ON&T

OCEAN NEWS & TECHNOLOGY | oceannews.com

JANUARY / FEBRUARY 2024

OCEAN SENSORS & DATA MANAGEMENT

Integrated Solutions for Offshore Challenges

MARINE OPERATIONS

PROJECT MANAGEMENT

SUBSEA NETWORKS

ENGINEERING & PROTOTYPE

INSTALLATION & COMMISSIONING

TEST & EVALUATION

OCEAN SPECIALISTS

AN ADVANCED OCEAN SYSTEMS COMPANY

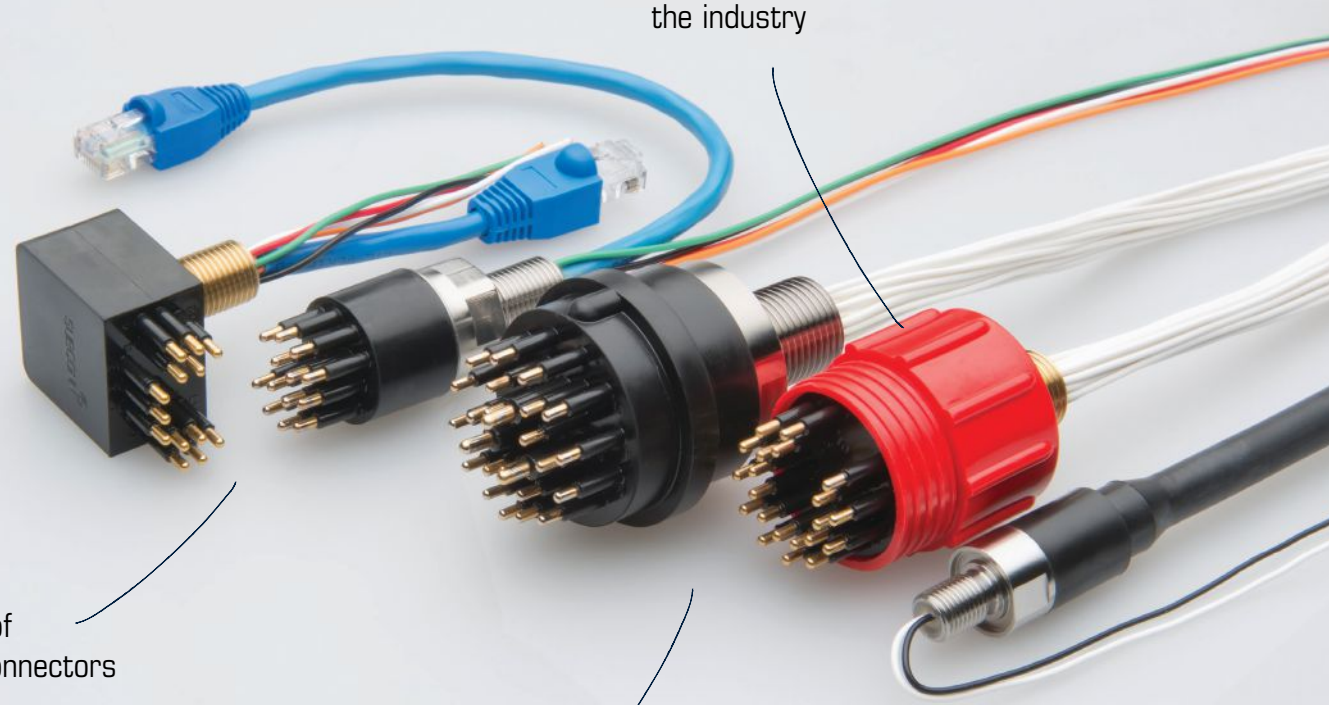
oceanspecialists.com

MacArtney
UNDERWATER TECHNOLOGY

SubConn®
DEPENDABILITY AT EVERY LEVEL

Wet-mate connectors

Recognised throughout
the industry



Full range of
Ethernet connectors

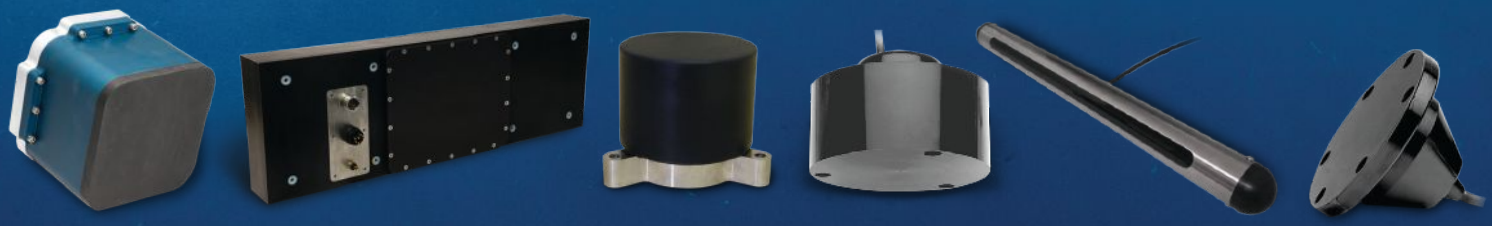
More than 45 years
proven track record

Available worldwide

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

MSI® TRANSDUCERS | AIRMAR® TECHNOLOGY CORPORATION

Custom Solutions. Unmatched Quality. Fast Delivery.



Transducers and Arrays with custom connectors or repackaged to your specifications.

Our collaboration delivers the most cost-effective custom solutions — with **lead times in *weeks***, not months.

Visit us at Oceanology International London – Booth B150

Contact us

MSITRANSDUCERS.COM

AIRMAR.COM

UNLOCKING UNRIVALED ACCURACY

NEW ROVINS 9-DVL
All-in-one INS/DVL

- Accurate georeferenced position at high frequency: 0.02% TD
- Compact design for easy integration on all platforms
- Pre-calibrated and plug-and-play
- 6,000 m rated

- **Meet us at Oceanology International**
  Booth #E100-200

exail

CONTENTS

MONTHLY EXCLUSIVES

FRONTLINE

TAKE 5

ENERGY MARKETWATCH

CHECK THE TECH

EDITOR UPFRONT

In today's increasingly data-centric and connected world, a more comprehensive understanding of our oceans must remain a societal priority. Defining explorative priorities will always trigger debate, but informed discussion hinges on a common language: reliable marine data.

In this first edition of 2024, we meet some of the great enablers in such a dialogue; the organizations championing the rapid development of ocean sensors and the robust platforms, increasingly remote in nature, needed to support their deployment.

editor@oceannews.com

FRONTIERS

CONTINUUM

ON THE COVER

An electric WAM-V 16 USV from Sulmara undertakes a high-resolution geophysical survey for a client off the coast of Texas. (Credit: Sulmara)

ON&T
OCEAN NEWS & TECHNOLOGY

MANAGING EDITOR
Ed Freeman

EDITORIAL
Haley McQueen
G. Allen Brooks
Inger Peterson
Jenna Holleran

PRODUCTION
Lisa D. Ferrari
Keith Meinhold
Patrick Lyons

DISTRIBUTION
Whitney Schwerin
Kadesha Dsilva

ADVERTISING
Lisa Chilik
Tel: +574-261-4215
Lchilik@tscpublishing.com

Mimi King
Tel: +44 77 7601 7564
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 10 times a year in print and digital by Technology Systems Corporation, 8502 SW Kansas Ave, Stuart, FL 34997, telephone 772-221-7720.

A TIME AND A PLACE

Ocean observation needs a cooperative system of systems

Dr. William Burnett
Director, National Data Buoy Center

A 2022 panel discussion on uncrewed systems recommended that the government replace moored buoys with uncrewed systems because they are "... less expensive and more accurate." As the former Naval Oceanography Deputy, I know that uncrewed systems are critical to achieving mission success. However, I found the recommendation to be myopic in terms of cost, priority, and availability of actual capabilities, and did little to address larger societal challenges.

The ocean observing community has one axiom: The ocean is undersampled in all geographical locations and at all depths. It's undersampled in temporal and spatial resolution and frequency. In physical and biogeochemical parameters, the ocean has about 1/10th of land observing stations; a stark contrast to the other 70% of the Earth's surface.

A CONCERTED APPROACH

Fortunately, there are many platforms that observe the ocean environment in real time. Ships have provided marine observations for over a hundred years. Moored buoys have provided deep ocean and coastal marine observations for over fifty years. Drifting buoys and floats have provided drifting observations for over thirty years. Uncrewed platforms have provided remote observations for over twenty years. They all need to be tied into a system of systems, so their collective value is realized.

In the summer of 2022, National Data Buoy Center (NDBC) mitigated two buoy outages in the Gulf of Mexico with two Saildrone uncrewed surface vehicles (USVs). Overall, the mission provided reliable observations. However, the Saildrones were located in the Loop Current, so when surface winds were low and the ocean currents strong, they struggled to maintain station keeping. This was an important lesson learned, providing applications for other platforms.

Proceeding from the Loop Current mission, in 2023 NDBC replaced a moored buoy located on the west coast with a Saildrone which is providing almost 100% reliability because currents are weaker, and winds are stronger. Real-world lessons like this show the utility of different platforms successfully operating in different environments.

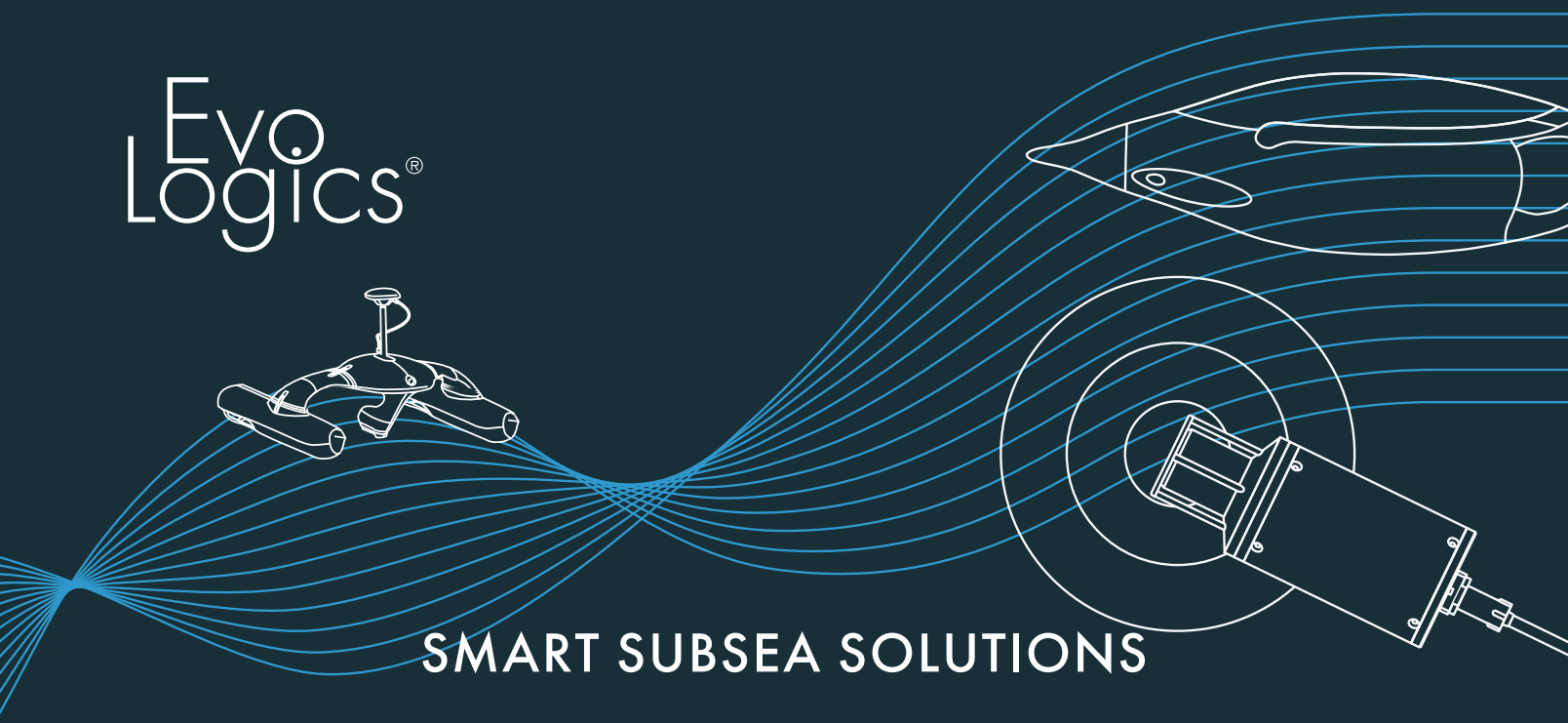
ONGOING INVESTMENTS

There is a time and a place for all these platforms to resolve the observation gaps that exist in the ocean environment. We must develop an overarching strategy that involves diverse platforms and eliminate the idea that one type can, or should, replace another type. A distributed, flexible architecture is required that can accommodate older observations but can also assimilate data from new platforms and capabilities.

More investments in multiple observing systems are necessary to resolve the issue of a severely undersampled ocean environment. Both NOAA and the US Navy are enablers of the Commercial Engagement Through Ocean Technologies (CENOTE) Act signed by the White House in 2018. Along the Mississippi Gulf Coast, a triple helix of innovation is occurring with academia, government and industry collaborating together to use all platforms to observe the environment. These combined capabilities will usher in a golden age of ocean observing.

Reflecting back on the 2022 panel discussion, I realized that the nation's strategy must be one of coordination, integration, alignment, and collaboration. In-situ, real-time marine observations ensure the successful movement of $1.5 trillion in goods and services in and out of US ports annually. The US Marine Economy accounted for 1.9%, or $432.4 billion, of current-dollar US gross domestic product in 2021. There is a time and a place for all platforms to work together. Our community challenge is to determine the optimum strategy, and architecture, to employ them as a service to society.

EvoLogics®



SMART SUBSEA SOLUTIONS

- Delivering data in most adverse conditions: underwater acoustic modems with advanced communication technology and networking
- Accurate USBL, LBL and hybrid positioning of underwater assets, navigation for divers
- Modem emulator and multiple cost-saving developer tools
- Sonobot 5 - the autonomous surface vehicle for bathymetry, monitoring, search & rescue, and AUV support
- Quadroin - the novel bionic AUV for surveys and monitoring

Meet us at

OCEANOLOGY INTERNATIONAL 2024!

12 - 14 March
London, ExCel

STAND G300

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

EvoLogics.de

EXPANDING HORIZONS

Futureproofing our oceans relies on robust and reliable data

Ken Kostel
Director of Research
WOODS HOLE OCEANOGRAPHIC INSTITUTION®

> IT IS CRITICAL THAT THE PACE OF SCIENTIFIC RESEARCH STAYS AHEAD OF THE PROFIT MOTIVE TO GUARD AGAINST POTENTIALLY HARMFUL ENVIRONMENTAL IMPACTS…

The news that 2023 was the hottest year on record, especially in the ocean, is another sobering reminder that planetary change is accelerating at a dramatic rate. Whether it's carbon dioxide levels, ocean temperatures, sea levels, ecosystem-shifts, or melting ice sheets and declining Arctic sea ice, the ocean is changing faster than ever—and 2023 was a warning sign of more to come. It was also an exclamation point on the need to focus efforts on rapidly reducing greenhouse gas emissions and consider actively removing carbon dioxide from the atmosphere to avoid even more severe impacts.

