Electric Manipulator Arm. OceanTools will assist with the manufacture of the arm in their state-of-the-art CNC machine shop and electronics workshops.

The EMA 5 is a high-performance, rugged, compact, and reliable multi-function electric manipulator arm designed for underwater operation on observation class ROVs. The EMA 5 electric manipulator arm, developed by TMI Orion Dynamics is a five-function manipulator module offering slew, elevation, elbow bend, jaw rotation, and jaw open/close.

The compact design has an embedded electronic controller, with no additional pod required. Monitoring software is available for remote operation, or a TMI Orion Surface Control Unit can be ordered separately. The EMA 5 can be controlled with a gamepad. Cartesian mode is available, with set positions. Applications include underwater precision manipulation, scientific and environmental sample collection and subaqueous tooling and grabbing.

Jean-Marie Vachette, Subsea Robotics Sales Manager for TMI-Orion Dynamics said: "We are pleased with this collaboration with OceanTools, a company known for its expertise in the world of offshore and underwater robotics, but also to have found a very professional partner with whom to collaborate on topics such as manufacturing, assembly and testing."

Kevin Parker, Managing Director of OceanTools added: "We are absolutely thrilled and delighted to be working with TMI-Orion Dynamics. The EMA-5 is a well-proven rugged and dependable manipulator for which we see tremendous potential. We're very well positioned to not just sell the arms but also to machine much of the arm as well as offering a great service and support facility. We will also be adding EMA-5 arms to our equipment rental pool."

The EMA5 Electric Manipulator, which will be marketed as the EM5 to fit in with OceanTools product naming protocol, is the latest addition to OceanTools' extensive range of pioneering underwater technology, including tools and market-leading subsea cameras, lighting, and dye detection systems.

FET DELIVERS TRIO OF ROVS TO OCEANPACT IN BRAZIL

Forum Energy Technologies (FET) has delivered three of its 200HP Perry XLX-C work class Remotely Operated Vehicles (ROVs) to Brazil-based OceanPact.

The systems, which were manufactured at FET's UK facility at Kirkbymoorside, North Yorkshire, will be deployed across two of OceanPact's vessels to support inspection, repair and maintenance services for the state-owned oil company's oilfields (Petrobras).

The 3,000 m depth rated compact 200HP XLX-C delivers the high performance of a work class vehicle in a smaller form. The vehicles benefit from an impressive high flow auxiliary hydraulic circuit combined with a high payload capacity to carry additional tools and sensors.

Each XLX-C was supplied with an underslung tooling skid for additional tooling and options fitment, complementing

the vehicles high performance. A comprehensive supplementary tooling package including torque tools, verification units and fluid injection systems was also provided.

The ROVs were supplied with active heave compensated Dynacon Launch & Recovery Systems (LARS), as well as associated surface power and control installations.

As part of the scope, FET has also supplied a VMAX ROV Simulator configured with a complete XLX-C Console. The simulator is provided with a host of training exercises, each designed to train and evaluate pilot competence in a variety of skills such as tether management, manipulator control and operation of tooling.

VMAX can also offer bespoke scenario builds for training and engineering analysis purposes. Using VMAX as a pre-operation or pre-fabrication tool has proven to be a



» The Perry XLX-C work class ROV is rated to 3,000 meters. (Photo credit: FET)

valuable way to verify equipment design, de-risk operations and ultimately save time and money.

Simone Pizzolato, FET's commercial manager, said: "We continue to see a high demand for our latest generation of XLX-C vehicles as our customers realize the benefits of its enhanced performance within a more compact form. The business has an unrivalled history of producing the most technologically advanced vehicles to the market and we're pleased to have been chosen by OceanPact to deliver their first work class ROV fleet at such a pivotal time as it expands its subsea operations."



HIGH-DURABILITY FLEXIBLES

- Liquid containment systems
- Berm liners
- Emergency water distribution systems
- Air cushion vehicle skirts
- Industrial diaphragms
- Deployable solids management

Contact:
Address: 113 Street A, Picayune, MS 39466 U.S.A.
Phone: (601) 889-9050 Email: sales@AEF-Performance.com

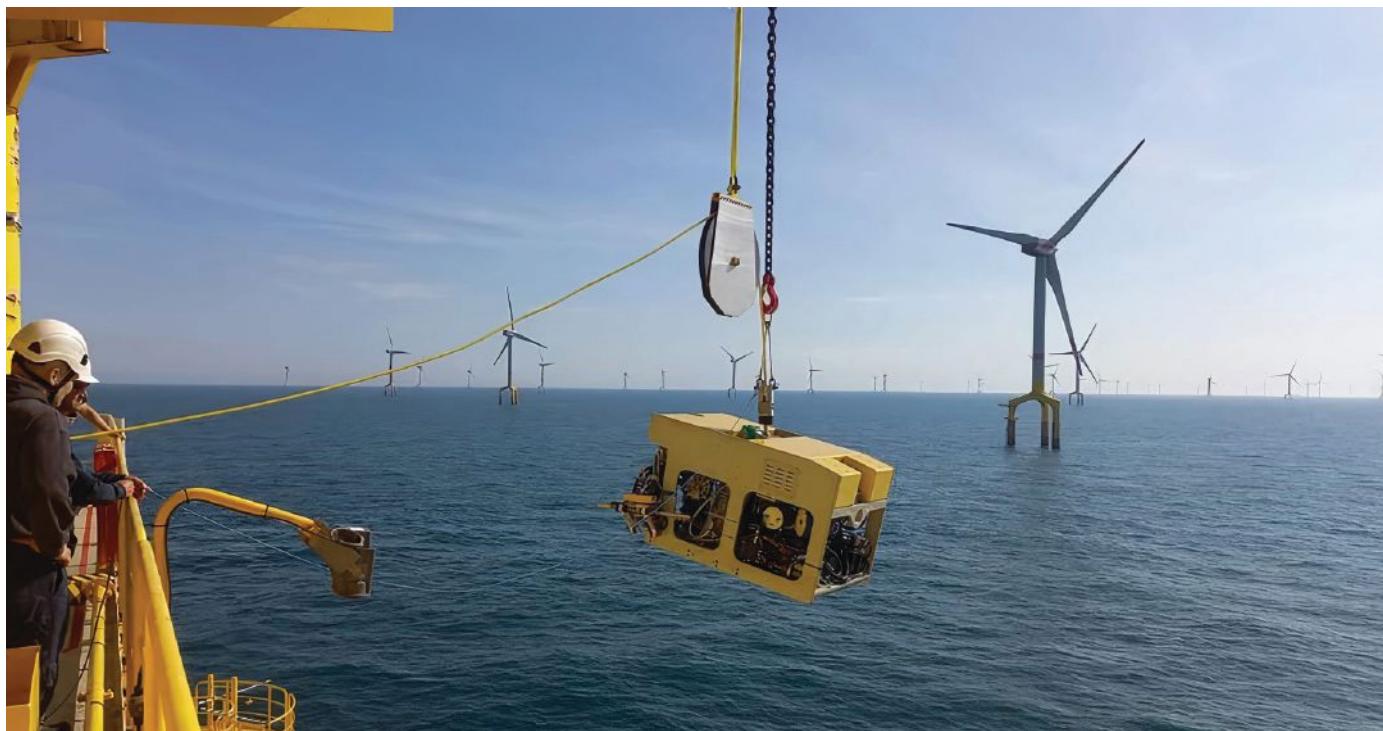


BUOYANCY INFLATABLES

- Underwater lifting bags
- Vehicle recovery systems
- Pipe pluggers
- Aircraft lifting bags
- Proof load testing products
- Ordnance disposal systems

Contact:
Address: P.O. Box 2030, North Kingstown, RI 02852 U.S.A.
Phone: (401) 884-8801 Email: sales@Subsalve.com





» Deployment of the ACFM NodeScanner at the BARD Offshore1 wind farm. (Photo credit: TSC Subsea)

TSC SUBSEA ANNOUNCES FURTHER GLOBAL AND SECTORAL EXPANSION

TSC Subsea, a global specialist in remotely deployed subsea NDT inspections for the energy industry, is entering 2023 in a strong position, with plans to target new markets in the Middle East, Africa and South East Asia.

The strategic growth plans follow on from one of the company's most successful years to date which saw it establish new bases in Brazil and Australia and grow its global headcount by more than 30% in response to increasing demand for its tools and services. The year also marked the company's entry into new sectors, including offshore wind and flow assurance.

The growth in personnel continued a trend set the previous year when TSC saw its headcount increase by more than 40% in 2021. The growth trajectory is expected to continue throughout the coming year as new regions come online and activity across all sectors continues to increase.

Last year also saw the development of several new innovative technologies which provided solutions across the subsea sector including the ART vPush, an industry first in

acoustic deepwater hydrate detection, and winner of the best subsea project award for 2022 from the Pipeline Industries Guild.

As the market continues to embrace advanced diverless inspection solutions, the company is seeing a fast uptake of the new solutions it develops, and many campaigns now encompass multiple TSC technologies.

Following the success of its first wind industry campaign on behalf of Ocean Breeze Energy GmbH (OBE) to carry out critical diverless weld inspection at the BARD Offshore1 wind farm using its ACFM® NodeScanner™, TSC Subsea is continuing to modify and develop solutions to support the offshore wind sector, demonstrating its ability to diversify beyond the oil and gas industry.

Growth across the second half of 2022 was led by a new leadership team with Stuart Kenny becoming its new president and Rhys Slattery joining the company as operations director.

"I am delighted to see the success that was created throughout 2022 and the

continuing impact it will have on supporting our ambitious growth plans for 2023," said Mr. Kenny.

"Having established ourselves as market leading for the subsea delivery of ACFM and Acoustic Resonance Technology (ART), we were proud to launch Advanced Ultrasonic and Pulsed Eddy Current capabilities in 2022. We strongly believe these additional NDT modalities will springboard TSC Subsea onto the next level of our growth strategy.

"With expert knowledge in all NDT methods and a team of expert mechanical design engineers, we are perfectly armed to provide solutions to the most challenging integrity concerns. The coming year will see us continue to focus strongly on growth across all our regions and through the ongoing development of our technologies. We currently have a number of solutions under development to address the many market challenges faced by the energy sector and we look forward to bringing these to market."

DEPOCEAN ACTIVATES BATTERY HYBRID OPTION FOR MPSV STRIL SERVER

Ocean services provider DeepOcean has activated an option to request the installation of a battery hybrid system on board the *Stril Server* multi-purpose support vessel (MPSV).

DeepOcean is chartering the *Stril Server* from Stavanger-based shipowner Simon Møkster Shipping, who will upgrade the vessel to include battery power notation in the first quarter of 2024.

The vessel is currently on a two-year time charter agreement with DeepOcean. She supports the company's offering within subsea inspection, maintenance, and repair (IMR), light construction and recycling services to operators in the offshore renewables and oil and gas industries.

"We have set a target to reduce our CO₂ emissions by 45 percent by 2030. Reducing fuel consumption and emissions from vessels that we charter is an important part of reaching this goal. It is also a deciding factor when choosing which shipowners we wish to hire vessels from. We are very pleased that Simon Møkster Shipping

has an equally ambitious strategy for reduction of carbon emissions," said Øyvind Mikaelsen, CEO of DeepOcean.