Ocean-based climate solutions that are ready to implement today could help close the emissions gap—the difference between where greenhouse gas emissions are and where science tells us they should be—by as much as 35%. In addition, the promise of other marine carbon dioxide removal (mCDR) techniques is attracting attention from both scientists and investors in the growing carbon market. But there is a caveat. While we have a growing base of knowledge about how the ocean might respond to these interventions, we do not currently have the level of networked observations throughout the ocean water column required to evaluate the potential benefits and environmental impacts of mCDR at scale.

It is critical that the pace of scientific research stays ahead of the profit motive to guard against potentially harmful environmental impacts and to ensure that mCDR efforts are guided by strong science to validate claims of carbon uptake and long-term sequestration. This "blue carbon" market must be developed in a responsible way, with science supporting the careful development of safe, effective mCDR strategies through the establishment of proven environmental measurement, reporting, and verification (eMRV) capabilities.

MORE DATA NEEDED

But to do so, we need more eyes in the ocean. At present, there isn't enough data to adequately assess how things like the increased pace and severity of marine heatwaves or changes in

Argo floats deployed in the Atlantic. (Credit: Blue Observer)

Pioneer Array ready for deployment. (Credit: WHOI)

currents are affecting ocean health, let alone how a comprehensive effort to remove atmospheric carbon through some of the most promising mCDR methods listed in a recent National Academies report might affect fisheries or other critical marine ecosystems.

Doing so is not easy, as the ocean is almost singularly configured to defy easy observation. Aside from the very surface, it is almost impenetrable to remote observation, making satellite-based sensors, while still necessary, largely blind to critical processes that occur at depth and across large volumes of the ocean. Environmental conditions such as high pressure, extremes of temperature, high winds, heavy seas, and the corrosive nature of seawater make designing, deploying, and maintaining observing networks and instruments throughout the volume of the open ocean complex and costly, but undeniably and fundamentally important to the long-term sustainability of human society.

TECH PLATFORMS

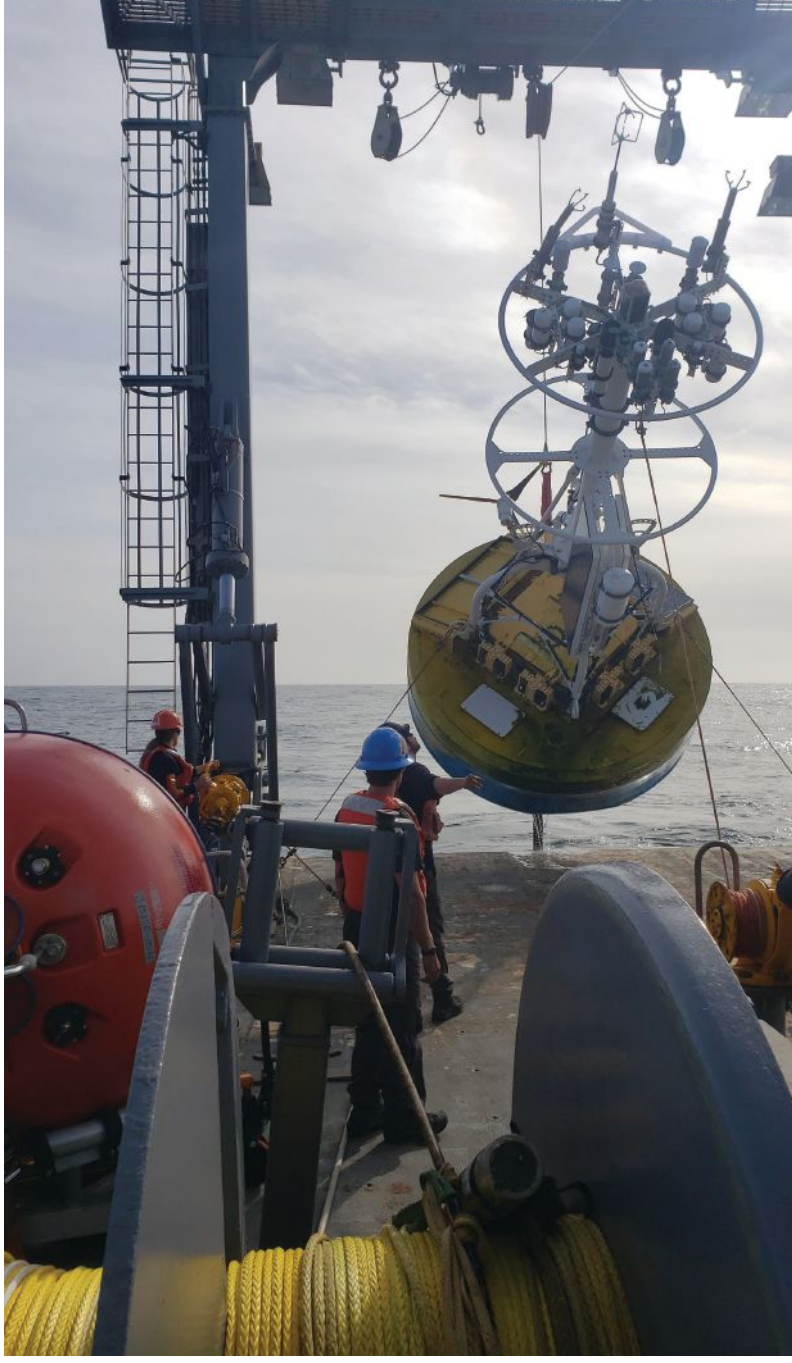
Currently there is about one autonomous profiling float in the global Argo program for every patch of ocean the size of Texas. These sensors drift below the surface for years and make a profile of basic oceanographic parameters—mostly salinity and temperature—from 2,000 meters to the surface every 10 days. Currently there are fewer than 4,000 of these "core Argo" floats, and their number recently declined due to attrition brought on by a host of factors, including cost and access to ships. The next generation of Argo floats, those that reach the deepest parts of the ocean to track humanity's warming signal into the depths, and biogeochemical Argo floats that monitor the transport of carbon through the ocean, are slowly ramping up.

In addition, recent years have seen two arrays of moored instruments in the high-latitude, Southern Hemisphere that were part of the National Science Foundation-funded Ocean Observatories Initiative discontinued due to the cost and complexity of regularly accessing this distant and often hostile part of the globe. The regions those arrays occupied are critical parts of the global ocean current system known as the thermohaline circulation as well as linchpins in the global carbon cycle, both of which are fundamental drivers of Earth's climate and have far-reaching effects on the lives and livelihoods of almost everyone on the planet.

EXPANDING OCEAN OBSERVATION

To properly support the knowledge-based decisions needed to prepare for the changes ahead, the global ocean observation capacity needs to be vastly expanded. One vision for the shape this eventual expansion might take is what we are calling the Ocean Vital Signs Network (OVSN), an "internet of the ocean" that combines fixed and mobile platforms holding sensors that return a continuous stream of data from the air-sea interface to the seafloor that gives us an always-on, always-connected view of ocean health.

In December, a group of 124 organizations from around the globe signed the Dubai Ocean Declaration calling for increased ocean observation and delivered it to the leaders gathered at the annual UN climate conference (COP28) in Dubai, UAE. COP28 also saw nearly $500 million in new ocean and climate-related funding commitments from sources including Bezos Earth Fund and the Ocean Resilience and Climate Alliance (ORCA)—a new consortium of climate and ocean institutions announced by Bloomberg Philanthropies at the COP28 Ocean Pavilion—to ensure the health and vitality of the ocean.



Mooring Recovery. (Credit: WHOI)

Momentum for enhanced ocean observations and modeling is increasing with a recent influx of funding, gifts, and grants to institutions like the Woods Hole Oceanographic Institution (WHOI), which received funding over the past three years from a combination of federal, corporate, and private sources totaling more than $85 million, including $25 million from WHOI board chair Paul Salem, to support a variety of climate solutions, including the advancement of eMRV capabilities supported by robust ocean monitoring.

These and other commitments are a literal and figurative drop in the ocean compared to the scope and scale of the task before us. And there is nothing more central to the future of humanity than our ability to understand the ocean that dominates our planet, and our lives.

whoi.edu

CSIRO RESEARCH VESSEL DEPLOYS TO TRY AND SOLVE THE SOUTHERN OCEAN PUZZLE

CSIRO's research vessel (RV) *Investigator* deployed on January 4, 2024, on the longest voyage in its 10-year history to the Southern Ocean and sea-ice edge.

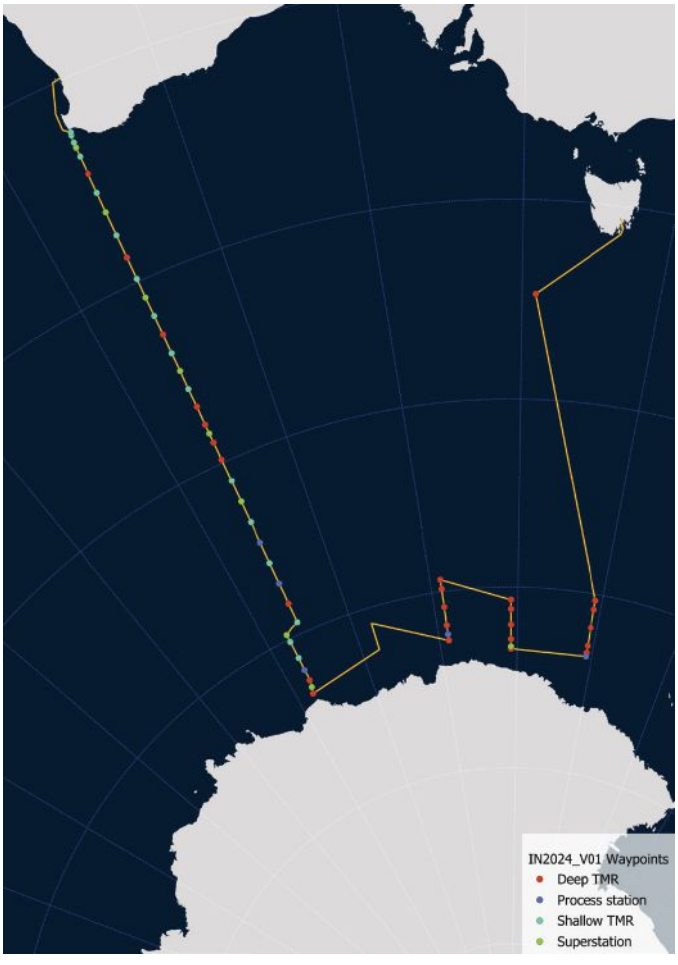
The aim of the 60-day voyage is to improve our ability to anticipate the impacts of future climate change.

The science teams on board, led by the Australian Antarctic Program Partnership (AAPP) and Australia's national science agency, CSIRO, will search for climate clues between the deep ocean, up to six kilometers below the water surface, to low-lying clouds, two kilometers above in the atmosphere.

Co-Chief Scientist Dr. Steve Rintoul, of CSIRO and AAPP, said the Southern Ocean takes up vast amounts of heat and carbon dioxide and acts as a handbrake on climate change, which means it has a profound influence on climate patterns in Australia and the rest of the globe.

"To anticipate how climate and sea level will change in the future, we need to understand how the Southern Ocean works and how sensitive it is to change," Dr. Rintoul said. "What's amazing about the Southern Ocean is that everything is interconnected—we can't hope to understand how the region influences climate unless we measure each piece and how it fits with the other parts of the system."

RV Investigator. (Credit: CSIRO)



The voyage, known as MISO—Multidisciplinary Investigations of the Southern Ocean—will explore how links between physics, biogeochemistry, plankton, aerosols, and clouds influence the Earth's climate.

Changes in the Southern Ocean would have profound implications, influencing the rate of climate change, the productivity of the Antarctic ecosystem, and the future of the Antarctic Ice Sheet. Changes in the Antarctic Ice Sheet, in turn, would affect the rate of sea level rise.

Recently published research has shown the "overturning circulation" of Antarctic waters driving global ocean currents may be slowing down, affecting the redistribution of heat, carbon and nutrients across the globe.

Co-Chief Scientist Dr. Annie Foppert from the Australian Antarctic Program Partnership at the University of Tasmania said the meltwater from the Antarctic Ice sheet is reducing the amount of dense water sinking to the deep ocean around Antarctica, slowing ocean currents that control climate.

"Data collected on the MISO voyage will be compared to earlier measurements to track how the Southern Ocean is changing and what it means for climate and sea level rise," Dr. Foppert said. "To track these changes in the deep ocean, we will deploy a dozen deep-diving robots. These new floats, able to collect measurements down to six kilometers below the sea surface, will allow us to track how the ocean is changing for the next five years by profiling the full depth of the ocean."

The crew will sail about 2,300 km south from Hobart to the edge of the Antarctic ice, before returning to Fremantle in early March in a 9,260 km round trip. (Credit: CSIRO)

HOW THE NORTH ATLANTIC ABSORBS CO2 IS SUBJECT OF NEW NOC RESEARCH

Scientists from the National Oceanography Centre (NOC) have published new research showing a significant time difference in the rate of particles sinking to the bottom of the ocean and the reasons why this occurs. The research provides an essential foundation for future work into how the ocean can be used to combat climate change.

The data was gathered at the Porcupine Abyssal Plain Sustained Observatory (PAP-SO) in the Northeast Atlantic. A number of instruments are deployed at PAP-SO which record the changing characteristics of this environment. Located about 300 miles southwest of Ireland in a water depth of nearly 5,000 m, it has been gathering data since 1989 and continues to this day. PAP-SO monitors the long-term changes in the ocean environment, including atmosphere, weather, and the deep-ocean interior and seabed up to three miles below the ocean surface.

The project discovered that the structure of the ecosystem in the upper ocean plays a crucial role in determining how fast carbon is sequestered and why this changes over time. The upper ocean is around the first 100 meters of the ocean where small particles form naturally before gravity sinks them to the deep ocean in a process known as particle flux. Previously it had been thought that sequestration simply depended on the rate at which the microscopic plants grow, however, this new paper shows that the makeup of the ocean ecosystem itself has a significantly outsized impact.

Professor Richard Lampitt, Senior Research Scientist at the NOC, and lead author on the report, said: "This research shows the importance of ongoing ocean research. PAP-SO is currently one of only four such long-term projects in the world and understanding the reasons why particle flux varies so much is crucial as we seek to understand the way it functions and develop ways to mitigate the effects of climate change in the future."

In the past few decades, the ocean has slowed down the rate of climate change by absorbing about 30% of all carbon emissions produced by humans. The process, named the Biological Carbon Pump (BCP), involves microscopic organisms from the upper ocean sinking to the deep ocean, sometimes thousands of meters below the surface. These organisms contain carbon which is removed from the atmosphere as CO2 and when they sink into the deep ocean, the carbon is removed from the atmosphere for hundreds or even thousands of years. The BCP is vital for the health of the planet as it currently transfers about 10 gigatonnes of carbon into the deep ocean every year that would otherwise end up in the atmosphere.

A specially designed buoy with numerous sensors has been deployed at a depth of 3,000 m as part of the PAP-SO project. There, traps collect sinking material into bottles every two weeks. Every year, the traps are recovered, and the samples removed before being replaced for the next year. Samples from the bottles are analyzed at the NOC. This allows scientists to confidently compare each year and detect changes, trends and safely inform policy makers.

Particle or sediment traps are funnel-shaped devices that capture sinking particles. (Credit: NOC)

LARGEST KNOWN DEEP-SEA CORAL REEF HABITAT REVEALED BY MULTI-PARTNER PROJECT

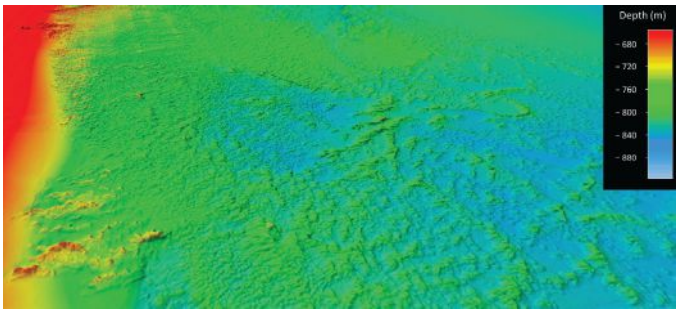
Covering 6.4 million acres, an area larger than Vermont, an underwater seascape of cold-water coral mounds off the shore of the southeast United States coast has been deemed the largest deep-sea coral reef habitat discovered to date, according to a paper recently published in the scientific journal *Geomatics*.

"This strategic multiyear and multi-agency effort to systematically map and characterize the stunning coral ecosystem right on the doorstep of the US East Coast is a perfect example of what we can accomplish when we pool resources and focus on exploring the approximately 50% of US marine waters that are still unmapped," said Derek Sowers, Ph.D., Mapping Operations Manager for the Ocean Exploration Trust and lead author of the study.

"Approximately 75% of the global ocean is still unmapped in any kind of detail, but many organizations are working to change that. This study provides a methodology aimed at interpreting mapping data over large ocean regions for insights into seafloor habitats and advancing standardized approaches to classifying them to support ecosystem-based management and conservation efforts."

For the study, *Mapping and Geomorphic Characterization of the Vast Cold-Water Coral Mounds of the Blake Plateau*, scientists synthesized bathymetric data from 31 multibeam sonar mapping surveys, the largest of which were led by NOAA Ocean Exploration, to produce a nearly complete map of the seafloor of the Blake Plateau, located about 100 miles off the southeast US coastline.

The study area that includes the coral reef is nearly the size of Florida. It is approximately 35–75 miles (60–120 km) offshore of the southeast coast beginning off Miami, Florida and stretching to the area offshore of Charleston, South Carolina. The authors used a standardized system developed as part of the study to classify, delineate, and quantify coral mound features. This automated system identified 83,908 individual coral mound peak features in the mapping data, providing the first estimate of the overall number of potential cold-water coral mounds mapped in the region to date.

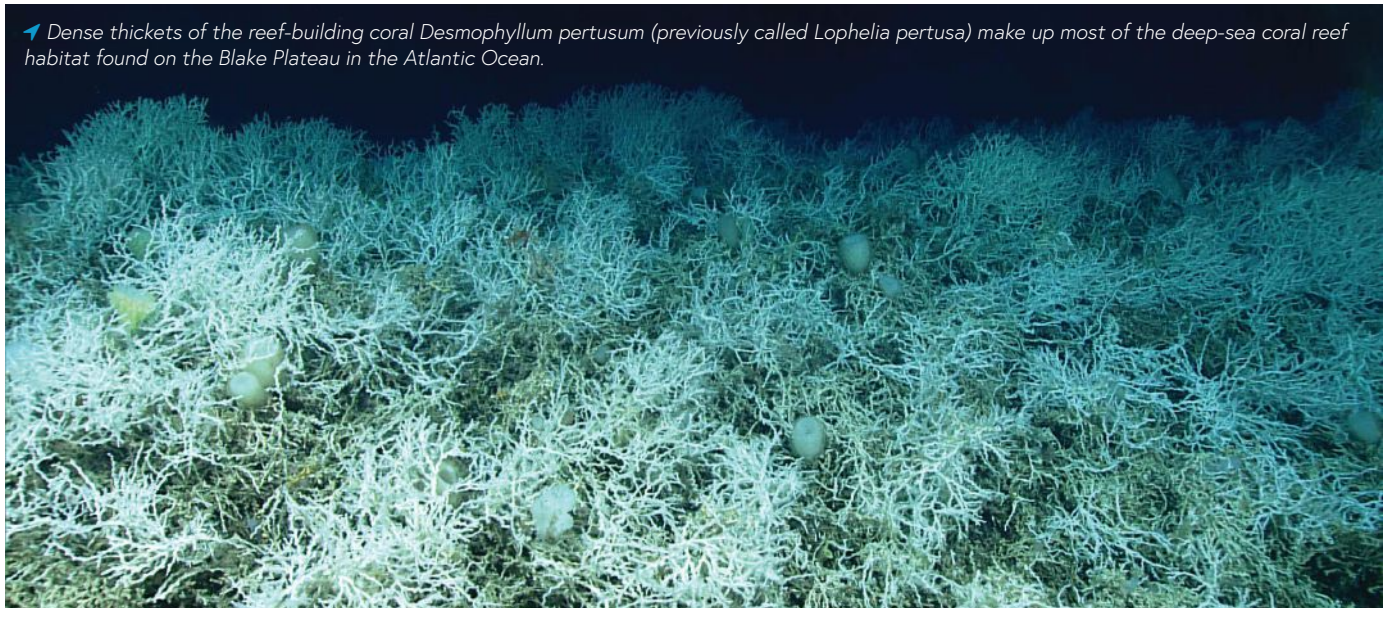


Atlantic Ocean seafloor multibeam bathymetry data showing the coral mound features in green located on the Blake Plateau. (Credit: Derek Sowers, et al.)

The study documents the massive scale of the coral province, an area composed of nearly continuous coral mound features that span up to 500 kilometers (310 miles) long and 110 kilometers (68 miles) wide, with a core area of high-density mounds up to 254 kilometers (158 miles) long and 42 kilometers (26 miles) wide. The results also highlight how different regions of the Blake Plateau exhibit large variations in the density, height and pattern of coral mound formation.

Data analyzed, which included imagery from 23 submersible dives in addition to mapping data, were collected as part of a coordinated, multi-year ocean exploration campaign involving NOAA Ocean Exploration, NOAA Ocean Exploration Cooperative Institute partners Ocean Exploration Trust and the University of New Hampshire, the Bureau of Ocean Energy Management, Temple University, and the US Geological Survey, with contributions from Fugro, the NOAA Deep Sea Coral Research and Technology Program, and the South Atlantic Fishery Management Council.

Dense thickets of the reef-building coral Desmophyllum pertusum (previously called Lophelia pertusa) make up most of the deep-sea coral reef habitat found on the Blake Plateau in the Atlantic Ocean.



ASL ENVIRONMENTAL SCIENCES EXPANDS WAVE MONITORING SERVICES

ASL Environmental Sciences (ASL) recently acquired three Mesemar PBM-15 Polyethylene buoys for a major metocean study being undertaken for a client project. These buoys are designed to the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recommendations and are made from high-quality rotomolded virgin polyethylene, filled with closed-cell expanded polyurethane foam. Highly suitable for deep-water sites, where extreme weather requires a more robust buoy for metocean data collection, they feature the ability to add an internal ballast weight for greater stability and high shock resistance.

Following their successful recovery in the spring of 2024, ASL plan to add these to their lease pool to offer to future clients, especially for measuring directional waves in offshore environments to support the development of offshore wind farms and other marine renewable energy projects where stable, reliable data collection over extended periods is required.

The PBM-15 can easily be configured to meet client monitoring needs and client-customized instrument packages. The buoys are intended to expand ASL's existing shallow-water wave monitoring services to include deep-water directional wave studies for site assessment, numerical modeling studies, and other applications. Examples of data collection include, but are not limited to, directional waves, wind, barometric pressure, and custom solutions.

ASL's three yellow buoys are instrumented with a yellow flashing light to conform to the standards and guidelines in the Canadian Aids to Navigation System (TP 968). (Credit: ASL)

TAKE 5

THE ON&T INTERVIEW

Small footprint, big impact is perhaps the best way to sum up Sulmara's influence on the international survey services market in recent years. Founded in 2019, Sulmara is laser focused on decarbonizing the offshore energy industry by substituting traditional operational support for the use of uncrewed and remote survey solutions. This month we catch up with Michael King, Sulmara's Head of Sales, to find out more.

with Michael King
Head of Sales
SULMARA

1 ON&T: For any readers not familiar with Sulmara, give us a quick overview...

MK: Sulmara is a leading international subsea services provider, specializing in site investigation, construction support, subsea survey, and asset inspection across the offshore energy and utilities sectors. We aim to drive the decarbonization of offshore services by using innovative technologies and methodologies.

We were established in 2019, and in that same year delivered an uncrewed surface vessel (USV) force multiplier survey solution generating carbon savings in excess of 4.5 million cubic meters on a single project—a real statement of intent. Since then, we have been at the forefront of USV operations globally, including being part of the first Orsted award for uncrewed survey services in 2021 on the Greater Changua offshore windfarm in Taiwan.

In 2023, we were delighted to be awarded a £2 million grant from Net Zero Technology Centre to advance the use of towed sensors from USVs for use in the offshore energy sector, building on successful delivery of over the horizon USV operations on three continents. We now have over 200 staff, and offices in the US, the UK, Singapore, and Taiwan to support our customers internationally. Our growth has been significant, not only in terms of our capabilities, but also our people and global footprint, and we will continue to expand in 2024, further de-risking the use of sustainable technology on behalf of our clients.

We aim to innovate with purpose, challenging industry conventions to deliver environmental, technical, and commercial advantages to our clients, because the environmental impact of our decisions doesn't stay offshore.

Sulmara's WAM-V USVs are battery powered, so data can be acquired with zero carbon footprint. (Credit: Sulmara)

2 ON&T: With a growing range of commercial USVs available, what makes Sulmara's unique?

MK: Our culture of innovation is what sets us apart. We don't have all the answers, and we recognize that any technology has limitations. For many offshore tasks, USVs provide an alternative solution that significantly reduces CO2 emissions when compared to conventional technology, but they are not always the whole answer.

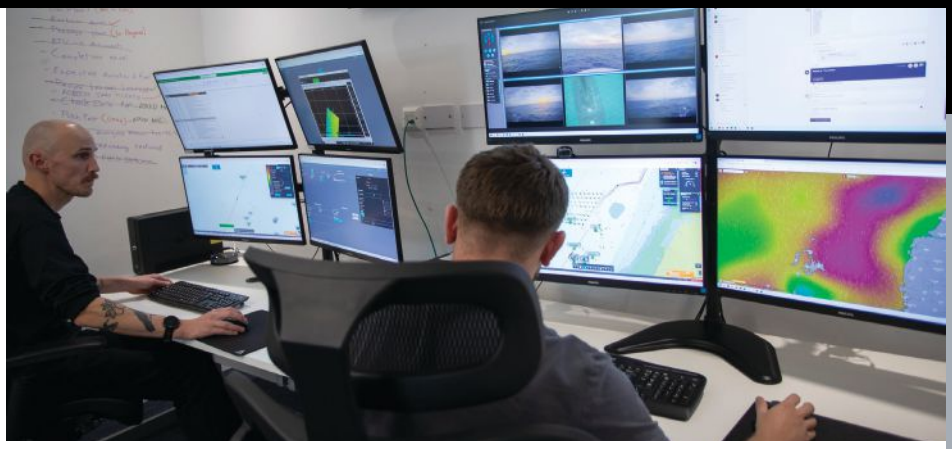
At Sulmara, we aren't limited to one uncrewed platform or operational methodology; it's our project experience with a range of different platforms and remote-control systems, in a variety of marine environments, that sets us apart. We are constantly solving real-world problems for our clients with evolving methodologies and technologies. Our people are empowered to take a problem or a challenge and solve it in a different way—beyond convention—and develop, de-risk, and prove solutions for our clients.

3 ON&T: What impact might uncrewed platforms have on the ocean industries this decade?

MK: The use of uncrewed and remote technology will expand, that is hard to contest. It is now up to developers to invest in practical solutions that meet the demands of the sector.

We have already demonstrated that USVs with towed sensors can provide uncrewed capability in unexploded ordnance (UXO) clearance and risk management, and with more and more clients wanting low carbon solutions, USVs can be utilized in areas that make conventional deployments risky for the personnel on vessels.

We are working to improve on the towing capabilities of USVs to further expand the types of projects able to be completed remotely and with no one offshore. This will in turn expand their use across all phases of offshore energy projects. We have already worked with many of the world's leading energy companies, such as Orsted and Chevron, proving the technology in the field, and we're excited about our next phase of development. It's not been easy—the application of new technology never is—but based on recent work in the field, we see USVs as central to the future of offshore survey.



Sulmara sees remote operations as the key to safe and efficient offshore survey. (Credit: Sulmara)

4 ON&T: Could you share any details of such a USV-led project?

MK: We have worked on many USV-inspired projects in recent years, from feasibility studies for the European Space Agency to over-the-horizon projects in Taiwan, each time using a USV model and configuration best suited to the environment of operation. Most recently, we've been proving some of our sensor towing capabilities for UXO missions, and for very shallow water route survey work where traditional techniques would not have yielded adequate data quality.

In the past, the complexity of towing additional sensors was seen as the most significant limitation of USVs. However, in 2023 we worked with one of our partners, UXO risk management experts SafeLane Global, to simultaneously collect detailed bathymetry data while scanning for potential UXO targets using a towed magnetometer array from one of our WAM-V USVs.

The USV was outfitted with a state-of-the-art high resolution MBES system to acquire detailed bathymetric data and towed two magnetometers to detect any magnetic anomalies from potential buried UXO. This project was challenging given the extreme shallow water and operational confines of a port, where even the smallest crewed vessel would have struggled. Thanks to the innovative towing setup, we were able to provide excellent data quality to mitigate the UXO risk, and as the WAM-V USV is battery powered, the data was acquired with zero emissions. As part of our commitment to de-risking new technology, Sulmara carried out extensive trials on Loch Ness in Scotland, the only disappointment being no mythical creatures in sight!

5 ON&T: What does 2024 and beyond hold for the team at Sulmara?

MK: We are busy working towards announcing some exciting additions to our business and expanding our offering to our clients. Not forgetting what sets us apart, we are driving innovation and technology development to ensure we can meet market needs, whilst keeping our impact on the environment as minimal as possible.

To achieve this, we have to be thought leaders, and we are proud to have been asked to moderate a series of thought-provoking panel discussions at Oceanology International this year, designed to challenge ourselves and our industry peers, clients, and suppliers to try and re-evaluate the way we do things, the overall risk management concepts we use, and how we impact the environment in the long term. We'll also be taking part in similar technology and innovation-focused conference sessions at the Oceantic Network's International Partnering Forum in New Orleans in April, sharing some lessons learned from our operations across the world and continuing the discussion with other industry leaders to work out how we can all get better.

Throughout this year, we will continue to challenge convention and collaborate with our partners to bring clients and technology to a path that delivers our energy needs with a clear focus on the impact we leave for the future.

sulmara.com

SMART CABLE TO MONITOR SEISMIC ACTIVITY OFF THE COAST OF CATANIA IN SICILY

Güralp Systems Ltd, a leading global provider of seismic monitoring instrumentation and solutions, has successfully designed, manufactured, and deployed a 21-km 'SMART' cable 30 km off the coast of Catania in Sicily, Italy. The SMART cable (Science Monitoring and Reliable Telecommunications) is an innovative system developed by Güralp in partnership with Istituto Nazionale di Geofisica e Vulcanologia (INGV), for the Italian InSEA SMART cable Wet Demonstrator project which will measure seismic risk off the coast of Sicily.