Simon Møkster Shipping will install a 620 kWh battery system from SEAM AS, which is a supplier of zero-emission solutions to the maritime industry. *Stril Server*'s control and DP systems will also be upgraded, and system for onshore charging will be installed. The upgrade will be conducted in the first quarter of 2024.

The *Stril Server* is equipped with 2 x Kystdesign ROVs together with DeepOcean's dedicated infrastructure, allowing for remote operations from the company's Remote Operations Centre in Haugesund, Norway.

DeepOcean is a world-leading ocean services provider, enabling energy transition and sustainable use of ocean resources. The company delivers subsea services within oil and gas, removal and recycling of subsea infrastructure, offshore renewables, mining of marine minerals, and to other ocean-based industries.

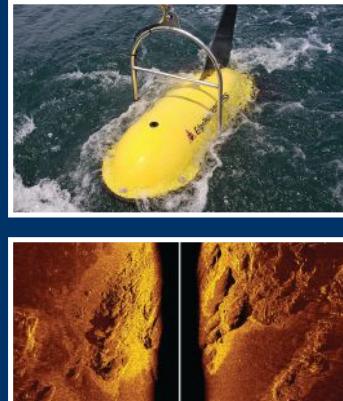


» MPSV *Stril Server*. (Photo credit: DeepOcean)



2050-DSS

COMBINED SIDE SCAN SONAR & SUB-BOTTOM PROFILER



- **Versatile:** Tri-Frequency Side Scan to cover a range of applications
- **Capable:** Towfish based CHIRP Sub-bottom profiler to deliver higher resolution data
- **Loaded:** Built-in pressure (depth), heave, pitch and roll sensors
- **Flexible:** Support for 3rd party sensors



EdgeTech.com

info@edgetech.com
USA 1.508.291.0057

FUGRO USV PROVIDES TAQA WITH SAFER AND MORE SUSTAINABLE OFFSHORE INSPECTIONS

Fugro has completed its first fully remote offshore survey inspection in the North Sea for energy company TAQA using one of its Blue Essence® USV with Blue Volta® eROV.

The complex project, in Europe's busiest part of the North Sea, involved the inspection of two platforms and over 40 kilometers of pipeline off the coast of the Netherlands.

The inspection investigated the mobility of the seabed, pipeline depth measurements, visual inspections and cathodic protection measurements within the 500-meter zone to ensure the integrity of TAQA's assets. During operations, both Blue Essence® USV and Blue Volta® eROV were remotely controlled via satellite link by operatives at Fugro's remote operations centers (ROC) in

the Netherlands and Aberdeen. The acquired Geo-data was accessed in near real time and used to inspect the offshore assets and surrounding seabed environment.

This project forms part of Fugro's wider strategy towards more uncrewed operations for greater agility, sustainability and safer offshore inspections. Remote operations enable employees to work onshore in ROCs rather than in high-risk offshore environments, the carbon footprint of the USV is up to 95% less than conventional support vessels and the client has access to near real-time data resulting in faster and more informed decision making.

TAQA's Netherlands Country Manager René Zwanepol said: "We are very pleased to

have been able to cooperate with Fugro on this innovative approach and gain experience with a new technology, and to unlock the potential it holds for us. This campaign has proven to bring many benefits, especially environmental, safety and cost savings. It is definitely the way forward for us for future campaigns."

Gordon Kennedy, Regional Director of Marine Asset Integrity at Fugro, added: "I'm so proud of the successful collaboration with TAQA and the Dutch authorities which made it possible to accomplish this survey. Fugro is committed to developing new remote and autonomous technologies that will accelerate the transition towards safer and cleaner inspections and more efficient Geo-data acquisition. In addition, USVs present an exciting solution for offshore wind farm monopile and cable inspections as well as quay walls and other underwater structures."



» Fugro's USVs are remotely controlled by operatives at remote operations centers (ROCs) in the Netherlands and Aberdeen. (Photo credit: Fugro)

ASHTEAD TECHNOLOGY SIGNS RENTAL AGREEMENT WITH MARITIME ROBOTICS

International subsea rental equipment and solutions specialist Ashtead Technology has signed a multi-year rental agreement with Maritime Robotics, a leading provider of unmanned technology solutions.

Under the terms of the agreement, Ashtead Technology will be a rental partner for Maritime Robot's Otter Unmanned Surface Vehicles (USVs) for high-quality maritime data acquisition.

The Otter is the smallest member of Maritime Robot's USV family with a footprint of only 200 x 108 x 81.5 cm and a weight of 55 kg. The Otter's robust catamaran design and the tightly integrated survey sensors makes this system a cost-effective, turnkey solution for bathymetric surveys in sheltered waters.

Phil Middleton, Ashtead Technology's Head of Survey & Robotics, said: "This investment marks our first step into the supply of autonomous technology solutions for unmanned offshore survey operations. Autonomy is a key enabler for risk reduction, cost efficiency and reduced environmental impact and at Ashtead Technology we endeavour to ensure that our portfolio of rental equipment continues to meet our customers' current and future operational requirements.

"We are excited about developing our partnership with Maritime Robotics and look forward to seeing these systems performing well in the field for our customers."

Kristoffer Fortun, Chief Sales Officer at Maritime Robotics, said: "This agreement

reinforces our commitment to growth and the continued development of our autonomous data acquisition solutions. Ashtead Technology is a progressive business with a first-class reputation, and we are delighted to be working together to continue building momentum for our equipment globally."



» Otter USV. (Photo credit: Maritime Robotics)



BiSN AWARDED KEY NORTH SEA CONTRACT

BiSN, a leading supplier of downhole sealing solutions and technology to the global oil and gas industry, has been awarded a key contract by a major oil and gas operator in the North Sea.

The contract requires BiSN to use its proprietary Wel-lok™ alloy barrier technology to safely and efficiently plug and abandon oil and gas wells in the North Sea.

BiSN signed a three-year contract, which features two one-year extensions, to provide this operator with Wel-lok™ alloy plugs for its ongoing offshore UK P&A campaign in the North Sea.

The technology is a cost-effective and environmentally-driven solution that provides a permanent well-barrier and gas-tight seal in single and multiple annuli.

The scope of work includes providing BiSN Wel-lok™ alloy plug barrier technology, which ensures a permanent plugging and abandonment of oil and gas wells so that they are securely and reliably sealed, vastly reducing corporate

liability and potential environmental impact.

BiSN's industry-leading alloy plugs are a superior solution compared with conventional technology that uses cement, elastomers, resin, or others as sealing elements that deteriorate over time, particularly in harsh environments.

"We are pleased and very excited that BiSN has been awarded this major contract. This is another step forward in the execution of our company mission to provide unique barrier solutions that protect the earth's natural resources," said Paul Carragher, Founder and CEO of BiSN. "Our strategic objectives, which include providing our novel technology and best-in-class services, focus on working collaboratively with our customers to support and exceed their well abandonment objectives."



SUBSEA 7 AWARDED CONTRACTS BY EQUINOR OFFSHORE NORWAY

Subsea7 has been awarded two contracts by Equinor for the Irpa and Verdande field developments, located in the Norwegian Sea. The two projects will be executed in a consortium between Subsea7 and DeepOcean.

The Irpa field development project, located in the Aasta Hansteen area at 1,350 meters water depth, involves a subsea tieback of approximately 80 kilometers to the Aasta Hansteen FPSO. The Verdande field development project, located in the Nordland Ridge area, involves a subsea tieback to the existing Skuld field and Norne FPSO facilities.

subsea 7

DIGITAL VIDEO RECORDING & INSPECTION SYSTEMS

SD HD 4K H.264 H.265

4U RACK MOUNTED

EDGE DVR IS MOBILE

The EdgeDVR Laptop - an Industry First

- Diving
- Workclass & Inspection ROV
- Platform & Pipeline Inspections
- Construction & Decommissioning

DIGITAL EDGE SUBSEA

digitaledgesubsea.com

DIGITAL HORIZON: UNMANNED VEHICLE EXERCISE IN BAHRAIN SHOWCASES CROSS-SECTOR COLLABORATION



By Capt. Edward Lundquist
US Navy (Ret.)



Utilizing surveillance data from dispersed and disparate sensors to know what's happening in the maritime domain is smart idea. The intelligent solution to deal with enormous amount of data is to leverage artificial intelligence. The US Navy's Task Force 59 has done exactly that during the recent Digital Horizon exercise.

Part of the US Fifth Fleet, based in Bahrain, Task Force 59 is the Navy's first task force dedicated to rapidly integrating and merging unmanned systems and artificial intelligence into maritime operations.

Digital Horizon was a military event that engaged a number of partners together, harnessing the capabilities of artificial intelligence, mesh communications networks and new technologies, to bring unmanned assets into the Fifth Fleet.

The 17 industry partners—who worked side-by-side with each other and the military personnel taking part in the exercise—brought their 15 advanced unmanned platforms, data integration and AI systems to Bahrain, 10 of which were introduced for the first time.

Vice Adm. Brad Cooper, commander of US Naval Forces Central Command, Fifth Fleet and Combined Maritime Forces, said Digital Horizon launched the US Navy on a journey of discovery and innovation to meet a critical need for maritime domain awareness: "The waters in the Middle East region are dynamic and fast. We're talking 5,000 miles of coastline from the Red Sea around the Arabian Peninsula into the Arabian Gulf—that's a huge area to cover—and perhaps too large an area to cover with manned vessels. But more important, these waters are vital to the global economy."

FORGING INNOVATION PARTNERSHIPS

According to Cooper, the new technology allows the operators to see further, faster, and more efficiently, so that manned ships can

be used more effectively. Cooper said that less than two years ago the concept was just a two-page white paper, and today TF 59 has reached full operational capability, and has established operating hubs in Bahrain and Aqaba, Jordan, and is teaming with many other nations. And while the number of USVs in use in CTF 59 today is relatively small, Cooper said the goal is to have US and partner nations operating 100 drones in the region by the end of next summer.

"In our exercise, we replicated activity that we would regularly see here in the region, and we pushed the systems to their limits through about 30 different tactical scenarios to observe their true capabilities. By getting our hands on new systems, we're able to



» USVs participating in Digital Horizon 2022, heading to sea from the Naval Support Activity in Bahrain on Dec. 1, 2022. (Photo credit: Edward Lundquist)

figure out what works and what doesn't. Our feedback helps move innovation process forward," said Capt. Michael Brasseur, the task force commander.

MANAGING MISSION DATA

A primary objective of the exercise was to transmit the data from the various platforms and their respective sensors to Task Force 59 Robotics Operations Center (ROC) on the Naval Support Activity in Bahrain, where it is being processed, analyzed, and displayed.



» The launch of Ocean Aero's Triton, which uses solar power and can transition from USV to UUV. (Photo credit: Edward Lundquist)

The AI and machine learning helps with sifting through the huge amount of data to understand "patterns of life," and helps determine what is and isn't normal activity so something out of the ordinary can be further investigated, ultimately helping operators make quicker and better decisions.

The result is the presentation of a common operating picture on a "single pane of glass," and allows for command and control of multiple unmanned systems on one screen, so that one operator can control multiple unmanned systems, as opposed to one system controlled by multiple operators.