A repeater being deployed. (Credit: Güralp Systems)

The InSEA project, funded by the Italian Ministry of Research and managed by the Istituto Nazionale di Geofisica e Vulcanologia (INGV), aims to investigate the use of seismometers and environmental monitoring sensors deployed in and around the repeater housings of traditional telecommunications cables without compromising the scientific or operational value of the data being transmitted by the sensors.

The pioneering SMART cable system comprises a 21-km-long telecommunications cable with three instrumented repeaters located at spacings of 6 km. Each repeater houses a Güralp Certimus seismometer, a Güralp Fortimus accelerometer plus an externally mounted instrumentation pod that contains an absolute pressure gauge and a temperature sensor. Global Marine provided Güralp with specialist assistance with the repurposing of the repeater housings.

The system was designed to be laid using standard commercial ocean cable-laying equipment and the successful deployment onto the seabed was undertaken in this way, during a 36-hour window last month, to a depth of 2,000 m. Initial data collected from the instrumentation following deployment showed that all was working as anticipated. Further analysis of the data collected by the system will be undertaken following a more substantial monitoring period.

MARLINK UPGRADES SEISMIC SURVEY VESSEL TO GATHER CRITICAL OFFSHORE LARGE-SCALE DATA

Marlink, a smart network and digital solutions company, has upgraded the smart hybrid VSAT installation on the seismic research vessel *Ramform Hyperion* to provide an uplink speed of more than 250 megabits per second (Mbps) using GEO VSAT.

This throughput was achieved to enable the transfer of seismic data from the vessel to its landside headquarters for processing in real time. The increase in capability and efficiency for the vessel's network reflects the very high value of the exploration 3D, high-density 3D or 4D undersea imaging it produces.

Using a bespoke engineering approach, Marlink's in-house team of engineers designed a technical solution based on a 1.5 m VSAT antenna, enabling seamless transfer of 2.7 terrabytes of data from ship to shore in 24 hours. Longer term, the solution was able to provide an average capacity of more than 230 Mbps upload from the vessel.

The data transfer was achieved using Marlink's network of high throughput GEO satellites, with the focus on delivering data at the required speed specifically to shore.

Beyond theoretical specifications, the trial aimed to evaluate the real-world performance of VSAT services in a dynamic maritime environment. Factors such as signal stability, latency, and adaptability to varying weather conditions were integral to the assessment.

The data transfer was achieved using Marlink's network of high throughput GEO satellites. (Credit: Marlink/PGS)

NBOSI TO PROVIDE CT SENSORS
FOR SAILBUOY UNCREWED SURFACE VESSELS

NBOSI Sensors to Enhance SailBuoy Capability. (Credit: NBOSI)

NBOSI's Conductivity-Temperature (CT) Sensor has been selected by Offshore Sensing AS to enhance the capabilities of their latest SailBuoy uncrewed surface vessels.

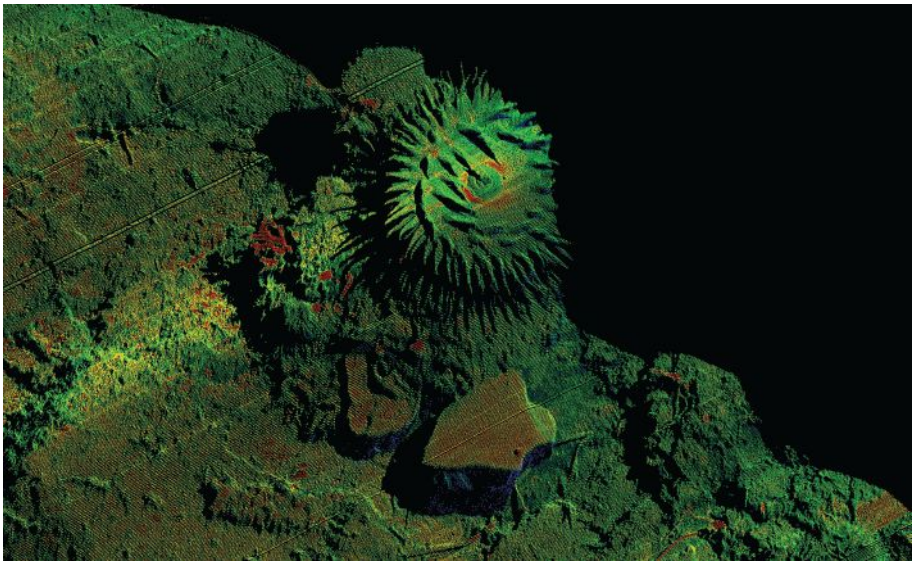
These sensors cater to the specific needs of autonomous underwater and surface ocean vehicles, serving a wide range of sectors including research, offshore operations, survey and defense.

Established in 2014 as a spin-off from Christian Michelsen Research, Offshore Sensing AS specializes in developing SailBuoys for various ocean applications including wave measurement and water quality monitoring. The SailBuoy autonomously navigates the oceans, transmitting crucial data at regular intervals. Field-proven for extended periods at sea, including the first trans-Atlantic crossing by an unmanned surface vehicle, the SailBuoy is a solution for measuring ocean parameters, tracking oil spills, and acting as a communication relay station for subsea instrumentation.

"We are delighted to continue our relationship with Offshore Sensing AS and contribute to the success of their SailBuoy unmanned surface vessel. NBOSI's commitment to creating accurate, reliable sensors aligns seamlessly with the innovative technologies employed by Offshore Sensing AS," said Dave Fratantoni, CEO at NBOSI. "Our sensors have decades of field application, and we are confident in their ability to enhance mission performance."

Commenting on the collaboration, David Peddie, Chief Technology Officer at Offshore Sensing AS added: "NBOSI sensors enable the SailBuoy to deliver accurate and reliable temperature and salinity data for our customers."

VOYIS INSIGHT MICRO LASER SCANNER
UNLOCK SECRETS OF VERTICAL CORAL REEFS



Credit: Expedition FKt230918 funded by the Schmidt Ocean Institute with participation of the Charles Darwin Foundation and the Galapagos National Park.

Voyis, a pioneer in cutting-edge technology solutions, is proud to announce its work with Memorial University of Newfoundland on an extraordinary scientific expedition to the Galápagos Islands funded by Schmidt Ocean Institute, and with the participation of the Charles Darwin Foundation and the Galápagos National Park. This initiative, led by Chief Scientist Katleen Robert, represents a groundbreaking effort to explore and document the enigmatic world of cold-water coral ecosystems thriving on the cliffs of this UNESCO World Heritage site.

The Galápagos Islands, renowned for their unique biodiversity, are home to a multitude of cold-water corals, including those residing in vertical habitats. These deep-dwelling corals, shrouded in mystery due to their inaccessibility, hold vital ecological significance. The expedition took place from September 18 to October 19, 2023, and was equipped with advanced technology, including Voyis' Insight Micro laser scanner, to unlock the secrets of these vertical coral reefs.

Cold-water corals on cliffs have long presented challenges to researchers due to their depth and inaccessibility to ship-based sensors. The Insight Micro laser scanner, known for its capability to capture high-resolution 3D data and crisp still images with low power consumption, is poised to play a pivotal role in overcoming these obstacles.

The Galápagos Marine Reserve, one of the world's largest marine protected areas, ensures that these coral ecosystems have remained untouched by destructive human activities. This pristine environment provides an unprecedented opportunity for Chief Scientist Katleen Robert and her team to study undisturbed ecosystems. The resulting baseline data will be shared with local colleagues and used in regional conservation efforts.

While tropical and shallow-water corals are well-documented, cold-water corals constitute approximately half of the global coral population. Yet, the vertical environments where many thrive remain largely unexplored. This knowledge gap, especially in the southern hemisphere, underscores the significance of this expedition in contributing to a more comprehensive understanding of global coral ecosystems.

Cold-water corals, which lack symbiotic algae found in shallow-water corals, rely on passing currents for sustenance. The team's research will shed light on the intricate relationship between water column dynamics, physical reef features, and coral survival. Additionally, the connection between geology and coral fine-scale distribution will be examined to better comprehend the environmental conditions shaping these vertical reefs.

The heart of this expedition lies in the deployment of the ultra-high-resolution laser scanner, which will create a detailed 3D reconstruction of the coral habitat, including cliff morphology and biological layers.

Using the ROV SuBastian as a survey vehicle, the team will map these vertical reefs with unparalleled precision, allowing for the study of organism distribution, biodiversity, coral growth, and the identification of individual species. This digital reconstruction will provide accessible insights for scientists and the public alike.

Voyis' Insight Micro laser scanner. (Credit: Voyis)

DIALOGUES WITH INDUSTRY ROADMAP
PUBLISHED BY MTS AND PARTNERS

In late January, The Marine Technology Society (MTS) announced the release of the Dialogues with Industry Roadmap, a groundbreaking collaboration involving MTS, the Global Ocean Observing System (GOOS), the National Ocean and Atmospheric Administration (NOAA), and industry representatives. This Roadmap is a significant step towards advancing a robust Ocean Enterprise that is essential to lives and livelihoods and contributes to the global Gross Domestic Product.

Developed over the past year, the Roadmap identifies 26 high-priority action pathways across three key areas: Improving the Marketplace, Collaboration for Societal/Governmental Change, and Shaping the Future.

"Through active engagement and collaboration within these key domains, MTS is dedicated to contributing its expertise to foster positive transformation within the Ocean Enterprise, ensuring that it remains at the forefront of cutting-edge technology, collaboration, and innovation," said MTS past president Zdenka Willis.


MTS

MTS, GOOS, and NOAA, along with representatives from Kongsberg Discovery and L3Harris invite all stakeholders in the Ocean Enterprise, spanning public, private, and academic sectors, to join forces in accelerating the Roadmap's implementation.

"By collaborating as an enterprise, we can amplify our collective voices and influence the trajectory of the Ocean Enterprise, while also promoting blue investment strategies," said Chris Ostrander, CEO of MTS.

As the initiative progresses into 2024, the organizations plan to develop a strategy for implementation and reporting on high-level actions. They commit to releasing an annual Ocean Enterprise Report to transparently track progress and highlight achievements. The emphasis remains on accelerating actions identified by the ocean observing community in the flagship Dialogue series and collaborating to find innovative solutions for tackling the ocean's most pressing challenges.

To access the Dialogues with Industry Roadmap, visit **mtsociety.org/goos-mts-dialogues-with-industry**.

FIRST POWER FROM VINEYARD WIND DELIVERED TO THE NEW ENGLAND GRID

A GE Haliade-X Turbine stands in the Vineyard Wind 1 Project Area. (Credit: Worldview Films)

Copenhagen Infrastructure Partners (CIP) and Avangrid, Inc. recently announced that power from the Vineyard Wind project was delivered to the New England grid for the first time on January 2, 2024, when one turbine delivered approximately five megawatts of power. The project expects to have five turbines operating at full capacity early in 2024.

"This is a historic moment for the American offshore wind industry," said Governor Maura Healey. "Soon, Vineyard Wind will be producing power equivalent of over 400,000 Massachusetts households. This is clean, affordable energy made possible by the many advocates, public servants, union workers, and business leaders who worked for decades to accomplish this achievement. As we look ahead, Massachusetts is on a path toward energy independence thanks to our nation-leading work to stand up the offshore wind industry."

"This truly is a milestone for offshore wind and the entire renewable industry in North America. For the first time we have power flowing to the American consumers from a commercial-scale wind project, which marks the dawn of a new era for American renewables and the green transition," added Tim Evans, Partner at CIP and Head of North America. "

"We've arrived at a watershed moment for climate action in the US, and a dawn for the American offshore wind industry," Avangrid CEO Pedro Azagra said.

Power from the project interconnects to the New England grid in Barnstable, transmitted by underground cables that connect to a substation further inland on Cape Cod. Once completed, the project will consist of 62 wind turbines generating 806 Megawatts, enough to power more than 400,000 homes and businesses in Massachusetts.

NEW NORTH STAR SOV SECURES CHARTER TO SERVICE HE DREIHT OFFSHORE WIND FARM

North Star has secured a contract with energy utility giant EnBW to deliver a new hybrid-electric service operations vessel (SOV) on a decade-long minimum charter to service the He Dreiht wind farm off the coast of Germany.

The agreement marks the firm's first offshore wind win outside the UK market, a milestone step in its ambitious European growth strategy to add 40 new SOVs to its fleet by 2040.

The newbuild is of VARD 407 design which has been tailored to meet EnBW's specific requirements. To drive high performance and efficiencies, the high specification vessel includes Voith Schneider eVSP propulsion and is prepared for the use of methanol as a fuel. The ship is also fully equipped with a height adjustable motion compensated gangway and 3D compensated crane. In addition, it utilizes the best available technology to support decarbonization, including North Star's Decision Support system.

Scheduled to commence long-term charter with EnBW from the end of next year, the walk-to-work vessel will provide premier accommodation in field for up to 34 wind technicians as they maintain the development's 64 wind turbines, located around 90 km northwest of the island of Borkum and 110 km west of Helgoland. The SOV will also act as a logistics hub and warehouse.

This new win for North Star marks the seventh newbuild SOV for the company since entering the renewables market in 2021. Its first two SOVs (VARD 4 12 and VARD 4 19 designs), The *Grampian Tyne* and *Grampian Derwent*, were delivered ahead of schedule last year, with a further two ships for the same UK North Sea client on track for delivery in February 2024 and February 2025 (both VARD 4 12s).

North Star's new SOV has been tailored to meet EnBW's specific requirements. (Credit: North Star)

DEMAND FOR ALTERNATIVE-FUELED VESSELS PROPEL MARITIME DECARBONIZATION EFFORTS

The latest stats from DNV's Alternative Fuels Insight (AFI) platform found that a total of 298 ships with alternative fuel propulsion were ordered in 2023—an 8% increase year on year. The year also saw methanol go mainstream, with a sharp increase in orders (138) putting it neck and neck with LNG (130). Additionally, 2023 marked a breakout year for ammonia, with 11 orders for vessels run on this fuel, and more in the pipeline.

Faced with increasing pressure to reduce greenhouse gas emissions, including stricter targets set by the International Maritime Organization (IMO) in July 2023, the maritime sector is considering a range of decarbonization options. Through its AFI platform DNV registers the industry's efforts related to newbuild vessels and retrofitting with 298 orders for vessels able to run on alternative fuels logged in 2023, and a total of 1,281 ships overall.

Knut Ørbeck-Nilssen, CEO Maritime at DNV, said: "As we navigate towards a greener maritime future, the growing demand for alternative-fueled vessels speaks volumes. These orders send pivotal signals to fuel providers and other important partners on shipping's decarbonization journey. While it is clear that the maritime fuel technology transition is already underway, we now need to ensure the fuels powering these engines become available.

"It is however crucial to emphasize that focusing solely on fuels may divert our focus from achieving significant impact in this decade. What is required are concrete measures that actively lower emissions. Energy efficiency initiatives can yield decarbonization outcomes both now and leading up to 2030."

RANGER 2 USBL FOR PDE OFFSHORE

Leading Taiwanese offshore geophysical and geotechnical investigation company PDE Offshore Corporation have upgraded their underwater acoustic positioning system onboard MV *Geo Energy* to Sonardyne's Ranger 2 USBL system. This will further enhance their capability in the exploration of offshore renewable energy (ORE) in Taiwan.

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

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

Sonardyne/PDE Offshore

NAVIGATING THE FUTURE

COVE's Digital Harbour

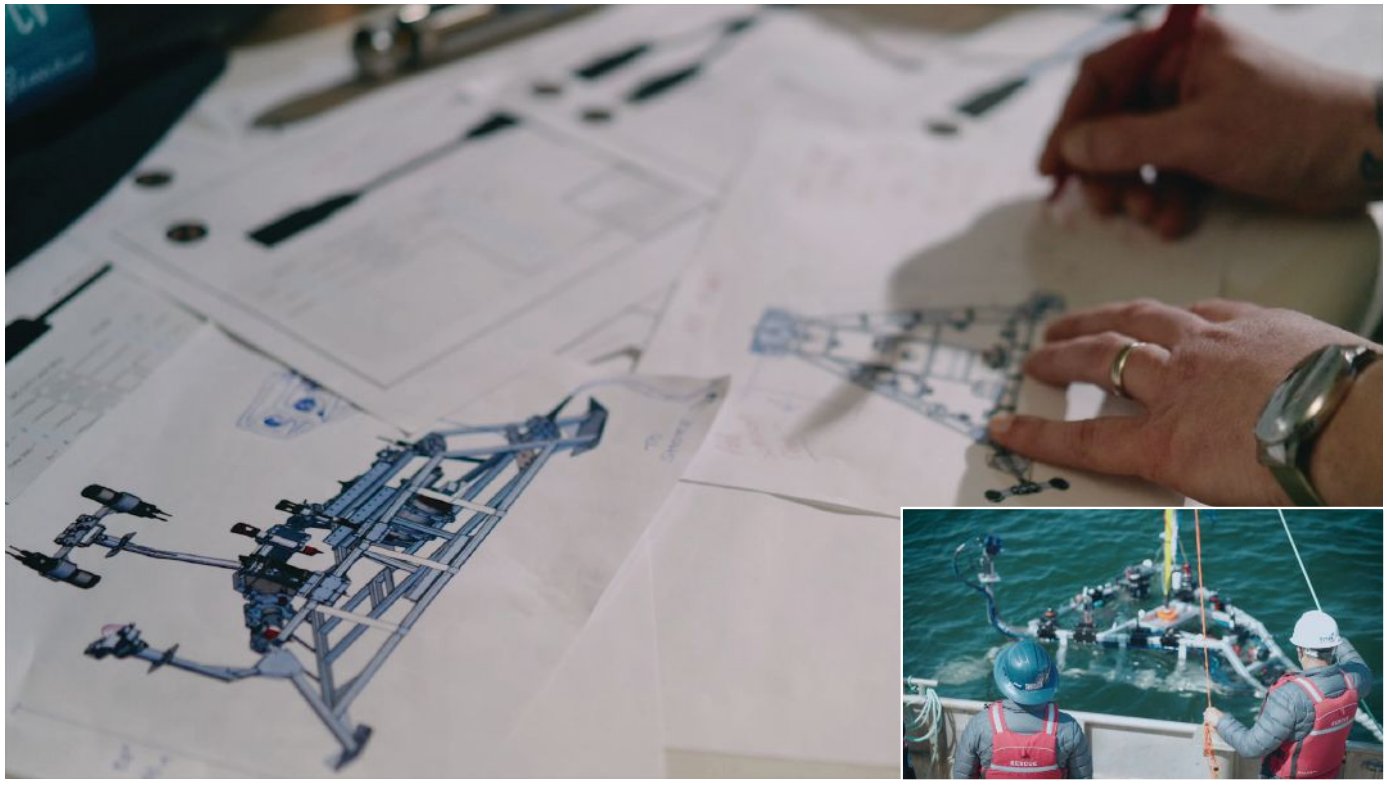
Levi Morrison, P.Eng, PMP, M.A.S.c.
Director of Innovation
COVE

> DIGITAL HARBOUR IS NOT MERELY A TECHNOLOGICAL ENDEAVOR; IT SERVES AS A TESTAMENT TO THE INFLUENCE OF STRATEGIC PARTNERSHIPS AND SHARED EXPERTISE IN SHAPING THE FUTURE OF MARINE DATA AND TECHNOLOGY.

In the heart of innovation, COVE is steering the course towards a revolutionary transformation of the Halifax Harbour, one of the world's largest and deepest-ice-free harbours, located in Nova Scotia, Canada. Through collaborative efforts with companies within the marine ecosystem, COVE has identified a crucial need for a shared foundation of physical and digital infrastructure centered around ocean data to propel product advancement.

COVE's Digital Harbour initiative aims to digitize the Halifax Harbour, creating a comprehensive real-time data platform. This ambitious project encompasses data collection from various sources, spanning the seabed, in the water, on the water's surface, on land, in the air, and via satellite—a concept which evolved from COVE's Stella Maris Testing Solution, a shoreside testbed for marine instrumentation. This inclusive approach sets the stage for a transformative leap in the ocean data landscape.

Designs for Stella Maris, now fully operational as a shoreside testbed for marine instrumentation. (Credit: COVE)



INDUSTRY-SPECIFIC INSIGHTS

Digital Harbour focuses on generating industry-specific insights by collecting data in key locations in real time. The digital platform, designed to be user-friendly and accessible, facilitates collaboration among stakeholders involved in developing ocean products along with the broader ocean community. This collaboration is vital for overcoming challenges unique to ocean data management and product development.

Recent advancements in ocean observation technologies will be integrated into Digital Harbour, creating a network of real-time data collection instruments. This blend of cutting-edge instruments and historical data holds immense potential for developing and implementing predictive algorithms, deepening our understanding of marine environments and enhancing our ability to anticipate and respond to changes in the marine ecosystem.

Managing ocean data poses difficulties as conditions are constantly changing, operational expenses are high, and direct access to hardware in the field is challenging. COVE recognizes the challenge of implementing standardized measurement concepts and is actively striving to create consistency among different data sets using the Halifax Harbour as the platform to do so. The integration of various datasets on the Digital Harbour platform enables the discovery of novel insights that were previously inaccessible solely through historical data analysis.

THE ROLE OF AI

The utilization of various data sets within a consolidated platform such as Digital Harbour marks a new era of knowledge that was previously unattainable solely through historical data. AI algorithms have the ability to analyze vast and complex data sets, uncovering patterns and correlations that traditional analytical methods may overlook.

A prime example is the ability to monitor E. Coli levels in the harbour, one of the several validated use cases of the project. By merging this information with live AIS (Automatic Identification System) data, it opens the opportunity to explore the potential correlation between elevated E. Coli levels and heightened vessel activity, isolated weather events, or seasonal variations. This integration offers valuable insights that were previously inaccessible, enabling a deeper understanding of the factors potentially influencing E. Coli levels and their impact on specific areas.

This increased understanding can result in more precise interventions and preventive measures aimed at reducing the risk of E. Coli contamination in our waters. Through the possible connection between vessel activity or weather events and levels of E. Coli, governing bodies can enforce more stringent regulations and monitoring procedures during peak periods. This implies that specific actions can be taken by authorities to tackle the problem of E. Coli contamination in our water, such as increasing the frequency of water quality tests or implementing stricter regulations. This data-driven approach can contribute to informing the public about the potential health hazards linked to certain areas, fostering responsible behavior and decreasing the likelihood of contamination incidents.

A CONNECTED FUTURE

Digital Harbour is not merely a technological endeavor; it serves as a testament to the influence of strategic partnerships and shared expertise in shaping the future of marine data and technology. The project highlights the importance of collaboration, forging innovative alliances, and implementing practical solutions, thereby demonstrating COVE's dedication to creating an environment that fosters technological advancements.

This initiative marks a significant stride towards a more interconnected and technologically advanced marine ecosystem. As COVE continues to navigate the intricacies of the marine technology landscape, its unwavering commitment to collaborative endeavors and practical implementations ensures a future where the oceans are not only traversed but also comprehended, monitored, and safeguarded through the power of groundbreaking technology.

coveocean.com

The integration of various datasets on the Digital Harbour platform enables the discovery of novel insights. (Credit: COVE)

EQUINOR AWARDED 39 NEW LICENSES ON NORWEGIAN CONTINENTAL SHELF

Equinor has been awarded 39 new production licenses by the Ministry of Energy in this year's Awards in Predefined Areas (APA):18 production licenses in the North Sea, 13 in the Norwegian Sea, and 8 in the Barents Sea. Equinor is the operator of 14 of the awarded licenses, and a partner in 25.

"These licenses give Equinor and our partners new opportunities to further develop the Norwegian continental shelf (NCS) as an energy province. We are familiar with the geology and confident that we will make new discoveries," said Jez Averty, Equinor's SVP for Subsurface, NCS. "Continued active exploration is necessary in order to reduce the production decline that will occur on the NCS. Phasing in oil and gas from new discoveries will secure long-term activity and contribute to energy security in the European and UK energy transition."

In Norway, Equinor is the operator of 35 offshore platforms with low production emissions, and processing and export infrastructures that have largely been paid off. Infrastructure-led discoveries can be rapidly developed, at low cost, and with low greenhouse gas emissions from production and transportation.

"We are modernizing the infrastructure on the NCS with an eye to the energy transition. Based on our plans for electrification and continued cuts in our own greenhouse gas emissions, the production from new discoveries in brownfield areas will not increase our production and transportation emissions. For discoveries that will require new development solutions, we will aim at technological solutions with low emissions. Equinor's energy transition plan, committed to cutting emissions in line with the Paris Agreement, also includes phasing in production from new discoveries," Averty added.

The authorities increased this year's round of awards by 92 blocks in the northwest of the Norwegian Sea and west of the Barents Sea.

Lone Stormoen/Equinor

EMPIRE WIND 2 OFFSHORE WIND PROJECT SEEKS NEW OFFTAKE OPPORTUNITIES

Jan Arne Wold/Equinor

Equinor and bp have announced an agreement with the New York State Energy Research and Development Authority (NYSERDA) to terminate the Offshore Wind Renewable Energy Certificate (OREC) Agreement for the Empire Wind 2 project, an offshore wind project in the US with potential generative capacity of 1,260 MW.

This agreement reflects changed economic circumstances on an industry-wide scale and repositions an already mature project to continue development in anticipation of new offtake opportunities. The decision recognizes commercial conditions driven by inflation, interest rates and supply chain disruptions that prevented Empire Wind 2's existing OREC agreement from being viable.

Equinor and bp believe offshore wind can be an important part of the energy mix and are committed to maintaining substantial contributions to the state and local economy.

"Commercial viability is fundamental for ambitious projects of this size and scale. The Empire Wind 2 decision provides the opportunity to reset and develop a stronger and more robust project going forward," said Molly Morris, president of Equinor Renewables Americas.

"bp is supportive of NYSERDA's leadership and commitment to offshore wind, which we believe is a critical part of New York State's and America's clean energy future," said Joshua Weinstein, bp's President of Offshore Wind Americas. "Offshore wind can deliver reliable renewable power as well as economic benefits to the state and its communities."

The Empire Wind 1 and Empire Wind 2 projects recently reached a key federal permitting milestone, having received the federal Record of Decision from BOEM; last month, Empire Wind 1 also received its Article VII Certificate of Environmental Compatibility and Public Need in New York.

TIDAL ENERGY SOLUTION
OFFERS ROUTE TO COMMERCIALIZATION


HydroWing

HydroWing is designed to be a cost-effective and scalable solution to tidal stream energy generation and was the largest tidal stream project in Wales to be successful in the UK government's latest Contracts for Difference round, having been awarded a 10 MW project at the Morlais tidal energy site in Anglesey.

Commercialization of the tidal energy sector has so far been held back by high operations and maintenance costs. HydroWing's next generation technology addresses that challenge head on. Its HydroWing technology offers a modular, reliable solution, based on its unique patented design. The wing system streamlines operations and maintenance by allowing for removal of sets of tidal energy turbines without the need to remove or work on the foundations. The new Quad Hull Barge is the latest innovation to the HydroWing system, which further increases productivity and drives down costs.

Richard Parkinson, MD of Inyanga Marine Energy Group, which is the parent company for HydroWing, said: "Deployment, recovery, and operations and maintenance are large factors in determining the levelized cost of electricity. However, offshore construction vessel availability is very weak with expensive day rates. This means that the cost of planned and unplanned offshore operations is very high. HydroWing's new Quad Hull Barge has been specifically designed to tackle this issue, driving down costs and ensuring the turbines can be effectively maintained at low cost and with reduced downtime.

"By using four hulls connected by crossbeams and arch support beams, the limit to load width is dramatically increased. Where commercial vessels would typically need to place the load onto the deck with little to no overhang of the load, the Quad Hull Barge locks the load after lifting to the arch. This reduces offshore handling and makes the operation much safer. It means that the width of the load can be independent of the vessel width."

AW-ENERGY UNVEILS WAVE ENERGY SYSTEM IN 150 MW OFFSHORE RENEWABLES PROJECT

WaveRoller converts ocean wave energy to electricity. (Credit: AW-Energy)

Finnish enterprise AW-Energy has successfully developed WaveRoller, a technology that converts ocean wave energy to electricity. The machine operates in near-shore areas (up to 2 km from shore) at depths of between 8 and 20 m. Depending on tidal conditions it is mostly or fully submerged and anchored to the seabed.

With the support from the EU-funded WaveFarm project, AW-Energy worked on scaling up wave energy production to industrial levels.

Unlike some renewable sources, wave conditions are highly predictable, allowing grid operators to forecast them days ahead with remarkable accuracy. This predictability, coupled with the extended use of wave energy converters is expected to provide up to 10% of the EU's energy by 2050, reducing the need for fossil fuel backup generators.

The EU aims to have at least 42.5% of renewable energy by 2030. The objective for ocean energy is to have at least 1 GW of installed capacity by 2030 and 40 GW by 2050—40 GW of installed capacity would be enough to supply roughly 40 million homes.

AW-Energy envisions a global project pipeline of 150 MW for the WaveFarm solution, unlocking economic benefits and job creation in the EU.

Through the implementation of the WaveFarm project, AW-Energy anticipates an addition of €275 million to the European economy and the creation of 500 jobs over the next decade. Deploying WaveRoller technology is projected to reduce 250,000 tons of CO2 emissions by 2030, making a substantial contribution to the transition to a sustainable blue economy. In addition, WaveFarms have been shown to attract fish stocks, which will benefit local fishing industries.

SHELL JOINS COLLABORATIVE PROJECT TO INTEGRATE RENEWABLE SUBSEA POWER

Energy major Shell has joined the Renewables for Subsea Power (RSP) collaborative project which is currently powering subsea equipment off the coast of Orkney through a combination of wave power and subsea energy storage.

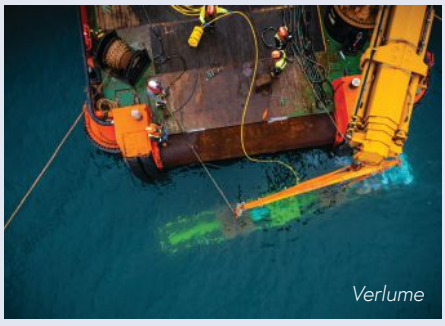
The £2 million demonstrator initiative, which is currently nearing 12 months in the water, has connected the *Blue X* wave energy converter—built by Edinburgh company Mocean Energy—with a Halo underwater battery storage system developed by Aberdeen intelligent energy management specialists Verlume.

The fully operational project, located 5 km east of Orkney Mainland, aims to show how green technologies can be combined to provide reliable low carbon power and communications to subsea equipment, offering a cost-effective alternative to umbilical cables, which are carbon intensive with long lead times to procure and install.

The new investment has come via the Shell Technology – Marine Renewable Program, a global R&D group pursuing the mission of finding, screening, testing, and developing marine renewable energy technologies to achieve more value with lower emissions and help build the critical energy infrastructure for the Blue Economy to grow and thrive.