Identifying potential threats faster allows for the US Navy to better position manned platforms to respond more rapidly. The vehicles taking part in Digital Horizon represented a wide range of capabilities from small to large, slow to fast, and short endurance to long-range."

The USVs that participated in the exercise were Elbit Systems' Seagull; Exail's DriX; L3Harris' Arabian Fox and MAST-13; Marine Advanced Robotics' WAM-V; MARTAC's MANTAS T-38 and Devil Ray T-12; Ocean Aero's TRITON; Open Ocean Robotics' Data Xplorer; Saildrone's Explorer; Seasats' X3; and SeaTrac's SP-48. UAVs also participated, including two vertical take-off and landing systems, Aerovel's Flexrotor and Shield AI's V-BAT, as well as Easy Aerial's tethered UAV, which is carried in a container on top of one of the USVs.

ACCELERATING COLLABORATION

The "mesh network" that linked everything together was provided by Silvus Technologies. Accenture Federal Services and Big Bear AI provided the data integration and artificial intelligence systems for the exercise. Although not present in Bahrain, an Ocius USV operating off Western Australia was linked into the network.

The AI operates on higher levels of sophistication, not only in the pattern of life but the command and control of the drones themselves, using both commercially available systems and government software. "We've done them separately in the past, and now we have them

integrated here in the ROC, using three specific applications—Computer Vision; AI-Enabled C2 and Anomalous Behavior Detection—all integrated on this single pane of glass," Brasseur said.

"One of the real advantages of Digital Horizon is to have the operator and our industry partners together in the operational environment working side by side. This enables a pace of innovation we just haven't seen before."



» Saildrone Explorer underway near the USCGC Emlen Tunnell (WPC 1145) in the Arabian Gulf. (Photo credit: Edward Lundquist)

THE FUTURE

Participants unanimously agreed that the events like Digital Horizon are the key to harnessing these new technologies to ultimately improve maritime threat detection and build an integrated unmanned and AI network with partners.

The vision of a "digital ocean" with a vast integrated network of sensors from seabed to surface to space, including unmanned systems, subsea sensors, ships, satellites, buoys, and other critical technologies, both from US and its international partners, isn't a far-fetched idea in a distant future. The technology exists and is being embraced today.



» *Topaz Tangaroa arrives in Merseyside UK. (Photo credit: Royal Navy)*

ROYAL NAVY'S TWO DEDICATED SUBSEA SURVEILLANCE SHIPS ARRIVE IN UK

The first of the UK's two new ships to protect key underwater infrastructure have arrived on Merseyside to begin preparing for front-line duties.

The distinctive blue-white *Topaz Tangaroa*, which has arrived at the Cammell Laird yard in Birkenhead, will become the UK's first ship dedicated to safeguarding vital seabed telecommunications cables and oil and gas pipelines, beginning operations in just six months' time.

Military equipment will be installed and the ship painted grey before the ship—the first of two planned Multi-Role Oceanographic Survey (MROS) vessels—begins training with the Royal Fleet Auxiliary ready for its first front-line operations this summer.

Announced by Defense Secretary Ben Wallace in November 2022, the accelerated acquisition of this MROS vessel will be vital to our national security.

"The first of two dedicated subsea surveillance ships will join the fleet this Summer, bolstering our capabilities and security against threats posed now and into the future," Wallace said.

The Royal Navy scoured the world for a vessel which would meet its requirements and selected the *Topaz Tangaroa*.

She was built in Norway four years ago to support a mix of underwater operations such as work on oil/gas rigs,

construction, maintenance and inspection work, as well as survey and remotely operated vehicle/autonomous submarine operations, making her ideal for underwater surveillance and seabed warfare.

The 6,000-tonne vessel, which is equipped with a helipad, crane, and expansive working deck—1,000 square meters, or the size of five tennis courts—has most recently been operating in the Pacific on underwater construction projects.

The ship also features a moon pool—a large access point in the bottom of the hull through which robot submersibles can be launched.

The vessel, whose new military name is still to be announced, will be crewed by around two dozen RFA sailors, plus up to 60 Royal Navy specialists will operate the undersea surveillance systems and other survey and warfare systems when embarked.

"This is an entirely new mission for the Royal Fleet Auxiliary—and one we relish," said Commodore David Eagles RFA, the head of the Royal Fleet Auxiliary.

"We have been entrusted with supporting a key operation to safeguard the UK's infrastructure, security and prosperity and that fills all of us in the RFA with pride. These are really exciting times."

BAE SYSTEMS TO DEVELOP ADVANCE SEEKER FOR MARITIME TARGETING

Under the terms of the contract, BAE Systems is leading the development, integration and testing of its multi-mode seeker for maritime strike applications.

BAE Systems has received a \$12 million Phase 2 contract from the Air Force Research Laboratory (AFRL) to further develop a low cost, all-weather, multi-mode (radar/infrared) open architecture seeker under the Maritime Weapon Innovation Program (MWIP) Joint Capability Technology Demonstration (also known as QUICKSINK).

QUICKSINK munition concept provides air-delivered maritime surface vessel defeat capability for the warfighter via a cost-effective precision-guided munition kit. The program aims to integrate the new seeker developed by BAE Systems' FAST Labs™ research and development organization.

The Weapon Open Systems Architecture (WOSA) compliant seeker is designed to be plug and play—providing semi-autonomous precision targeting of maritime surface vessels at low cost by retrofitting existing weapon systems to achieve torpedo-like seaworthy capabilities from the air.

"Our new multi-mode modular seeker enables precision identification and engagement of surface targets at great distances over a large area," said Chief Scientist at BAE Systems' FAST Labs Peter Dusaitis. "Our seeker technology will greatly increase the warfighter's capabilities, enabling combatant commanders with a new way to defend against maritime threats in a cost-effective manner."

Phase 2 focuses on integration and test maturation of a prototype multi-mode seeker system through free flight



capability demonstration against a maritime target.

BAE Systems' solution extends and uses its experience from Phase 1, its precision munitions portfolio, and sensor research area. Its previous open architecture seeker development work includes the Seeker Cost Transformation (SECTR) program and its Microwave Array Technology for Reconfigurable Integrated Circuit (MATRICs™) Transceiver—a field-reprogrammable array of radio frequency subsystems.

Intelligent Marine Robotics
Solutions that put you in control



Autonomous Surface Vehicles



ROVs for Hull & Tank Cleaning



Engineering & Design



Manufacturing & Fabrication

**SEA
ROBOTICS**
AN ADVANCED OCEAN SYSTEMS COMPANY

Visit SeaRobotics.com to learn more about our
Unmanned Marine Systems and Services

JFD WINS 3ISS NATO SUBMARINE RESCUE SYSTEM CONTRACT

JFD has won the prestigious 'Third In-Service Support' (3ISS) contract, worth £63 million, continuing seven years of safety critical operational assurance services to the NATO Submarine Rescue System (NSRS).

The 3ISS contract awarded to JFD by the NSRS Authority, on behalf of the Participant Nations, UK, France and Norway, demonstrates its confidence in JFD's ability to provide a full and complete in-service support solution. The NSRS is a premier fly-away global submarine rescue capability which exists to give submariners the best chance of survival should a submarine incident occur. The five-year 3ISS contract will start in summer 2023 and has the potential to be extended to a total of nine years.

Having managed the 'Second In-Service Support' (2ISS) contract since 2015, JFD has demonstrated its proven operational excellence through assured availability of the NSRS. JFD's 3ISS solution is rooted in intimate system knowledge and operational insight gained throughout the 2ISS contract.

JFD has unrivalled experience with real-life submarine rescue incidents, including locating and identifying the wreckage of *KRI Nanggala*, and deploying systems

in support of the submarine *Kursk* and *AS-28 Priz* incidents. JFD builds upon the expertise and lessons learned from these incidents to continue to raise the standards for safety in the submarine rescue domain.

Richard Dellar, JFD's Managing Director, said: "We are extremely proud to have been awarded the NSRS 3ISS contract. It is a true testament to the breadth and depth of our talented personnel's submarine rescue expertise and dedication. This decision firmly places JFD as the world leader in submarine rescue provision."

"Safeguarding the lives of submariners around the world is our number one priority. The all-too-long list of submarine incidents globally poses as a stark reminder of the critical nature of the services JFD provides. NSRS will continue to form a key part of JFD's global submarine rescue community along with Australia, Singapore, India and the other nations we support. We are committed to work alongside the NSRS Authority to ensure the highest levels of operational assurance are always achieved."

A world leader in the design, build and operation of submarine rescue systems, JFD has played an integral role in the UK's

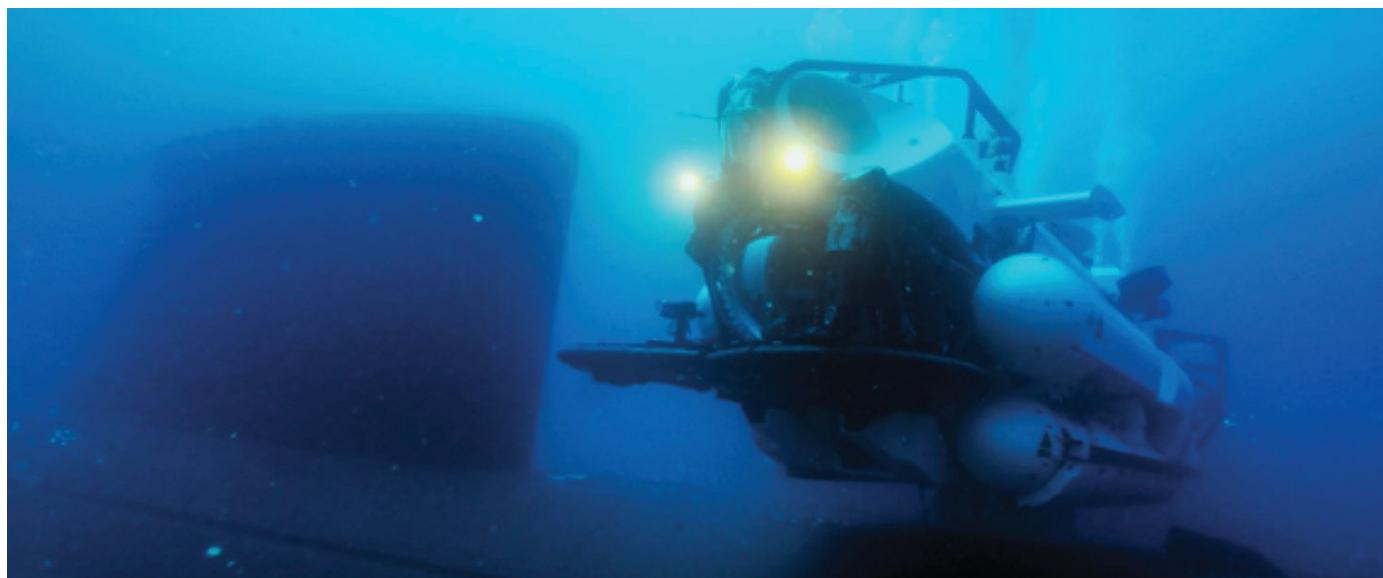
submarine rescue provision since 1983 and the NSRS since it came into service in 2008.

JFD also has a comprehensive global submarine rescue infrastructure, supporting submarine rescue contracts with multiple navies as well as in-service contracts for the Australian, Singaporean and Indian submarine rescue systems.

In the event of a distressed submarine (DISSUB), any delay to the rescue operation can have catastrophic results. To locate the DISSUB and rescue the lives on board as quickly as possible, the NSRS must be maintained at a high state of operational readiness and specialist personnel must be fully trained in all aspects of a safe rescue.

JFD's 3ISS solution builds upon the past seven years' performance and the team's extensive knowledge of global submarine rescue systems. Throughout the course of the 2ISS contract, JFD has undertaken 18 mobilization exercises and its proven team has an established track record for delivery in their field.

James Fisher and Sons plc
Marine Services Worldwide



» JFD is a world leader in the design, build and operation of submarine rescue systems. (Photo credit: JFD)



Integrated Solutions for Offshore Challenges

MARINE
OPERATIONS

PROJECT
MANAGEMENT

SUBSEA
NETWORKS

ENGINEERING
& PROTOTYPE

INSTALLATION &
COMMISSIONING

INSPECTION,
MAINTENANCE,
REPAIR

Ocean Specialists

oceanspecialists.com





AMERICAS

Subsea Tieback

Galveston, TX » Feb. 28 - Mar. 2
www.subseatiebackforum.com

US Hydro

Mobile, AL » March 12-16
www.thsoa.org/us-hydro

Canadian Underwater Conference & Exhibition (CUCE)

Halifax, Nova Scotia » March 26-28
www.underwaterconference.ca

Int'l Partnering Forum (IPF)

Baltimore, MD » March 28-30
www.offshorewindus.org/2023ipf

Sea-Air-Space

National Harbor, MD » April 3-5
[https://seaairspace.org](http://seaairspace.org)

Offshore Technology Conference (OTC)

Houston, TX » May 1-4
[https://2023.otcnet.org](http://2023.otcnet.org)

Global Energy Transition

New York, NY » June 7-8
<https://events.reutersevents.com/energy-transition/global-energy-transition-new-york>

H2O Conference

Halifax, Canada, MA » June 12-14
<https://www.h2oconference.ca/>

Suriname Energy, Oil, and Gas Summit

Paramaribo, Suriname » June 19-22
<https://suriname-energy.com/welcome>

US Offshore Wind

Boston, MA » July 11-12
<https://events.reutersevents.com/renewable-energy/offshore-wind-usa>

EUROPE

Reuters: Hydrogen Europe

Amsterdam, The Netherlands
» March 28-29
<https://events.reutersevents.com/renewable-energy/hydrogen-europe>

MCE Deepwater Development

London, UK » March 28-30
<https://mcedd.com>

Ocean Business

Southampton, UK » April 18-20
www.oceanbusiness.com

WindEurope

Copenhagen, Denmark » April 25-27
windeurope.org/annual2023

Deep Sea Mining Summit

London, UK » May 3-4
www.deepsea-mining-summit.com

Undersea Defence Technology (UDT)

Rostock, Germany » May 9-11
www.udt-global.com

All-Energy

Glasgow, UK » May 10-11
www.all-energy.co.uk

OCEANS Limerick

Limerick, Ireland » June 5-8
www.limerick23.oceansconference.org

Seanergy

Paris, France » June 20-21
www.seanergy-forum.com/en/seanergy2023

OTHER REGIONS

SubOptic

Bangkok, Thailand » March 13-16
www.terrapinn.com/exhibition/suboptic

DSEI Japan

Tokyo, Japan » March 15-17
www.dsei-japan.com/welcome

ICCOE

Shandong, China » April 14-16
www.iccoe.org

Gastech

Singapore » September 11-14
www.gastechevent.com

Mozambique Gas & Energy Summit

Maputo, Mozambique
» September 27-28
www.mozambiqueenergysummit.com

ADIPEC

Abu Dhabi, UAE » October 2-5
www.adippec.com

Eastern Mediterranean Conference

Cyprus » November 28-30
www.emc-cyprus.com

2023

MONTH & DEADLINES	EDITORIAL FOCUS & CONFERENCES	CONTENT
JAN/FEB Editorial: Jan. 20 Ad: Feb. 10	» OFFSHORE EXPLORATION US Hydro / March 12-16 CUCÉ / March 26-28 Int'l Partnering Forum / March 28-30	Editorial Topics: Offshore Infrastructure Development, Exploration of Deep-Sea Resources, ESG, Geotechnical Services Product Focus: Submersibles, AUVs, Lights, Cameras, Deck Handling Equipment, Research Vessels, Samplers
MARCH Editorial: Feb. 20 Ad: Mar. 10	» UNCREWED VEHICLES Ocean Business / April 18-20 OCEANS Limerick / June 6-8	Editorial Topics: Remote Marine Survey, Seafloor Mapping, Harbor Security, Long-Range Ocean Research, Coastal Monitoring Product Focus: USVs, AUVs, LARS, UAVs, Sonars, Propulsion and Positioning Systems
APRIL Editorial: Mar. 20 Ad: Apr. 7	» MARITIME DEFENSE & SECURITY UDT / May 9-11	Editorial Topics: Coastal Surveillance, Mine Countermeasures (MCM), Anti-Submarine Warfare (ASW), Search & Rescue, Submarine Cable Infrastructure & Protection Product Focus: USVs, XLUUVs, AUVs, ROVs, Amphibious Vehicles, MCM, ASW
MAY Editorial: Apr. 14 Ad: May 5	» GREEN ENERGY TRANSITION US Offshore Wind / July 11-12	Editorial Topics: Offshore Wind Infrastructure & Supply Chain, Subsea Batteries, Wave Energy Systems, At-Sea Automation, CCS Systems, Hydrogen Product Focus: Offshore Turbines, Supply Vessels, Underwater Batteries, Subsea Connectors, Submarine Cables, Renewable Energy Systems
JUNE Editorial: May 22 Ad: June 9	» UNDERWATER SENSOR TECHNOLOGY & IMAGING	Editorial Topics: Underwater Navigation, Marine Archaeology, Environmental Coastal Monitoring Product Focus: ROVs, Lights, Cameras, Manipulators, Towed Arrays
JULY Spotlights: June 27 Ad: July 7	» UNCREWED VEHICLES BUYERS' GUIDE □	Editorial Topics: Special Edition
AUGUST Editorial: July 24 Ad: Aug. 11	» OCEAN OBSERVATION, DATA, & COMMUNICATIONS	Editorial Topics: Oceanography, Meteorology, Remote Sensing, Telemetry, Data Processing, Seafloor Mapping, Cloud-Based Data Storage Product Focus: Marine Observation Systems, Buoys, Drifters, Marine Research Vessels, Subsea Nodes, CTD, Acoustics, Biosensors
SEPTEMBER Editorial: Aug. 21 Ad: Sept. 8	» REMOTE MARINE OPERATIONS	Editorial Topics: Subsea Inspection, Maintenance, Repair (IMR), Seabed Residency, Subsea Intervention, Oil Spill Response, Remote Operations Centers, Professional Development & Training Product Focus: Inspection AUVs, ROVs, USVs, Work-Class ROVs, Pipeline Pigs, Ultrasonic Imaging
OCT/NOV Editorial: Sept. 18 Ad: Oct. 6	» THE OFFSHORE DEVELOPER'S TOOLKIT	Editorial Topics: Offshore IoT, Asset Integrity Monitoring, Autonomous Control Systems, Digital Twin Technology, Decommissioning Services Product Focus: Predictive Maintenance Solutions, Electric Workboats, USVs, Untethered ROVs
DECEMBER Editorial: Oct. 30 Ad: Nov. 10	» THE FUTURE OF OCEAN TECHNOLOGY	Editorial Topics: Special Edition

□ Digital Issue

BAVISHI BEGINS AS DEPUTY NOAA ADMINISTRATOR

Jainey K. Bavishi, a distinguished expert in the field of climate adaptation and resilience, has started her role as the assistant secretary of commerce for oceans and atmosphere and deputy NOAA administrator.

In this role, Bavishi will be responsible for providing agency-wide direction with regard to climate resilience, fisheries, coastal and ocean programs, including efforts related to NOAA's implementation of the Bipartisan Infrastructure Law and Inflation Reduction Act.

"Jainey is the perfect person for NOAA and our nation at this critical moment," said Secretary of Commerce Gina Raimondo. "Her experience and leadership in developing multilayered and multidisciplinary solutions for community resilience are essential as we tackle the consequences of our changing climate."

Bavishi most recently served in the New York City Mayor's Office as director of the Office of Climate Resiliency where she oversaw the implementation of climate resilience strategies for the nation's largest city. Prior to that, she was the associate director for climate preparedness at the White House Council on Environmental



National Oceanic and Atmospheric Administration
U.S. Department of Commerce

» Jainey K. Bavishi, assistant secretary of commerce for oceans and atmosphere and deputy NOAA administrator.
(Photo credit: Michael Appleton)

Quality. She also held posts as the director of external affairs and senior policy advisor at NOAA from 2010 to 2013.

Bavishi also led a nonprofit initiative that built partnerships to scale innovative approaches to disaster risk reduction in the Asia Pacific region. Previous to that she was the head of a philanthropic initiative to build a coalition of community-based leaders focused on an equitable recovery from hurricanes Katrina, Rita, Gustav and Ike in the Gulf Coast region.

"Jainey's knowledge of NOAA, along with her skills and expertise, make her the right fit for this critical position at a time when climate and oceans are central to so many key policies and decisions," said NOAA Administrator Rick Spinrad, Ph.D. "I look forward to working with Jainey again and know she will be a champion of NOAA's science, service and stewardship mission—especially when it comes to connecting communities to the vast array of NOAA's actionable climate data and information."

"I am thrilled to be returning to NOAA to advance our efforts to prepare the nation for the impacts of climate change that we experience today and expect in the future," said Bavishi. "NOAA plays a critical role in supporting communities and businesses to adapt to a changing environment. I am excited to work with the extraordinary team of experts at NOAA, as well as our partners in the federal government and beyond, to deploy NOAA's science and services to support informed and equitable decision-making in the face of the climate crisis."

NOBLE JOINS BSEE AS RENEWABLE ENERGY PROGRAM DIRECTOR

The Bureau of Safety and Environmental Enforcement recently announced the appointment of Michaela Noble to the Bureau as the new Program Director for Renewable Energy and Regulatory Compliance. In this role, Noble will oversee and direct the national policy and research program for BSEE's Renewable Energy Program.

"BSEE's role in advancing offshore renewable energy is crucial to meeting the Biden-Harris Administration's goal of deploying 30 gigawatts by 2030," said BSEE Director Kevin Sligh. "Michaela's years

of experience in maritime law, offshore policy, and regulatory compliance make her the ideal addition to the BSEE leadership team as we build out our renewable energy program."

Cheri Hunter, the current Renewable Energy Coordinator, will oversee and direct renewable energy operations as the new BSEE Renewable Energy Operations lead.