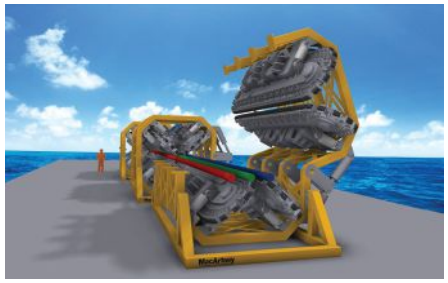
Joining RSP offers Shell access to all data and results from the current test program, alongside a feasibility assessment of the use of RSP technology at a location of their choice.

The Orkney deployment is the third phase of the pioneering Renewables for Subsea Power project. In 2021, the consortium invested £1.6 million into phase two of the program—which saw the successful integration of the core technologies in an onshore test environment at Verlume's operations facility in Aberdeen.



Verlume

MACARTNEY CEMAC TENSIONER SELECTED FOR JAN DE NUL CLV



MacArtney CEMAC tensioner system. (Credit: MacArtney)

MacArtney Offshore Wind Solutions, specializing in offshore mission equipment, has announced an expansion of its partnership with Jan De Nul Group. The company has been entrusted with designing and supplying custom CEMAC tensioner systems for Jan De Nul Group's entire cable-laying vessel (CLV) fleet, which includes the world's largest CLV, the *Fleeming Jenkin*.

MacArtney's comprehensive scope involves designing, constructing, and delivering advanced tensioner systems for Jan De Nul Group's entire cable-laying fleet, including the *Connector, Willem de Vlamingh* and the new *Fleeming Jenkin*. The scope also encompasses upgrading tensioner systems previously delivered for the *Isaac Newton*.

Remarkably, MacArtney's involvement extends to the recently announced XL CLV—the *Fleeming Jenkin*—boasting a cable carrying capacity of 28,000 tonnes and engineered for ultra-deep laying in waters up to 3,000 meters, as well as bundled lay operations.

For the XL CLV, MacArtney will supply three high-capacity CEMAC four-track main deck tensioners designed to facilitate bundled lay operations with minimized cable distance and combined lay operations up to 150 tonnes, two CEMAC loading arm tensioners and associated fully electrical 1-tonne cable engines.

The electrically driven tensioners ensure safe and controlled cable handling, with real-time monitoring of cable integrity. All equipment is fully integrated with the vessel's central control system. The solution is future-proof and designed to handle Jan De Nul Group's advanced export and interconnect cable installations.

Mike Welling, the Business Development Manager at MacArtney Offshore Wind Solutions, said: "Being re-selected by Jan De Nul Group for the supply of mission equipment signifies a testament to our competencies. Our dedicated team of construction and automation engineers is motivated by the challenge of aligning with the vessel's dynamics and control system seamlessly. We are committed to ensuring that Jan De Nul Group keeps playing a leading role in pioneering the cable installation market with their advanced fleet."

In line with the commitment to sustainable practices, all CEMAC tensioners provided by MacArtney will be driven by electric motors and feature active front-end drive technology. This innovative approach ensures efficient cable tension and facilitates energy regeneration, which is redirected back to the vessel's power plant, which includes batteries.

The world's largest CLV, the Fleeming Jenkin. (Credit: Jan De Nul/MacArtney)

ENERGY MARKETWATCH

WEATHERING THE STORM

Winter and domestic politics shape energy markets

G. Allen Brooks
ON&T's Offshore Energy Expert

Energy Musings
energymusings.substack.com

CRUDE OIL

The fourth quarter of 2023 was a disaster for oil. During the quarter, WTI prices fell by 21 percent, dropping nearly $20 a barrel from about $91 to slightly under $72. WTI briefly fell below $70 in December as sentiment reflected expectations that global oil demand was not increasing while supply was surging ensuring a glut of oil. As a result, energy stocks were the worst-performing market sector in each month of the fourth quarter leading to the sector being the second-worst performer for all of 2023.

Demand's problem was centered on China and its ongoing economic challenges. The Chinese oil demand rebound from the pandemic shutdown era failed to materialize as strongly as anticipated. OPEC+ members were forced to cut production to support oil prices. What was believed to be a temporary step appears to have become a long-term commitment. In the second half of 2023, oil traders began betting against Saudi Arabia, believing it would eventually tire of supporting prices by cutting its output and income. That is the history of prior attempts to control the oil market.

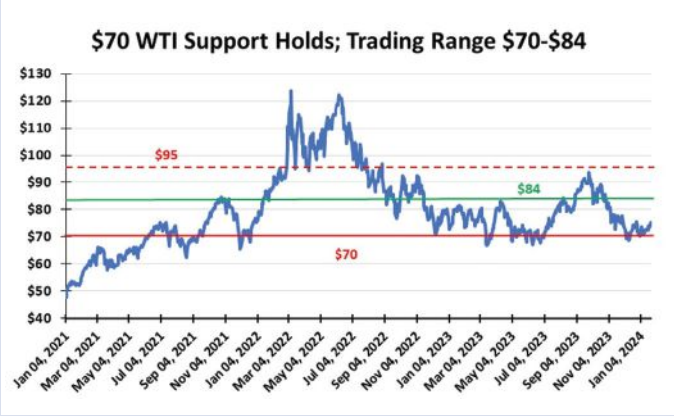
A problem is continued US oil output growth. Today, the US produces more oil than any country in history. The surprise for market watchers has been the growth of US oil output in the face of strong financial discipline by producers, along with the continued harassment by the Biden administration.

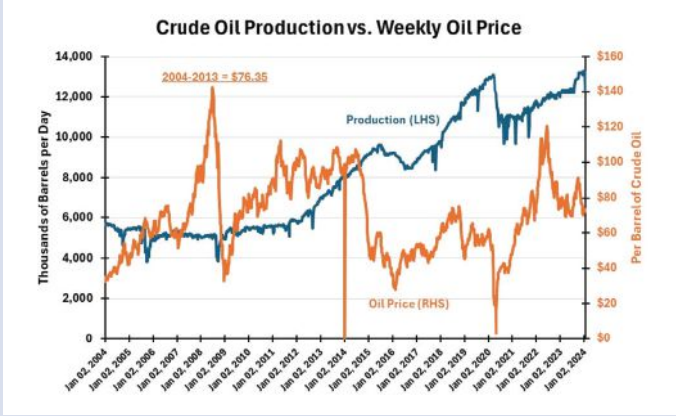
Recently, oil prices began climbing as experts sensed a shift in market dynamics. In 2023, according to the International Energy Agency (IEA), global oil demand grew by 2.3 million barrels per day, but it slowed to a 1.7 mmb/d rate in the fourth quarter. The agency forecasts global oil demand growth of only 1.2 mmb/d this year. However, it raised its forecast by 180,000 barrels per day in its most recent report. Does this hike foreshadow further demand increases as 2024 progresses?

The greatest oil market challenge is supply growth. The IEA sees a 1.5 mmb/d increase with most additional supply coming from non-OPEC+ countries, in particular, North and South American countries. The IEA outlook suggests little pressure for higher oil prices. But recently, the US Energy Information Administration projected that after a 1 mmb/d output increase in 2023, the US oil supply will only grow by 200,000 b/d in 2024, with a similar increase in 2025. Could that bring the market into balance sooner than the traders betting against higher prices expect?

With projections of 2024 oil industry capital spending growing by low single digits or possibly even declining, could the supply growth forecasts be overstated? This issue has been a key piece of the oil super-cycle investment thesis—limited investment crimps supply growth while demand steadily rises, which pushes

HIGHER OIL PRICES ARE NEEDED TO GENERATE INCREASED SUPPLY





up prices. Higher prices are needed to generate increased supply. This debate will dominate the 2024 oil market discussion. Sentiment swings will impact oil prices. Currently, the needle is pointing higher, and before adding any premium for the Middle East and South Pacific geopolitical risks.

NATURAL GAS

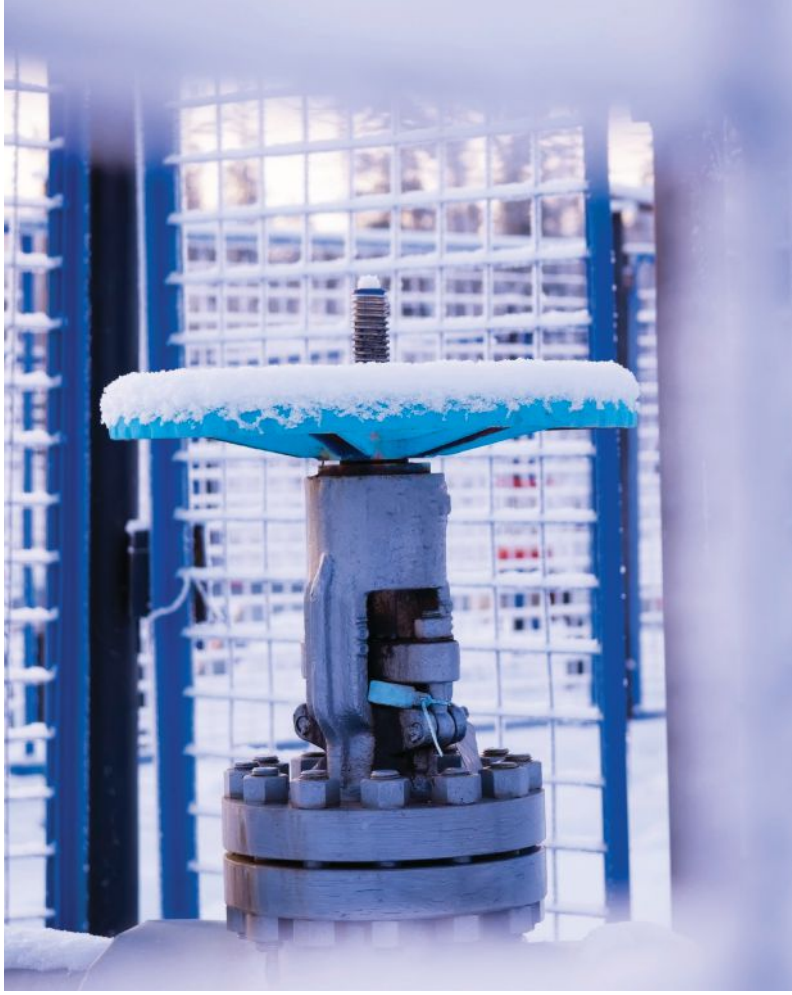
Winter is defining the natural gas market—like it always does. The polar vortex that swept down from the Arctic and across the US from the Rocky Mountains to the East Coast and down to the Gulf of Mexico sent natural gas prices up. On the last trading day of 2023, gas futures closed at $2.51 per thousand cubic feet. Eleven calendar days later they were 27 percent higher at $3.19. Three days later prices were $3.31. Extreme cold does that to prices.

The bitter cold temperatures had cities as far south as Dallas experiencing 10–12 degree Fahrenheit lows for three consecutive days with wind chills of zero or below. The Electric Reliability Council of Texas issued warnings about the need to conserve power to prevent a blackout. Although temperatures failed to reach the lows experienced in 2021's Winter Storm Uri, natural gas carried the load in generating power as wind and solar were largely absent. The same scenario happened elsewhere.

With power and home heating demands soaring in response to the record low temperatures, gas storage volumes were drained. After three weeks of winter so far, nearly all the surplus gas storage at the start of 2024 is gone, putting the gas market's future dependent on the weather during the rest of winter.

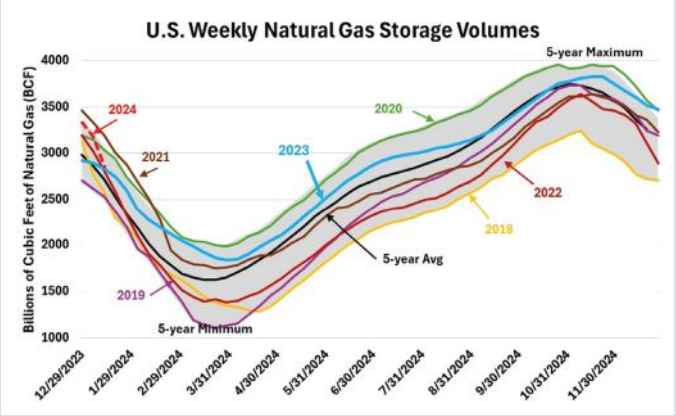
We ended 2023 with 553 billion cubic feet of extra gas in storage than at the end of 2022. That cushion shrank to only 110 bcf in three weeks. Cold weather drove up gas consumption but it also impacted production, which was about two billion cubic feet per day below the same point in 2023. The output decline is more pronounced when one considers that US gas output peaked in December at 105 bcf/d but averaged only 99 bcf/d so far in January. Forecasts call for gas production to grow by 1.5 bcf/d, or between 1–2 percent this year, but sharply lower than the 4 bcf/d increase in 2023.

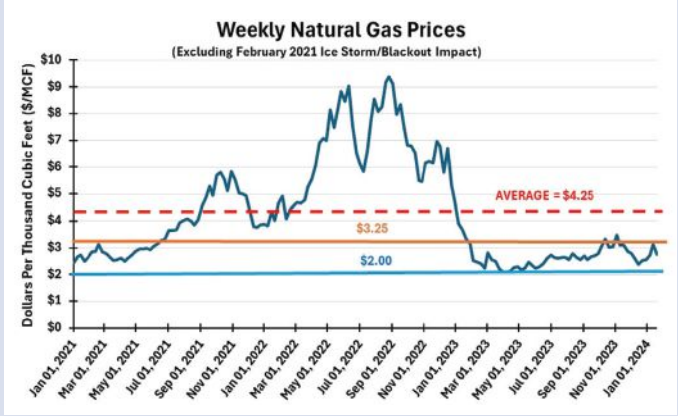
The biggest natural gas story is the Biden administration's recent decision to pause the approval process for new liquefied natural gas (LNG) export plants. Ostensibly the pause is to enable the Department of Energy to "take a hard look at the impacts of LNG exports on energy costs, America's energy security, and our environment." However, the LNG pause is seen as a blatant political move to "buy" the votes of younger Americans more concerned about the environment than their lifestyles, energy security, and international standing.



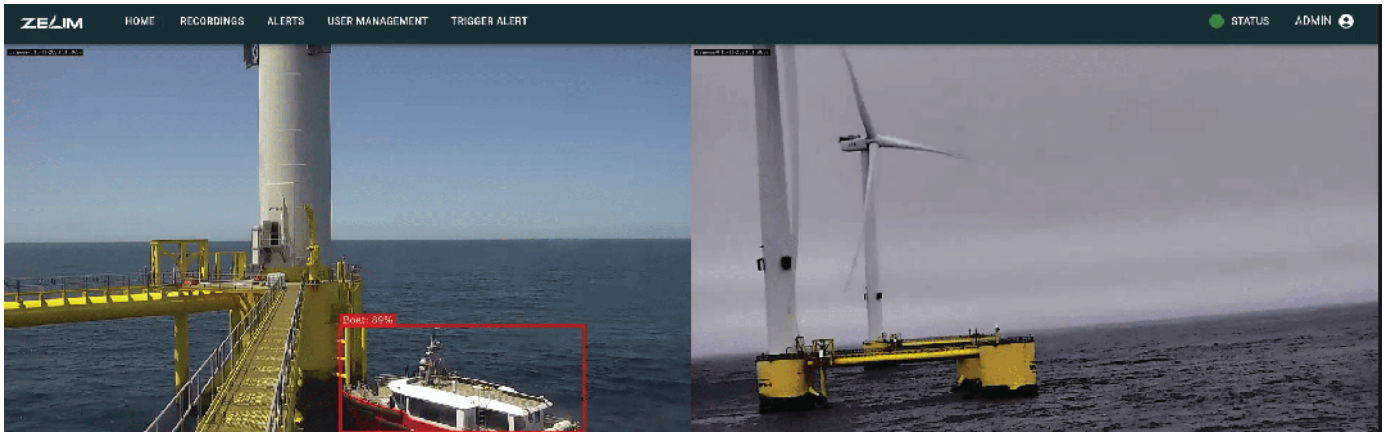
While this step doesn't impact terminals already approved or under construction, it has shaken our allies who wonder if they can trust US LNG supply. The supply of LNG, which burns 80 percent cleaner than coal, could be capped long-term and undercut the push to decarbonize the global energy system. The energy market has become a political football this year as the presidential election campaign begins.