"I'm excited about the opportunity to work with the fantastic team at BSEE as we undertake this new frontier of renewable energy development and regulatory oversight," said

Program Director Noble. "As a coalition builder, I look forward to bringing my many years of maritime law and policy development experience to expand BSEE's collaboration with federal and state partners, the renewable energy industry, Tribes, and other stakeholders to meet the challenge of developing a clean energy future."

Prior to BSEE, Noble served as the Senior Policy Advisor to the Assistant Secretary for Land and Minerals Management at the Department of the Interior. She also served as the Senior Counselor for Environmental

Policy at Interior, Director of the Office of Environmental Policy and Compliance within DOI, and as the Chief of the Environmental Law Division within the U.S. Coast Guard.



» Michaela Noble, BSEE's Director for Renewable Energy and Regulatory Compliance.

NAUTICUS ROBOTICS EXPAND OPERATING BASES TO NORWAY AND UNITED KINGDOM

Nauticus Robotics, Inc., a developer of ocean robots, autonomy software, and services to the marine industries, announces the initiation of its operations in Norway and the United Kingdom, beginning the company's international expansion strategy for 2023 and beyond.

The operating bases are strategically located in Stavanger, Norway and Aberdeen, Scotland to service the North Sea offshore market. Nauticus will deploy assets and collaborate with local partners to service the region's extensive offshore wind and oil and gas assets with its expanding Nauticus Fleet, a navy of surface and subsea robots. These regional bases will provide local subject matter expertise and logistics as the firm's international operations continue to grow. Eventually, Nauticus plans to open bases around the world, strategically located in targeted growth markets and equipped with local remote operation centers and service teams.

"The ocean touches nearly every aspect of our lives, yet paradoxically seems to receive less attention and innovation when



» Nauticus Fleet, a navy of surface and subsea robots.
(Image credit: Nauticus Robotics)

compared to other sectors," said Nicolaus Radford, founder and CEO of Nauticus. "As we expand our operations to these strategic locales and beyond, our core mission remains the same: to become the most impactful ocean robotics company and realize a future where autonomous robotic technologies are commonplace and enable the blue economy for the better. We are eager to ramp up activities in these international markets as our growing team contributes to our mission."

In April 2022, Nauticus commenced production of its Nauticus Fleet of Hydronaut and Aquanaut pairs. Initial delivery to its strategic international bases is anticipated to begin in Q2 2023. These tandem pairs will be deployed to multiple locations around the world to service offshore industries ranging from subsea maintenance and intervention to data collection activities.

ocean BUSINESS 23

Southampton UK • 18–20 April

THE HANDS-ON OCEAN TECHNOLOGY EXHIBITION AND TRAINING FORUM

- **Meet 360+ world leading** manufacturers and service providers
- **Discover the latest** marine autonomous systems, survey tools and biological and chemical sensors
- **See equipment live** with 180+ hours of free training & demonstrations
- **Navigate the year ahead** and have your questions answered at the free conference

3
DAYS

HUNDREDS
OF SOLUTIONS

TRANSFORM
YOUR BUSINESS



Be at the forefront
of ground-breaking
innovation

REGISTER
NOW FOR
FREE

oceanbusiness.com

Organized by
diversified
COMMUNICATIONS

In partnership with:
SMI
Safety Management International

Hosted by:
**National
Oceanography
Centre**

PGS ENTERS OFFSHORE WIND MARKET

PGS has been awarded its first ultra-high resolution windfarm site characterization project, sealing its entry into a strategically important new energy market.

PGS New Energy offers solutions to the ongoing energy transition by building on the subsurface and operational expertise of PGS' employees and operational assets. PGS aims to develop New Energy into a significant business unit and during 2022 the firm established a strong position in the carbon storage geoservices market.

Now PGS is taking the next step and enters the offshore wind site characterization market by being awarded the Company's first seismic acquisition contract in this domain.

The survey will cover two European windfarm sites, both of which are in a development phase. PGS will mobilize a 3D vessel for the project in early April 2023 and expects to complete acquisition towards the end of June.

The project will be acquired with the market-leading ultra-high-resolution 3D (UHR3D) P-Cable system. P-Cable provides



significantly more detailed subsurface data for shallower targets compared to traditional seismic acquisition systems.

"We are delighted with this contract award, which marks our entry into the offshore wind site characterization market. Our P-Cable system acquires ultra-high-resolution 3D shallow subsurface data significantly more efficiently than conventional solutions. We believe our geophysical approach to understand the shallow subsurface layers has a proven market fit and is ready to be scaled to increase our market share in the offshore wind segment. Carbon storage and offshore wind farms are important components of the transition to a sustainable energy mix," said Berit Osnes, Executive Vice President New Energy in PGS.

SEA-KIT EXPANDS R&D WITH NEW FACILITY

SEA-KIT International's brand-new production facility for its larger XL-Class Uncrewed Surface Vessel (USV) is now operational, with the first 18 m hull being fitted out ready for delivery this summer to world-leading geo-intelligence specialist, Fugro.

2022 was a busy year for the growing USV designer and builder. Having announced expansion plans in March, the company went on to successfully deliver two more of its proven 12 m X-Class vessels. Another two of these are currently in build in addition to the XL-Class, which has three times the payload capacity. SEA-KIT has recently been granted patents for its X and XL-Class designs.

Ben Simpson, SEA-KIT CEO said: "It is great to go into 2023 with the new facility up and running. With the addition of this building, we have tripled production capacity and expanded our R&D area. It gives us more, much-needed space for the ongoing development of launch and recovery systems for ROVs and AUVs, mast gondolas and sensor deployment systems, as well as enhancing manufacturing efficiencies for multiple USV builds."



» Ben Simpson, SEA-KIT CEO

AQUEOS CORPORATION MOVES INTO NEW FACILITY IN BROUSSARD, LA

Aqueos Corporation, a premier provider of subsea services to the Gulf of Mexico and Pacific Coast, has announced their move into a new permanent Broussard facility located at 1186 Petroleum Highway, Broussard, LA 70518.

"In light of the currently extremely challenging market conditions, maintaining close contact with our customers is more important than ever. This new facility will provide a comfortable environment for our Gulf of Mexico-based personnel with room for sustained growth and in close proximity to our customer base," said Ted Roche, Aqueos CEO.

Roche further commented, "Most importantly, we were able to negotiate extremely favorable lease terms with minimal impact to our overhead."



Eric Legende, President; Ted Roche, CEO; Brad Parro, CFO

Aqueos Corporation, with offices in Texas, Louisiana, and California, provides marine construction and specialty subsea services including a complete range of commercial diving, Remotely Operated Vehicles (ROVs) and vessel-related services to the offshore oil and gas, renewable and civil markets.

2023 INTERNATIONAL OFFSHORE WIND PARTNERING FORUM

March 28-30, 2023 | Baltimore, Maryland

HOST SPONSORS

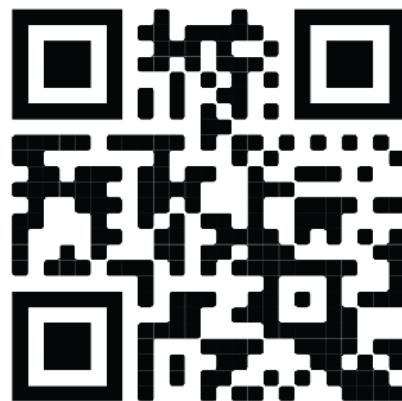


The International Offshore Wind Partnering Forum (IPF) is the premier offshore wind energy conference in the Americas.

Hosted by the Business Network for Offshore Wind, IPF connects global leaders and businesses in the supply chain, offers unparalleled networking opportunities, and delivers the most timely and relevant updates on the industry, from technology and policy to safety and siting.

In addition to plenary presentations and cutting-edge workshops from public officials and industry leaders, IPF offers registrants a wide array of networking opportunities to grow your business, including the popular WindMatch™ program. With the rapid expansion of offshore wind on a global scale, IPF attendance helps secure your place as a leader in the industry.

**REGISTER
TODAY**



Scan the code above to register, learn about exhibition and sponsorship opportunities, and more.



Seathe Difference

From Coastal
to Deep Sea



For over fifty years, CSA Ocean Sciences has partnered with leading commercial, academic, and government organizations around the globe to design and implement best-in-class marine environmental programs and mitigation strategies.

Find out how we can help manage your future environmental footprint, today.

csaocean.com

ADCP/DVL



NORTEK AS

Vangkroken 2 1351 Rud, Norway
 +47 67 17 45 00
 inquiry@nortek.no
 www.nortekgroup.com

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

BUOYANCY PRODUCTS



DEEPWATER BUOYANCY, INC.
 394 Hill Street Biddeford, ME 04005
 +1 207 502 1400
 +1 207 221 5718
 sales@deepwb.com
 www.DeepWaterBuoyancy.com
 Dan Cote, Sales Manager

DeepWater Buoyancy Inc. is the world's largest producer of subsea buoyancy products for the oceanographic community and has a vast product line of buoyancy solutions for offshore oil & gas, energy and technology companies. This product portfolio has been built over the course of 40 years serving these industries. Though products are offered for shallow water applications, the company specializes in deepwater, providing solutions to depths of 6000 meters and beyond.



NAUTILUS MARINE SERVICE GMBH
 Alter Postweg 30
 Buxtehude, 21614, Germany
 +49 (0) 4161 55903 16
 sales@nautilus-gmbh.com
 www.vitrorex.com
 Steffen Pausch

Nautilus Marine Service provides the finest VITROVEX® glass housings that are capable of operating in the most extreme regions of the Earth. VITROVEX® glass enclosures offer the dual advantage of buoyancy and pressure proof housings - a perfect combination for small and autonomous underwater instrumentation packages. Simple, reliable and affordable.



SUBSALVE

A Performance Inflatables Company™

SUBSALVE USA

P.O. Box 2030
 North Kingstown, RI 02852
 401 884 8801
 401 884 8868
 richard@subsalve.com
 www.subsalve.com
 Richard Fryburg

Since 1977 Subsalve USA has been America's #1 manufacturer of standard and custom flotation devices and we are the innovators in buoyancy and engineered inflatables. Our products include: Professional, Commercial, Standard, Shallow Water, Enclosed Flotation Bags, Cable & Pipeline Floats, Water Load Test Bags, Rapid Recovery & Mark V/ORCA EOD Systems.

CAMERAS/LIGHTS/LASERS

ARCTIC RAYS
SUBSEA TECHNOLOGIES

ARCTIC RAYS LLC
 600 Jackson Ct.
 Satellite Beach, FL 32937 USA
 +1 321 610 4635
 info@articrays.com
 www.articrays.com
 Dirk Fieberg

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



CATHX OCEAN

Unit D3, M7 Business Park,
 Newhall, Naas,
 Kildare W91F780
 Ireland +353 (0) 45 252 786
 UK +44 (0) 1224 432 180
 USA +1 (832) 808-3403
 apastor@cathxocean.com
 www.cathxocean.com
 Alberto Lopez Pastor

Cathx Ocean design and manufacture advanced subsea imaging and precision measurement systems for subsea operations. Designed to meet stringent technical, operational and integration requirements associated with various subsea applications and vehicle types, Cathx Ocean's systems offer precision, reliability and peace of mind. Products include advanced still imaging, colour laser point cloud and video systems, designed to deliver precision subsea data in a way that allows automation for subsea vehicle operations. The range includes the Hunter system (AUV Imaging and Laser), the Scout system (Observation Class ROV Imaging and Laser Profiling), the Pathfinder system (Work Class ROV Imaging and Laser Profiling) and the Prowler I & II systems (Towed Vehicle Imaging Range and Scale Measurement).