THE GAS MARKET'S FUTURE LOOKS HEAVILY WEATHER DEPENDENT





OCEAN WINDS AND ZELIM JOIN FORCES ON AI SAFETY PILOT PROJECT



Zelim, a UK-based startup developing innovative search and rescue solutions, is joining forces with Ocean Winds (OW), an international company dedicated to offshore wind energy and 50-50 joint venture between EDP Renewables and ENGIE, in a pilot project to test AI-enabled person detection software for floating offshore wind farms.

The objective is to test and prove Zelim's ZOE technology, AI-enabled software dedicated to person overboard detection and capable of finding and tracking people, vessels, and other objects, in real time and in harsh maritime conditions.

During the collaboration, Zelim will offer continuous monitoring of ZOE's live feed from cameras installed on two turbine foundations on Ocean Winds' WindFloat Atlantic project. The project will serve to train and improve the ZOE detection models whilst simultaneously proving its capability.

ZOE will be detecting both people and objects in the waters surrounding the turbines, providing direct alerts to the operation and maintenance control center in the case of a person falling overboard or an external vessel approaching the windfarm to increase the safety and security of the technicians and assets. By proving this capability, ZOE will support the site's operation and effectiveness by providing an additional layer of health and safety support.

Doug Lothian, CTO at Zelim, said: "We have been developing ZOE over the last 3 years to increase certainty in search, even in challenging conditions. We see ZOE providing a safety net around offshore assets, where if somebody ends up in the water, they will be detected and an immediate alert sent, thereby enabling a fast and efficient rescue. We are thrilled to be working with the team at Ocean Winds to create a new benchmark in safety for offshore workers."

SOLARDUCK SECURES ADDITIONAL FUNDING TO DEVELOP OFFSHORE FLOATING SOLAR POWER

SolarDuck

SolarDuck recently announced additional funding for the development and deployment of its Offshore Floating Solar power technology.

The funding has been provided by both existing and new investors. An international consortium of Katapult Ocean, Green Tower, Energy Transition Fund Rotterdam and Invest-NL all share SolarDuck's commitment to accelerating a sustainable supply of offshore energy with offshore floating solar power.

With the new funding, SolarDuck is able to extend its leading position by deploying its first commercial projects. In addition, its experienced and dedicated team continues to optimize the technology to build markets around the world and accelerate further roll-out.

SolarDuck's technology can be deployed in wind-scarce, but sun-rich regions as 'standalone' offshore floating solar farms. Co-locating SolarDuck technology with offshore wind is also possible, as will be happening in the Dutch North Sea.

SolarDuck is aiming to generate a sizeable impact by replacing fossil powered energy sources like coal-fired powerplants and diesel generators. This technology also enables island and offshore installations to set up an independent supply of renewable energy.

SolarDuck has a pipeline of over 3.5 GWp and has already secured projects around the world. Amongst other projects, work is underway on a 5 MW demonstrator project to be installed at the Hollandse Kust West VII offshore wind park in the Netherlands (North Sea) in collaboration with RWE. When completed, it will be the largest hybrid floating solar plant in existence.

TOTALENERGIES TO EXPAND IN ASIA

TotalEnergies has signed an agreement with OMV to acquire its 50% interest in Malaysian independent gas producer and operator SapuraOMV Upstream Sdn (SapuraOMV) for a consideration of $903 million (including the transfer of a $350 million loan granted by OMV to SapuraOMV), subject to customary closing adjustments.

SapuraOMV's main assets are its 40% operated interest in block SK408 and 30% operated interest in block SK310, both located offshore Sarawak in Malaysia. In 2023, SapuraOMV's operated production (100%) was about 500 Mcf/d of natural gas, feeding the Bintulu LNG plant operated by Petronas, as well as 7 kb/d of condensates. On block SK408, the development of the Jerun gas field is on track for startup in the second half of the year 2024.

The transaction is subject to customary conditions precedent, in particular the receipt of regulatory approvals. Closing is expected by the end of first half of 2024.

SapuraOMV also holds interests in exploration licenses in Malaysia, Australia, New Zealand, and Mexico where a discovery has been made in 2023 on block 30.

"We are pleased to strengthen TotalEnergies' position in Malaysia by becoming shareholder of the independent gas producer SapuraOMV. Over the past few years, we have developed a strategic international partnership with Petronas, the national company of Malaysia. This transaction will anchor our future growth in the country and reinforce our partnership with Petronas. With their low production costs and low GHG intensity, SapuraOMV's assets will perfectly fit in TotalEnergies' portfolio and participate in meeting the growing demand of gas in Asia," said Patrick Pouyanné, Chairman and CEO of TotalEnergies.

OMV Group

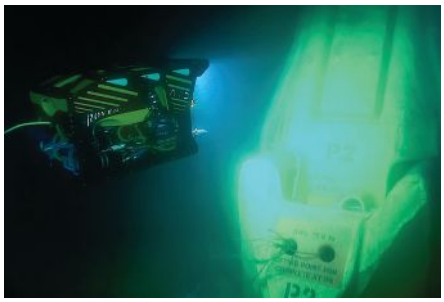
AUTONOMOUS INSPECTION DRONE TRIAL
IN THE NORTH SEA DEEMED A SUCCESS

Ocean services provider DeepOcean and Aker BP have successfully completed subsea trials with an Autonomous Inspection Drone (AID) at the Aker BP operated Alvheim field in the central North Sea.

The AID project is a strategic partnership between DeepOcean, Argus Remote Systems, and Vaarst where a system has been developed with industry guidance, support, and funding from Aker BP to bring a platform to market. The AID could potentially disrupt the way subsea inspections are conducted.

As part of a ten-day inspection campaign, Aker BP and DeepOcean inspected subsea trees and other subsea infrastructure at the Alvheim subsea field on the Norwegian continental shelf.

The subsea inspection missions were planned in advance by inspection personnel from DeepOcean. The mission plans were subsequently transferred from the digital mission planner by API (application programming interface) into the AID. This input can come from both onshore and offshore.



AID Trials. (Credit: DeepOcean)

The AID was mobilized on the DeepOcean-operated subsea IMR and ROV support vessel *Edda Fauna*, replacing the existing observation class ROV. The mission control was supervised both locally from *Edda Fauna* and remotely from Remota's remote operations center (ROC) in Haugesund, Norway.

The AID is based on a Rover MK2 ROV from Argus Remote Systems, with upgraded hardware and software packages. Argus is responsible for the AID platform and navigation algorithm. DeepOcean is responsible for the digital twin platform, mission planner software and live view of the AID in operation, while Vaarst is responsible for machine vision camera "Subslam 2x" for autonomous navigation and data collection.

The inspection data from the AID is streamed onshore and the position of the vehicle is continuously being streamed back into the digital twin to ensure high data quality and increase situational awareness.

The AID measures 1.25 x 0.85 x 0.77 meters and weighs 320 kilograms in air and can operate in water depths down to 3,000 meters. It can fly in DP mode and has both stations keeping and remote-control functionalities.

N-SEA STRENGTHENS OFFSHORE CAPABILITIES
WITH NEW SURVEY AND ROV SUPPORT VESSEL

N-Sea Group has entered into an agreement with Geo Plus to long term charter the Dutch flagged vessel *Geo Ranger*, a modern hybrid survey and ROV support vessel. The *Geo Ranger* will accompany the *Geo Focus*, which is already under N-Sea management and control.

The fuel-efficient diesel/electric vessel *Geo Ranger* is equipped with smart on-board technology, comprising various different sensors and a plug-and-play system for additional, project-specific customer equipment. With her focus on improved workability, durability and flexibility, the *Geo Ranger* may well set a new standard for survey vessels.

The *Geo Ranger* has a proven track record when it comes to safe and efficient offshore operations. With her DP station keeping capabilities, an overall length (LOA) of 41.60 meters, 8.70 meters width, and a working draft of 2.25 meters, she is the ideal vessel to operate in North Sea, Baltic Sea, Irish Sea, and Mediterranean Sea.

Furthermore, the vessel is equipped with 8T A-frame ideally suited for towing arrangements, geotechnical survey, and other subsea activities.

The vessel and its experienced crew will play a key role in realizing N-Sea's ambition to become the subsea services contractor of choice. With the long-term charter of the *Geo Ranger*, N-Sea is strengthening its footprint and position in the subsea service industry, following the expansion of the offshore markets.

N-Sea will have the vessel under full management and control. By having dedicated vessels, N-Sea can provide safer and more efficient operations through working with fully committed and integrated teams. With this new dedicated vessel initiative N-Sea can offer its clients, a unique set of subsea solution capabilities supported by experts, better serving the needs of our clients.

Geo Ranger. (Credit: N-Sea)

ROVCO ADDS TO SURVEY FLEET
WITH LONG-TERM CHARTER OF THE DP2 VESSEL

Rovco, a leading provider of high-technology offshore wind solutions has announced the long-term charter of the DP2 vessel *Glomar Worker*. The four-year charter with Glomar comes in response to client demand for innovative geophysical and geotechnical survey solutions.

Rovco is now converting the sister vessel to the already contracted *Glomar Supporter,* already under long-term charter. After completion of these role specific upgrades, the vessel will launch as a specialized and dedicated geophysical survey asset to serve the offshore wind market.

Rovco's newest survey vessel will be equipped with a hull mounted gondola and the highest specification sensor package, along with additional stern and starboard A-Frames to allow deployment of specialist towed survey equipment and multi-sensor towing.

Glomar Worker. (Credit: Rovco)

The *Glomar Worker* will also be equipped with an autonomous surface vessel (ASV) operating as a force multiplier. Further efficiencies will come from its DP2 station keeping capability, which will enable wider working windows across survey and ROV inspections by providing a stable platform for launch and recovery in marginal weather.

Both vessels have permanently mobilized WROVs, enabling the completion of survey and inspection tasks in field, without return to port or the need for additional vessels in field.

These SubSLAM® enabled vehicles provide live, close to asset high resolution, precision 3D reconstructions and fully autonomous inspection capabilities.

FULLY AUTONOMOUS SURVEY OF MPA COLLECTS HIGH RESOLUTION SEAFLOOR IMAGERY

The National Oceanography Centre (NOC), working with the University of Southampton and the Department for Environment, Food and Rural Affairs (Defra), recently completed a fully autonomous marine protected area (MPA) seafloor survey.

NOC conducted the autonomous survey of the Central Fladen Nature Conservation Marine Protected Area, which is located some 140 km south-southeast of Lerwick (Shetland), using an Autosub Long Range (ALR), famously known as 'Boaty McBoatface' launched from shore.

The ALR carried the University of Southampton's 'BioCam' instrument, a three-dimensional seafloor imaging system that comprises a stereo pair of cameras, dual LED strobes, and dual line lasers. Operated together, these instruments generate georeferenced, color corrected conventional still images, as well as texture maps and corresponding microtopographic maps of the seafloor.

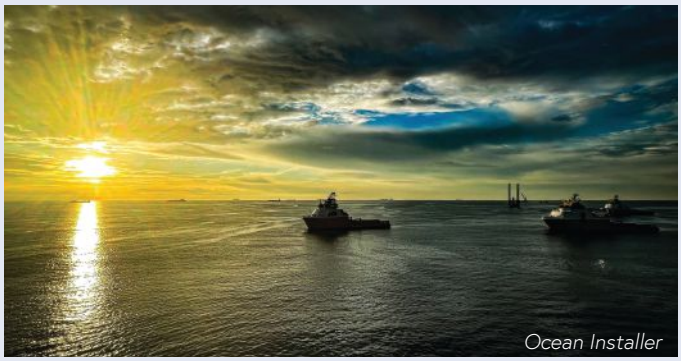

NOC

This project is part of Defra's Marine Natural Capital and Ecosystem Assessment (mNCEA) program, which is supporting the adoption of innovative marine monitoring technologies. These technologies will help to deliver the 'Big Data' needed in advanced data-driven machine learning for mapping and assessment of our marine natural capital and the benefits it provides.

This survey builds on the success and learnings of the previous AT-SEA missions, which demonstrated ALRs capability to undertake ecological surveys in end-of-life oil fields. The ability to use ALRs for high-tech, low impact marine surveying and monitoring projects negates the need for a traditional survey ship and crew, generating improved quality and quantity of information at a significantly reduced cost.

Following the successful recovery of the raw data gathered during the survey, work now continues to produce data products informing users about the current conditions of the MPA.

OCEAN INSTALLER SECURES CONTRACT IN PARTNERSHIP WITH OCEANEERING


Ocean Installer

Ocean Installer, in consortium with Oceaneering, has been awarded a significant contract from TotalEnergies EP Angola and its Partners of Block 17 to execute the transportation and installation work of GIR FLEX project. The project is part of the operator's program to extend the life of the FPSO, which has been producing since 2001, to 2031.

Ocean Installer will utilize their in-house expertise to project manage, engineer, and execute the project. The scope includes recovery of the old risers, transportation, and installation of 10 replacement risers as well as a gas lift umbilical, fabrication and assembly of the permanent equipment in-country and an extensive topsides support and modification campaign.

Ocean Installer's consortium partner on the in-country scope is Oceaneering. They will be responsible for the air and saturation diving services including associated project management, engineering, and procurement activities. With their vast local experience, Oceaneering will also manage all in-country operations.

"The GIR FLEX replacement project is our most significant project award from TotalEnergies to-date. This reflects the continued faith that TotalEnergies has placed in us, with several project awards since 2015. This award further enhances our strong track record in complex, production critical offshore projects for the West African market."

"I am also delighted that we have secured our second project in Angola. Furthermore, we look forward to collaborating with Oceaneering on yet another project. Oceaneering's in-country experience and local presence is invaluable, and they will be a key element to the overall project's success," said Ocean Installer CEO Kevin Murphy.

CHECK THE TECH

REDEFINING ACOUSTIC MONITORING

An exclusive look at BLUEiQ's OpenEar Hydrophone

In the hidden depths of our oceans, where 50–80% of our planet's biodiversity forms a profound symphony of marine life, a revolutionary innovation is unfolding to preserve the delicate harmony of our seas and protect the endangered North Atlantic Right Whale (NARW). BLUEiQ, a Boston-based ocean tech startup, is disrupting passive acoustic monitoring (PAM) with its smart, low SWaP-C (size, weight, power, and cost) machine learning (ML)-enabled hydrophones, specifically designed to protect ocean biodiversity and enhance offshore and port safety and security.

BLUEiQ unveiled its software-defined hydrophone, OpenEar, at the 2023 OCEANS Gulf Coast Conference in Biloxi, Mississippi. This unique hydrophone is not just another piece of technology; it's a low-cost, lightweight, and ML-enabled software-defined solution that integrates seamlessly with industry standards, such as Sofar's Spotter buoy and Smart Mooring, using the Bristlemouth open standard.