ROS

REMOTE OCEAN SYSTEMS An ISO-9001 Company

SYSTEMS SOLUTIONS SERVICE

REMOTE OCEAN SYSTEMS

5618 Copley Dr,
 San Diego, CA 92111
 1 858 565 8500
 jamesc@rosys.com
 www.rosys.com
 James Connell

Remote Ocean Systems has been an industry leader in the design and manufacture of reliable, high-tech equipment and systems for the most severe subsea, oceanographic, shallow water, industrial, commercial and military environments since 1975. Our product line includes high accuracy and robust positioners and rotators and a wide variety of lighting including: halogen and LED technology offering 10,000+ lumens, flood, spot, dimming and non-dimming types. Our cameras offer exceptional sensitivity in low light conditions, high definition color, compact size rated to 6000-meter depth. We also have a fully staffed engineering department to help with your special requirements.



SIDUS

SIDUS SOLUTIONS, LLC
 7352 Trade Street
 San Diego, CA 92121
 619 275 5533
 info@sidus-solutions.com
 www.sidus-solutions.com

SIDUS Solutions LLC, 'SIDUS' is a worldwide company that designs, manufactures and installs systems in the most extreme of environments. SIDUS products include Cameras, Pan & Tilts, Lights and Lasers for use in hazardous areas for and SUBSEA, serving the, energy, scientific, military, nuclear, and shipping industries. Engineering experience makes us the perfect choice for application specific surveillance systems to provide end to end safety and security. SIDUS provides complete integration, design, documentation, and commissioning for all systems. From sea-floor observation platforms, to surveillance systems on drilling rigs, or sonar deployment systems - SIDUS is a field proven solution.

CABLES



FALMAT CABLE
(A Winchester Interconnect Company)
1873 Diamond Street
San Marcos, CA 92078
+1 760 471 5400
Email: [Sales@falmat.com](mailto:sales@falmat.com)
www.falmat.com
Shawn Amirehsani

For nearly 6 decades, Falmat Cable (A Winchester Interconnect Company) has been a key supplier and a solution provider to the oceanographic and maritime industries supporting a wide range of subsea applications. We design and manufacture high performance cables for use in harsh and demanding environments. Our rugged Xtreme Cables are known and preferred worldwide for superior reliability and durability in commercial and military projects. Innovative cable solutions for ROV, instrumentation, towed array and many others, ranging from high flex miniature cable designs to rugged EOM steel cables incorporating high performance optical fibers and Ethernet pairs. Falmat offers an extensive list of stock cables specifically designed and produced for subsea applications. Visit our website: www.falmat.com



SOUTH BAY CABLE
54125 Maranatha Drive
P.O. Box 67
Idyllwild, CA 92549
+1 951 659 2183
+1 951 659 3958
Email: sales@southbaycable.com
www.southbaycable.com
Bill Tell, Sales Manager

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

**SUBSEA DATA SYSTEMS**

8502 SW Kansas Ave.
Stuart, FL 34997
+1 202 430 7074
Email: info@subseadatasystems.com
www.subseadatasystems.com

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

CONNECTORS



BIRNS, INC.
1720 Fiske Place
Oxnard CA 93033-1863 USA
+1 805 487 5393
+1 805 487 0427
USA +1 888 247 6788
Email: service@birns.com
www.birns.com
Eric Birns

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

**BIRNS AQUAMATE LLC**

111 Middle Road Acushnet,
MA 02743 USA
+1 508 998 2001
+1 508 637 8002
Email: sales@birnsaquamate.com
www.birnsaquamate.com
Michelle DeTerra

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

DIGITAL VIDEO RECORDING SYSTEMS

**DIGITAL EDGE SUBSEA**

DIGITAL EDGE SUBSEA, LTD
Doubletree Court, Cavendish St.
Ulverston, Cumbria LA127AD
+44 (0) 1229 206456
Email: john@digitaledgesubsea.com
www.digitaledgesubsea.com
John Benson

The EdgeDVR is currently used worldwide by most of the major ROV and Diving contractors. With our present Version 4 software, we have 6 models. The EdgeDVR has become an essential part of any ROV and Diving system offshore, easy to use and reliable. The system is capable of recording simultaneous High Definition and Standard Definition video, together with auto creation of Dive, Video, Photo and Anomaly logs. Multi channel digital overlay is also available for all recorded channels, logos and realtime survey data can be displayed. With around 500 systems now offshore, we have a proven record of reliability.

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

EQUIPMENT RENTAL

**OKEANUS SCIENCE & TECHNOLOGY, LLC**

255 Equity Blvd, Houma,
LA 70360
+1 985 346 4666
+1 985 346 8444
Email: Bleblanc@oceanus.com
www.oceanus.com
Benton LeBlanc

Okeanus Science & Technology is an established provider of winches, handling systems, and custom solutions for the oceanographic and subsea industry. Proven, reliable, and cost-effective, standard and custom designed winches range from small all-electric instrumentation winches to high horsepower all-electric or hydraulic umbilical and multi-purpose oceanographic systems. Okeanus also provides a range of standard and custom designed A-Frames, over-board sheaves, docking assemblies, HPUs, and other auxiliary equipment. We deliver turnkey solutions to commercial, scientific, and defense clients around the world. Okeanus has offices in Houston TX, Houma LA, and East Greenwich RI.

[SeaCatalog Vendor](#)

FIBER OPTIC PRODUCTS/ SERVICES

**OCEAN SPECIALISTS, INC.**

8502 SW Kansas Ave
Stuart, FL 34997
+1 772 219 3000
+1 772 219 3010
Email: contact@oceanspecialists.com
www.oceanspecialists.com

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

GEOPHYSICAL SERVICES



BLUEFIELD GEOSERVICES

Stuart, Florida 34997 USA,
Bath, BA1 5EB, UK
📞 +1 772 219 3000 (US Office)
📞 +44 (0) 7962 041451 (UK Office)
✉️ info@bluefieldgeo.com
🌐 www.bluefieldgeo.com

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

GYRO COMPASSES



KONGSBERG

KONGSBERG SEATEX AS
Pirsesteret
N-7462 Trondheim, Norway
📞 +47 73 54 55 00
📠 +47 73 51 50 20
✉️ km.seatex.sales@km.kongsberg.com
🌐 www.kongsberg.com/maritime
👤 Finn Otto Sanne at finn.otto.sanne@kongsberg.com

Kongsberg Seatex is a leading international marine electronics manufacturer specializing in the development and production of precision positioning and motion sensing systems. Our commitment is to provide quality products and solutions for safe navigation and operations at sea in the commercial offshore, maritime, hydrographics and defence industries.

LIQUID STORAGE



AERO TEC LABORATORIES, INC. (ATL)

45 Spear Road Industrial Park,
Ramsey, NJ 07446 USA
📞 +1 201 825 1400
📠 +1 201 825 1962
✉️ atl@atlinc.com
🌐 www.atlinc.com
👤 David Dack

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

MARINE ENVIRONMENTAL CONSULTING SERVICES



CSA OCEAN SCIENCES INC.

8502 SW Kansas Avenue
Stuart, FL 34997
📞 +1 770 828 5464
✉️ gstevens@conshelf.com
🌐 www.csaocean.com
👤 Gordon Stevens

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



MORGAN & EKLUND, INC. (M&E)

4909 US Highway 1
Vero Beach, FL 32967
📞 +1 772 388 5364
📠 +1 772 388 3165
✉️ info@morganeklund.com
🌐 www.morganeklund.com

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

MOTION SENSING EQUIPMENT



KONGSBERG

KONGSBERG SEATEX AS

Pirsesteret N-7462 Trondheim, Norway
📞 +47 73 54 55 00
📠 +47 73 51 50 20
✉️ km.seatex.sales@km.kongsberg.com
🌐 www.kongsberg.com/maritime
👤 Finn Otto Sanne at finn.otto.sanne@kongsberg.com

Kongsberg Seatex is a leading international marine electronics manufacturer specializing in the development and production of precision positioning and motion sensing systems. Our commitment is to provide quality products and solutions for safe navigation and operations at sea in the commercial offshore, maritime, hydrographics and defence industries.

NAVIGATION & POSITIONING SYSTEMS



ADVANCED NAVIGATION

255 George St, Sydney NSW 2000
📞 +61 2 9099 3800
✉️ info@advancednavigation.com
🌐 www.advancednavigation.com

Advanced Navigation is a worldwide leader in AI-based navigation solutions and robotics. We develop solutions from the ground up with a long-standing history of building bespoke hardware and software for our customers. Our expert engineers specialize in developing low SWaP-C (Size, Weight and Power, Cost) solutions in inertial navigation, GNSS, underwater acoustic navigation, and robotics using artificial intelligence. We're trusted by the world's most innovative companies, including NASA, Airbus, Boeing, Tesla, Google, Apple, and General Motors. Our latest navigation solution, Boreas, offers a 40% reduction in size, weight, power, and cost relative to competing systems. Boreas is a high accuracy GPS-aided INS, based on Advanced Navigation's new DFOG (Digital Fibre Optic Gyroscope) technology, which is the culmination of 25 years of development involving two research institutions. Advanced Navigation is an ISO 9001 certified company. All our solutions are designed and manufactured in Australia.



OCEANWISE LTD

16 Butts Road, England GU34 1NB,
Hampshire, United Kingdom
📞 +44 (0) 1420 768262
✉️ sales@oceanwise.eu
🌐 www.oceanwise.eu

OceanWise provides applications, services and tools that enable safer and smarter management of marine operations. We have developed and delivered a range of products and services including:
Environmental Monitoring: Capture, manage and share critical weather, tide and environmental data to inform decisions. Complete monitoring systems, from conceptual design to ongoing maintenance and support.
Compliance: We provide applications, advice and training to improve data management and ensure compliance of marine operations.
Marine and Coastal Mapping: We provide a range of digital marine maps that are fit for purpose, in the right format, accurate and up to date.

EvoLogics®

EVOLOGICS GMBH

Ackerstrasse 76
13355 Berlin, Germany
+49 (0) 30 4679 862 00
+49 (0) 30 4679 862 01
sales@evologics.de
www.evologics.de

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



KEARFOTT CORPORATION

1150 McBride Avenue
Woodland Park, NJ 07424
+1 973 785 6000
marketing@kearfott.com
www.kearfott.com

Kearfott is a leader in the design, manufacture, and support of guidance, navigation, and motion-control products for the aerospace, defense, energy exploration, and unmanned system markets. For over 100 years, Kearfott has been committed to delivering the best, most innovative technology for guidance, navigation, and motion-control products. Its products guide spacecraft and strategic missiles, navigate autonomously undersea, provide navigation and fire control for ground vehicles, and control motion aboard aircraft. Kearfott is a subsidiary of Astronautics Corporation of America, a global leader in the design, development, and manufacture of avionics equipment and systems for the commercial and military aerospace industry.



KONGSBERG

KONGSBERG SEATEX AS

Pirsentertet
N-7462 Trondheim, Norway
+47 73 54 55 00
+47 73 51 20
km.seatex.sales@km.kongsberg.com
www.kongsberg.com/maritime
Finn Otto Sanne at finn.otto.sanne@kongsberg.com

Kongsberg Seatex is a leading international marine electronics manufacturer specializing in the development and production of precision positioning and motion sensing systems. Our commitment is to provide quality products and solutions for safe navigation and operations at sea in the commercial offshore, maritime, hydrographics and defence industries.

NETWORKS & DATA COMS



KONGSBERG

KONGSBERG SEATEX AS

Pirsentertet
N-7462 Trondheim, Norway
+47 73 54 55 00
+47 73 51 20
km.seatex.sales@km.kongsberg.com
www.kongsberg.com/maritime
Finn Otto Sanne at finn.otto.sanne@kongsberg.com

Kongsberg Seatex is a leading international marine electronics manufacturer specializing in the development and production of precision positioning and motion sensing systems. Our commitment is to provide quality products and solutions for safe navigation and operations at sea in the commercial offshore, maritime, hydrographics and defence industries.

OCEANOGRAPHIC INSTRUMENTS/SERVICES



ASL ENVIRONMENTAL SCIENCES, INC.

Victoria, BC, Canada
+1-250-656-0177
asl@aslenv.com
www.aslenv.com

- Meteocean Equipment Leasing:** Acoustic Doppler Current Profiler (ADCPs), Ice Profilers, AZFP, acoustic releases, wave/tide gauges, pingers, satellite beacons, CTD+DO+Tu profilers, and more.

- Oceanographic Products:** Acoustic Zooplankton Fish Profiler (AZFP), Ice Profiler IPS5 & shallow water SWIP, Wave Profiler, Acoustic Scintillation Flow Meter (ASF), Custom acoustic system integration.

- Consulting:** Field work, data collection, analyses, numerical modelling, remote sensing, oceanographic mooring design and system integration.

- Manufacturer's Representative:** Teledyne RD Instruments, Deep Water Buoyancy, WERA Northern Radar.



SEA-BIRD SCIENTIFIC

13431 NE 20th St.
Bellevue, WA 98005
+1 425 643 9986
sales@seabird.com
www.seabird.com/contact

For decades, customers have trusted Sea-Bird Scientific to help them generate accurate, usable data to help them bring science to the surface. As an industry-leading provider of sensors and systems for oceanographic research and environmental water quality monitoring of physical and biogeochemical properties, Sea-Bird Scientific's instruments will go into the most punishing ocean conditions and come back with data that is meticulously accurate. Our standard is high because we, ourselves, are part of the scientific community: the instruments our customers use are the instruments we'd want in our own fieldwork. And we're always available to consult and offer guidance, because supporting science starts with supporting scientists. For the scientists committed to making a positive impact, in research initiatives across the globe, in every ocean condition: It's Sea-Bird Scientific.

ROPE



CORTLAND COMPANY

10633 West Airport Blvd Ste 300
Stafford TX 77477
+1 215 582 4032
patrick.yerger@cortlandcompany.com
www.cortlandcompany.com
Patrick Yerger

Cortland is a global designer, manufacturer, and supplier of technologically advanced synthetic fiber ropes, slings, and synthetic fiber strength members. Collaborating with customers, our team uses its experience in high performance materials and market knowledge to transform ideas into proven products. For more than 35 years, our custom-built solutions have been developed for work in the toughest environments and to overcome some of the world's greatest challenges. They consistently enable our customers to meet the demands of the aerospace, defense, medical, research, subsea, marine, and energy industries. Cortland is a part of the Energac Tool Group (NYSE: EPAC), a diversified industrial company. Visit us online at www.cortlandcompany.com.

SONAR SYSTEMS



EDGETECH

4 Little Brook Rd.
West Wareham, MA 02576
+1-508 291 0057
info@edgetech.com
www.edgetech.com
Amy LaRose

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



VALEPORT LIMITED

St Peter's Quay
Totnes
Devon
TQ9 5EW UK
+44 (0)1803 869292
www.valeport.co.uk

Valeport provides leading-edge marine sensing and monitoring solutions. We are a British manufacturer of hydrographic and oceanographic instrumentation, which includes: Bathymetry, CTD & Environmental, Current, Sound Velocity and Tide Gauges. Valeport has supplied the subsea sector for over fifty years, supporting the hydrographic and oceanographic communities with a comprehensive portfolio of products that deliver highly innovative solutions. Valeport's worldwide customer base includes: AUV/ROV, ASV, hydrography, hydrometry, metrology & positioning, oceanography, ports/harbours & dredging and renewable energy. Our philosophy of keeping development and manufacturing entirely in-house, assures our customers of our expertise and commitment to providing the highest levels of quality, performance and service.

IMAGENEX

IMAGENEX TECHNOLOGY CORP.

209 - 1875 Broadway Street
Port Coquitlam, BC
V3C 4Z1 Canada
+1 604 944 8248
info@imagenex.com
www.imagenex.com
Steve Curnew

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


KLEIN – A MIND TECHNOLOGY BUSINESS

11 Klein Drive
Salem, NH 03079
+1 603 893 6131
International +1 603 893 6131
Email: KleinSales@MIND-Technology.com
www.MIND-Technology.com

Celebrating over 50 years in the marine technology industry, Klein – A MIND Technology Business continues to be a world leading sensor technology manufacturer of high-resolution side scan sonar equipment and radar-based security and surveillance systems. Klein has developed a worldwide reputation of excellence in the industry by providing quality products and excellent customer service. Klein sonar systems are deployed by government agencies, navies, port authorities, surveyors, oil companies and universities worldwide. Visit our web site and discover how Klein is Making the Oceans Transparent!



GENERATIONS AHEAD IN SONAR & ULTRASONIC TECHNOLOGY

MASSA PRODUCTS CORPORATION

280 Lincoln St., Hingham, MA 02043
+1 781 749 4800
Email: JOK@massa.com
www.massa.com
John O'Keefe

Massa Products Corporation designs, engineers, and manufactures sonar and ultrasonic products for use in ocean, air, and fluids. Founded by Frank Massa, the man who pioneered the field of electroacoustics over 75 years ago, Massa is the only company that remains family owned and has continuity in the field since the dawn of the industry. With over 165 US Patents Awarded, Massa has become an Industry leader and trusted partner of the US Navy. Massa is also an ISO 9001:2015 Certified company that will tailor designs to fit customer needs. Challenge your perception of what's possible with Massa Products Corporation!

SOUND VELOCITY PROBES/CTDS
SAIV A/S

Environmental Sensors & Systems

SAIV A/S

Nygardsviken 1, 5165
Laksevag, Norway
+47 56 11 30 66,
Email: info@savais.com
www.savais.no
Gunnar Sagstad

- STD/CTD, Sound Velocity probes/recorder with optional multi-parameter facilities; Turbidity, Fluorescence, Oxygen etc. The new CTD/STD model SD208 with wireless communication and high accuracy: 0.002 m/s, 0.002 °C.
- Precision pressure /depth (0.01% accuracy) and temperature sensors/recorders. Applications: hydrographic profilings, installation on ROVs and towed systems, etc. Robust and compact designs are combined with accuracy and "plug and play" compatibility. Output format for sonar equipment, e.g. EM1002, EM3000, SSP, HiPAP and Reson 8125.

SUBSEA TECHNOLOGY


SUBCTECH GMBH
Wellseedamm 1-3, 24145 Kiel,
Germany
+49 431 22039 880
+49 431 22039 881
Email: info@subctech.com
www.subctech.com

Ocean Power: Leading manufacturer of Subsea Oil-Gas, Storage, UPS, ROV and AUV vehicle Li-Ion batteries - fully approved according API17F, MIL-STD, UN T38.3 etc. to guarantee highest efficiency, reliability and safety for your jobs.

Ocean Monitoring: Leading manufacturer of autonomous, standardized underway measurement systems for greenhouse gases e.g. pCO₂ and other water quality parameters. Producer of datalogger and CO₂ analyzers with SOCAT standard.

2023

Canadian Underwater Conference & Exhibition

Man & Machine Underwater

Save the Date

March 26 - 28, 2023

Halifax, NS

Conference Focus

Join your colleagues and industry professionals for exhibits and technical presentations that will address occupational diving operations, as well as ROV & AUV activities across North America.

For more information on Sponsoring, Exhibiting, Speaking or Registration visit our website
www.cuce.ca

TELEMETRY



METOCEAN TELEMETRICS

21 Thornhill Drive Dartmouth,
Nova Scotia B3B 1R9 Canada
 ☎ +1 902 468 2505
 ☎ +1 902 468 4442
 ☐ email@metocean.com
 ☐ www.metocean.com
 ☐ Emily MacPherson

MetOcean Telematics provides complete end-to-end telematics services, with a focus on niche MetOcean solutions. As a prominent Iridium Satellite Value-Added Reseller (VAR), MetOcean provides Iridium telemetry for your products and solutions to ensure data is transmitted quickly and reliably. Equipped with the ISO 9001 certification, MetOcean has a long history of assisting customers with integrating Iridium hardware into a range of devices and applications, from Unmanned Surface Vehicles and Autonomous Underwater Vehicles to Buoys and Profiles, and our team understands the challenges you face when deploying your device. When it comes to reliable, global satellite coverage at sea, choose MetOcean.

TRANSDUCERS



AIRMAR TECHNOLOGY CORPORATION

35 Meadowbrook Drive
Milford, NH 03055, USA
 ☎ +1 603 673 9570
 ☐ sales@airmar.com
 ☐ www.airmar.com

AIRMAR Technology is a leading developer and manufacturer of acoustic and ultrasonic sensing solutions. We push the boundaries of ultrasonic technology to develop advanced products that withstand the harshest ocean environments while reliably facilitating data gathering from surface to full ocean depth. Our comprehensive suites of marine, oceanographic and survey transducers, plus our WeatherStation® instruments, deliver performance that meets the most challenging mission requirements. Ideal applications include shallow and deep-water survey, sub-bottom profiling, navigation, fisheries research, aquatic habitat assessment, underwater scientific applications and more. Customization of transducers for specific marine applications is available.

UNMANNED MARITIME VEHICLES

GENERAL DYNAMICS
Mission Systems

GENERAL DYNAMICS MISSION SYSTEMS' BLUEFIN ROBOTICS PRODUCTS

553 South Street
Quincy, MA 02169
 ☎ +1 617 715 7000
 ☐ justin.reid@gd-ms.com
 ☐ www.gdmissonsystes.com/bluefin
 ☐ Justin Reid

General Dynamics Mission Systems' family of Bluefin Robotics products consists of autonomous unmanned underwater vehicles (UUVs) and related technologies for defense, commercial, and scientific customers worldwide. Their core autonomous product line includes Bluefin®-9, Bluefin®-12, Bluefin®-21, and subsea power technologies. General Dynamics offers a full range of modular, free-flooded UUV platforms and products, integrated with over 70 different sensors on more than 100 vehicles. We design, develop, deliver, and provide operations and sustainment support for UUVs worldwide to research institutes and industry, providing UUVs and auxiliary equipment to the United States' and International Navies for various defense applications.



INTERNATIONAL SUBMARINE ENGINEERING LTD. (ISE)

1734 Broadway Street,
Port Coquitlam, BC, V3C 2M8
 ☎ +1 604 942 5223
 ☐ info@ise.bc.ca
 ☐ https://ise.bc.ca/

International Submarine Engineering Ltd. (ISE) is a world leader in the design and integration of autonomous and remotely operated robotic vehicles and terrestrial robotics. Over our 40+ years in business, we have accumulated a great deal of expertise in the design, manufacture, and maintenance of: Autonomous Underwater Vehicles (AUVs), Remotely Operated Vehicles (ROVs) for subsea operation, Human Occupied (HO) submersibles, Customized systems for the offshore oil industry, Customized systems for the Military-Naval sector, Hydraulic, pneumatic, and electric robotic manipulators, Teleoperated and autonomous robotic systems, Robotic systems for nuclear industry applications, Communications and real-time control system.



L3HARRIS

L3HARRIS TECHNOLOGIES, INC.

275 Martine Street
Fall River, MA 02723 USA
 ☎ +1 508 678 0550
 ☎ +1 508 678 0552
 ☐ IVER.Sales@L3Harris.com
 ☐ www.L3Harris.com
 ☐ Jim Kirk

L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains. L3Harris develops autonomous, lightweight Unmanned Undersea Vehicles (UUV). L3Harris has established itself as the leader in man portable UUVs, providing highly capable vehicles to a wide array of military, commercial and research customers. With over 15 years experience in the underwater field, our engineers have developed a reliable and easy to use platform that is trusted to complete marine missions all around the world.

VideoRay



VIDORAY

212 East High Street,
Pottstown, PA 19464
 ☎ +1 610 458 3000
 ☎ +1 610 458 3010
 ☐ sales@videoray.com
 ☐ www.videoray.com
 ☐ Jeff Orlowski

VideoRay is the world's leading manufacturer of portable underwater robotic systems. VideoRay Mission Specialist Systems have redefined the "inspection class" category. Much more than underwater cameras, they deliver industry leading power and maneuverability

and are rugged enough to work anywhere, handling tough jobs and applications. They are used around the world in demanding underwater missions to support national security, first responders, object search and recovery, infrastructure examination and science and research. VideoRay is available on the General Services Administration (GSA) Schedule.

WINCHES, HANDLING, & CONTROL SYSTEMS



OUTLAND TECHNOLOGY

38190 Commercial Ct.
Slidell, LA 70458 USA
 ☎ 985 847 1104
 ☎ 985 847 1106
 ☐ jeff@outlandtech.com
 ☐ www.outlandtech.com
 ☐ Jeff Mayfield

Offering the most rugged equipment and unsurpassed customer service, Outland Technology has been the world's leading manufacturer of underwater video, lighting and ROV equipment for over 30 years. We recognize that no two jobs are the same and specialize in products that are customizable for your specific applications.

OKEANUS

AN ADVANCED OCEAN SYSTEMS COMPANY

OKEANUS SCIENCE & TECHNOLOGY LLC

11989-A FM 529
Houston, TX 77041
 ☎ +1 713 460 1400
 ☐ Bleblanc@oceanus.com
 ☐ www.oceanus.com
 ☐ Benton LeBlanc

Okeanus Science & Technology is an established provider of winches, handling systems, and custom solutions for the oceanographic and subsea industry. Proven, reliable, and cost-effective, standard and custom designed winches range from small all-electric instrumentation winches to high horsepower all-electric or hydraulic umbilical and multi-purpose oceanographic systems. Okeanus also provides a range of standard and custom designed A-Frames, over-boarding sheaves, docking assemblies, HPUs, and other auxiliary equipment. We deliver turnkey solutions to commercial, scientific, and defense clients around the world. Okeanus has offices in Houston TX, Houma LA, and East Greenwich RI.

SeaCatalog Vendor



SEAROBOTICS CORPORATION

7765 SW Ellipse Way,
Stuart, FL 34997
 ☎ +1 772 742 3700
 ☐ info@searobotics.com
 ☐ www.searobotics.com

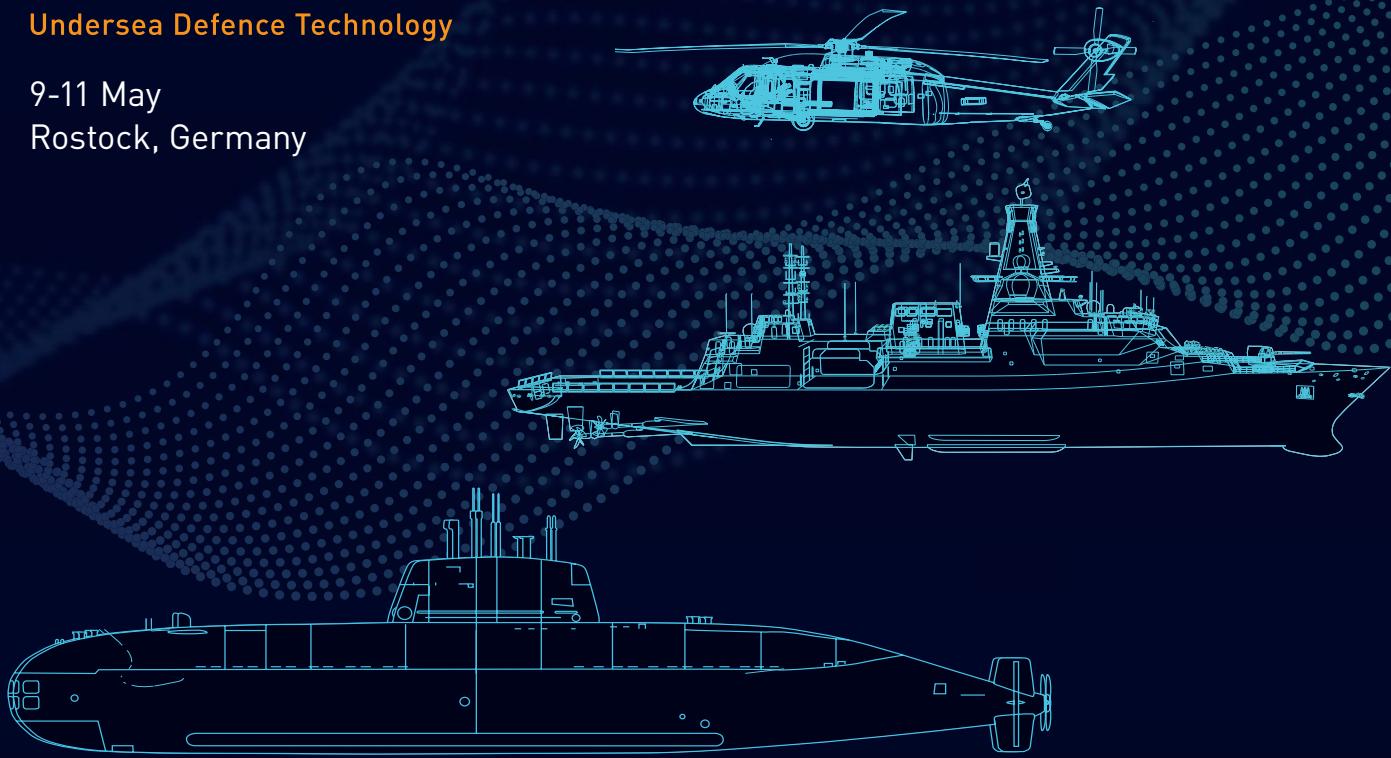
SeaRobotics Corporation, headquartered in Stuart, Florida, specializes in the engineering and manufacture of intelligent marine robotics, including crewless survey vehicles. Clients include major military and commercial organizations, both U.S. and foreign. Applications for SeaRobotics ASVs range from bathymetric and hydrographic surveys to coastal, harbor, and riverine surveillance. In addition to an expanding line of ASVs, SeaRobotics also designs and builds hull and tank bio-inspired underwater grooming and cleaning systems, as well as a variety of scientific sampling equipment such as box and push corers and suction samplers.



Undersea Defence Technology

9-11 May
Rostock, Germany

Discover UDT. Register Now



Attend the global event dedicated to Undersea Defence and Security

Rostock will host the 34th edition of UDT this May. Designed to equip nations in the face of increasingly diverse threats and challenges, the focus of the conference theme will be "**Maintaining Operational Advantage with Increased Underwater Domain Awareness**". Alongside the three-day conference, the exhibition will showcase the latest solutions available to tackle the challenges of operating in one of the toughest environments known to man.

Ready to join us in Germany? Visit our website to register.

 **75%**
exhibitors met new prospects

 **96%**
visitors achieved their business goals

Interested in Exhibiting?

If you would like to become an exhibitor or a sponsor please contact Samar Jaafar, Event Manager

 samar.jaafar@clarionevents.com

 udt-global.com

Organised by



Bluefield Geoservices	07	Ocean News & Technology / USV Report.....	67
www.bluefieldgeo.com		www.oceannews.com/uncrewed-vehicles	
Blueprint Subsea.....	19	Ocean Specialists, Inc.	51
www.blueprintsubsea.com		www.oceanspecialists.com	
Canadian Underwater Conference & Exhibition (CUCE)....	63	Okeanus Science & Technology.....	68
www.underwaterconference.ca		www.okeanus.com	
CSA Ocean Sciences	58	Remote Ocean Systems	21
www.csaocean.com		www.rosys.com	
DeepWater Buoyancy.....	05	Saab Seaeye.....	39
www.deepwaterbuoyancy.com		www.saabseaeye.com	
Digital Edge Subsea.....	45	SeaRobotics.....	49
www.digitaledgesubsea.com		www.searobotics.com	
EdgeTech	43	South Bay Cable	35
www.edgetech.com		www.southbaycable.com	
EvoLogics	09	SubCtech GmbH	29
www.evologics.de		www.subctech.com	
International Partnering Forum (IPF)	57	Subsalve USA	41
www.offshorewindus.org/2023ipf		www.subsalve.com	
J.W. Fishers Manufacturing, Inc.	33	Terradepth	37
www.jwfishers.com		www.terradept.com	
MacArtney.....	03	Tritech International	25
www.macartney.com		www.tritech.co.uk	
Metron	15	Undersea Defence Technology	65
www.metsci.com		www.udt-global.com	
Ocean Business.....	55	VideoRay	02
www.oceanbusiness.com		www.videoray.com	
Oceaneering Int'l	04		
www.oceaneering.com			

NEW FOR 2023

Expert insight, commentary, and market forecast
for the expanding global USV industry.



CONTACT US TODAY

www.oceannews.com/uncrewed-vehicles



Whatever the mission...

Okeanus designs and manufactures mission-critical ocean equipment for commercial and government agencies throughout the world. We harness breakthrough Science and Technology to equip clients with the tools and trusted support they need for the rigors of ocean exploration.

Our comprehensive product portfolio—from customized deck equipment, including winches, LARS and A-Frames, to our extensive range of underwater survey and sampling equipment—is available for purchase or rent, and rapid deployment.

Whatever your mission, Okeanus has turn-key solutions to make it a success.

okeanus.com