OpenEar offers easy integration of passive acoustic sensing capabilities into micro UUVs or solar powered buoys. (Credit: BLUEiQ)

SAFEGUARDING THE NARW

Aligned with the urgent need to address the alarming decline of the NARW population, OpenEar can be used as a solution for protecting and enhancing the conservation of NARWs. NARWs face multiple threats, including ship collisions, communication disruption due to human-generated ocean noise, and changes in their food sources caused by climate change. As highlighted in NOAA's recent testimony, the lack of existing technology to track and monitor vessel strikes emphasizes the critical need for innovative and efficient solutions.

The deployment of PAM technology is pivotal in preventing negative impacts on NARW populations. OpenEar can be used as a tool to mitigate threats to NARWs, including ship collisions, communication disruption due to human-generated ocean noise, and changes in their food sources caused by climate change. The OpenEar hydrophone provides real-time alerts that help prevent ship strikes and protect whale migration patterns, contributing significantly to ongoing conservation efforts.

REWRITING PAM PRACTICES

BLUEiQ aims to disrupt PAM practices by developing open, customizable, and impact-driven sensing technologies for biodiversity protection and port and harbor safety. The goal is to drive down costs and make these crucial tools more accessible, ensuring effective solutions to pressing ocean sustainability challenges. BLUEiQ is set to offer an open software integration kit for quick and efficient integration.

BLUEiQ is actively preparing for upcoming pilots to deploy their smart OpenEar hydrophones for real-time NARW detection and localization along the US Eastern Seabed and Marine Sanctuaries. These pilot tests will play a crucial role in validating the effectiveness of OpenEar.

COLLABORATIVE STARTUP

BLUEiQ's business model involves a powerful collaboration with industry leaders and esteemed academic institutions. As a premier startup alumni of various prestigious accelerator programs, including the Gulf of Maine Research Institute (GMRI), CleanTech Open, MassChallenge, BLUEiQ leverages these connections to advance its mission. The startup won a prestigious award from Mass Clean Energy Center, is also a 2024 member of The BLUE Incubator and Greentown Labs in Boston, MA, and the USM Research Foundation 2024 Gulf Blue Navigator program in Gulfport, MS.

Talking exclsuively to ON&T, Founder and CEO Kim Gavin of BLUEiQ remarked: "BLUEiQ is spearheading a visionary mission to provide vital information that empowers federal regulators to make informed decisions without unduly burdening key industries in Massachusetts, Rhode Island, and Maine. Addressing critical issues such as NOAA's proposed vessel speed restrictions and the lack of real-time monitoring technology, BLUEiQ's commitment is to create a comprehensive and reliable NARW dataset."

OpenEar significantly reduces payload power consumption, size, cost and runs Machine Learning at the edge. (Credit: BLUEiQ)

blueiq.us

OCEAN predICTions

In our first ICT-focused column, in partnership with Oceanology's OceanICT, we profile the exciting work being done by the European Space Agency (ESA) to accelerate the development of new and exciting business ideas involving space.

Offering funding, business, and technical support to help to generate successful business and create jobs. ESA Space Solutions manages a growing portfolio of ocean ICT projects where companies have taken ideas from concept to commercialize key products and services in the domain.

In 2023, ESA launched the Space for Maritime Task Force, which aims to contribute to sustainability and maritime safety by increasing the use of innovative integrated solutions that exploit digital and space technologies, such as communications, navigation, and earth observation.

To this end, ESA has supported several initiatives seeking to advance maritime sustainability, satellite-based automatic identification systems (AIS), smart routing, and autonomous vessels, among others.

"The future of ocean-based ICT hinges on identifying and responding to shifting customer needs, and we are particularly excited by the opportunities that autonomous systems supported by space technologies offer operations and maintenance (O&M), especially as renewable energy installations move further offshore," said Grant Day, UK Regional Ambassador for ESA Space Solutions.

Read our exclusive interview with ESA at oceannews.com/take5

OCEANICT POWERED BY ON&T

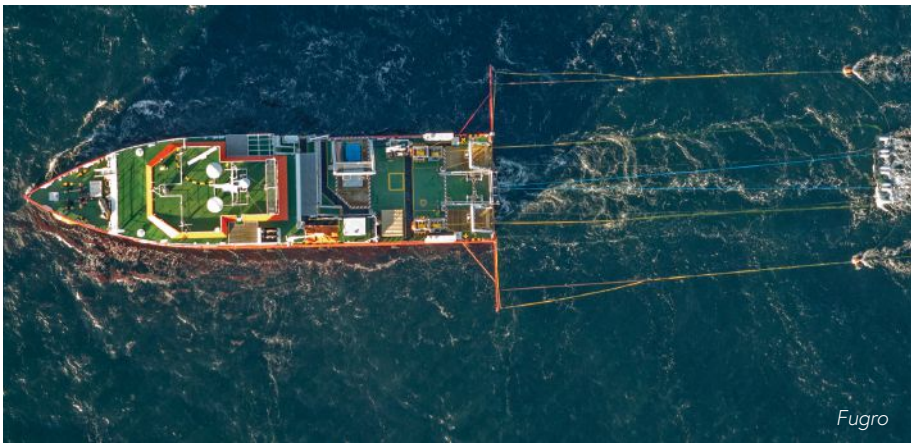
FUGRO TO DELIVER UUHR SURVEYS FOR DOORDEWIND PROJECT

Fugro has been awarded the geophysical survey contract for the development of the Dutch Doordewind offshore wind farm zone. Key to selecting Fugro is its innovative 2D ultra-ultra-high resolution (UUHR) surveys that provide unprecedented data quality. The Doordewind project, led by the Netherlands Enterprise Agency (RVO), is part of the Dutch Government's Offshore Wind Energy Roadmap 2030, which aims to accelerate the development of offshore wind in the Netherlands.

Fieldwork is scheduled to start in April 2024 and will be conducted with Fugro's geophysical vessel *Fugro Pioneer*. Onboard are customized digital streamers and processing technology that enable 2D UUHR surveys.

Using proprietary software and decimeter accuracy positioning systems, this advanced data acquisition method enables detailed ground modeling and interpretation of near surface geology to inform future geotechnical investigations and the design of offshore wind farms. The data will also be used for planning geotechnical investigations and design of the offshore wind farm and installations.

The Doordewind wind farm zone is located approximately 77 km off the north coast of The Netherlands and will be the first wind farm to connect to the Eemshaven. The total wind farm area is approximately 580 km² and is planned to contain a total capacity of 4 GW divided over two sites of 2 GW each.



Fugro

VARD TO CONVERT PSV INTO CABLE LAYING VESSEL

IT International Telecom Marine SRL (IT) has chosen VARD to convert the Platform Supply Vessel (PSV) *IT Infinity* into a Cable Laying Vessel.

The PSV was built at Vard Brattvaag and delivered to Volstad Maritime in 2008 under the name *Volstad Princess*. SD Standard Drilling acquired the vessel in 2017 before it was sold to IT in 2021 and was renamed *IT Infinity*. Now, the vessel returns to VARD for the conversion.

Vard Electro is involved in the project through the installation of cable and new switchboards as well as updating existing electrical systems. Vard Interiors is delivering HVAC solutions.

The work will be carried out by Vard Brattvaag in Norway and the vessel will be delivered in Q3 2024.

TDI-BROOKS LAUNCHES NEW DP VESSEL TO SUPPORT US OFFSHORE WIND MARKET

TDI-Brooks has expanded its fleet by incorporating the RV *NAUTILUS* (formerly known as *Nautical Geo*), thereby increasing its vessel capacity. The *NAUTILUS* is a DP2 vessel that was built in 2000 and measures 75 meters in length.

Equipped with the newly acquired Geomiil Manta-200 CPT, which can be deployed through the mid-ship moonpool, the system has the capability to penetrate the soil up to 40–50 meters, depending on its composition. The vessel is expected to be fully prepared for the first offshore wind program by early March.

The vessel provides a wide range of offshore support, including subsea services, construction assistance, exploration, production, AUV, ROV, and diving support. It also caters to military operations, scientific marine research, and survey mapping.

The *NAUTILUS* has a North American MCK-1240 upper forecastle deck on the starboard side, which includes a SWL 7.1-ton crane. Additionally, the vessel offers spacious accommodation with 46 berths and a large deck capacity.

In addition, the *NAUTILUS* is equipped with Geomil Manta-200 CPT, Neptune 3K & 5K vibracorers, and a specially designed pneumatic vibracorer by TDI-Brooks.

To facilitate surveys to approximately 2,500 meters water depth, the *NAUTILUS* is also equipped with a Teledyne RESON full ocean depth multibeam echosounder (MBES).

TDI-Brooks

CRP SUBSEA SECURES BRAZIL CONTRACT

CRP Subsea recently secured a contract with a leading energy technology company that involves the supply of distributed buoyancy modules (DBMs) to a deepwater oil field project situated in the pre-salt Santos Basin, offshore Brazil.

CRP Subsea's DBMs will be utilized on a flexible production riser transporting oil from the subsea facility to the floating, production, storage and offloading (FPSO) vessel above. Specifically engineered, the DBMs will establish a dynamic subsea lazy-wave configuration to mitigate the top tension on the FPSO.

They feature a high-capacity compliant internal clamp, intricately designed to ensure controlled and uniform circumferential clamping pressure around the riser. This not only maintains the position of the DBM but also eliminates the risk of pipeline damage, contributing to the prolonged lifespan of the field.

James Harrison, Key Account Manager at CRP Subsea said: "We are thrilled to have been selected by a key flexibles customer for this project. It is great that our market-leading internal clamp technology is consistently chosen as the preferred solution. Recognized for minimizing installation risks and ensuring the reliable operation of deepwater flexible risers, our technology sets the standard. We look forward to this and future collaborations with our valued customer."

DECOM'S C1-46 CHOPSAW DELIVERS IMPRESSIVE RESULTS ON FIRST DEPLOYMENT

Decom Engineering's investment in developing its largest subsea Chopsaw to date has paid off following impressive results on its first deployment.

The C1-46 Chopsaw played a pivotal role in a subsea infrastructure decommissioning project on behalf of DeepOcean in the Northern North Sea.

This ambitious project involved the removal of pipelines, control umbilicals, and various subsea structures from the seabed in water depths of up to 180 meters, each requiring precise and efficient cutting.

The Decom team was tasked with cutting a wide range of pipe sizes, from 1,042 mm OD concrete-coated carbon steel pipes to 220 mm OD super duplex pipes. These subsea pipelines needed to be segmented into 9.5-meter sections for efficient recovery to the vessel deck.

Powered from topside and ROV using a Hydraulic Power Unit (HPU), reeler, hot stabs and control panel, the C1-46 exceeded all expectations, proving its worth in the harshest of subsea environments. The smaller C1-24 chopsaw was utilized for certain tasks and also operated with a mix of topside and ROV controls.

The C1-46 averaged 15 cuts before requiring a blade change, significantly reducing the need for recovery to the surface and impressively completed 79 cuts on its first deployment, showcasing a remarkable 100% success rate.

The C1-46 Chopsaw has been designed to cut tubulars and other materials up to 46" diameter and is able to cut a wide range of materials, including inconel alloys, duplex and concrete.

It can be operated in water depths of up to 2,000 meters, has the ability to cut in any orientation, and is capable of multiple cuts per blade (20-100), resulting in large cost savings and increased efficiency. Blade changes are efficient and safe and the Chopsaw can be supplied set up in a number of configurations and settings to suit project requirements.

Decom Engineering team on deployment in Northern North Sea. (Credit: Decom Engineering)

TGS COMPLETES DEEPWATER NODE SURVEY OFFSHORE GUYANA FOR EXXONMOBIL

TGS, a leading global provider of energy data and intelligence, is has announced the successful completion of a series of marine Ocean Bottom Node (OBN) surveys offshore Guyana. On December 1, 2023, the final node recovery marked the culmination of three exclusive OBN surveys commissioned by ExxonMobil Guyana.

TGS successfully acquired 2,400 square kilometers of OBN data within a span of 410 days, concluding the data acquisition process 20 days ahead of the projected schedule. This achievement not only sets a record for the longest deepwater node survey but also showcases TGS' cutting-edge ZXPLR node technology utilized throughout the surveys.

During field operations, TGS earned 12 Catch of the Week (COTW) awards from ExxonMobil Wells. The COTW program acknowledges outstanding achievements related to health, safety, and the environment across all of ExxonMobil Wells' operations worldwide. The awards reflect the unwavering commitment, expertise, and teamwork demonstrated by our field crews, and TGS extends its warmest congratulations to the teams and individuals who earned these awards. TGS also recovered 1.2 metric tons of marine debris, removing a large amount of discarded fishing gear, plastics, and other harmful debris from the marine environment in Guyana.

MACARTNEY LAUNCHES HYBRID CONNECTOR WITH EXPANDED OPTICAL BEAM TECHNOLOGY

The TrustLink Metal Shell Hybrid connector offers remarkable flexibility, featuring two optical passes and four electrical contacts. (Credit: MacArtney)

MacArtney recently launched the Hybrid connector, a compact addition to their renowned TrustLink Metal Shell (MS) series. The TrustLink MS design prioritizes reliability in a high-density connector, addressing the challenges of harsh marine environments with limited space.

The Hybrid was developed in response to customer demands for a small, all-in-one connectivity solution supporting numerous applications, including efficient and reliable data transmission with minimal attenuation and interference.

"The single-footprint Hybrid is ideal for tight spots," said Paul Anthony, Global Business Manager Connectivity for MacArtney. "With two optical passes and four electrical contacts, it enhances versatility while reducing the number of connectors required."

Leveraging MacArtney's proven OptoLink technology, initially designed to deliver dependable fiber optic connections in a compact connector, the Hybrid excels in high-speed data and video transmission. This is achieved through minimal insertion loss and low back reflection.

The Hybrid features two optical passes that enable the combination of single-mode and multi-mode fiber optics, along with four electrical contacts. Expanded optical beam technology ensures robust and secure connections, positioning it as the ideal connectivity solution where the accuracy and integrity of transferred data are paramount.

The Hybrid, available from stock, is designed as a connectivity solution with recommended or client-specific cable options, terminated by one of MacArtney's global workshops. The comprehensive workshop solutions cover every subsea and offshore aspect, including moulding, custom assemblies, end-to-end harnesses, dedicated cable, electronics, fiber optics and testing facilities.

BOURBON COMPLETES FIRST STAGE OF EOLMED FLOATING WIND PROJECT

With the successful installation this autumn of a Floating Electrical Hub (FEH) off Port-la-Nouvelle (southern France), Bourbon Subsea Services teams have laid the foundation stone for the Eolmed project, a pilot floating wind farm located off Gruissan in the Mediterranean.

This project will involve three wind turbines producing more than 110 million KwH/year by 2025, which is equivalent to the consumption of 50,000 inhabitants. The FEH is a floating infrastructure that will be connected to the three wind turbines on one side and the shore connection cable on the other, enabling the transportation of electricity to the power grid.

This first major step, which took over a year to prepare, mobilized about thirty BOURBON experts (engineering, project management and offshore teams) covering the design, manufacture, towing and installation of the FEH and its subsea mooring system. Towing and installation took place over a period of two months and involved the use of an Anchor Handling Tug Supply (AHTS), the Bourbon Liberty 222, equipped with a BOURBON remotely operated vehicles.

The Eolmed project, led by the renewable energy company QAIR, is one of the first floating wind farm projects in the Mediterranean. Its aims are both to validate the technical reliability and business model of such an installation and to contribute to the creation of an offshore wind energy industry in the Occitanie and PACA regions (South of France).

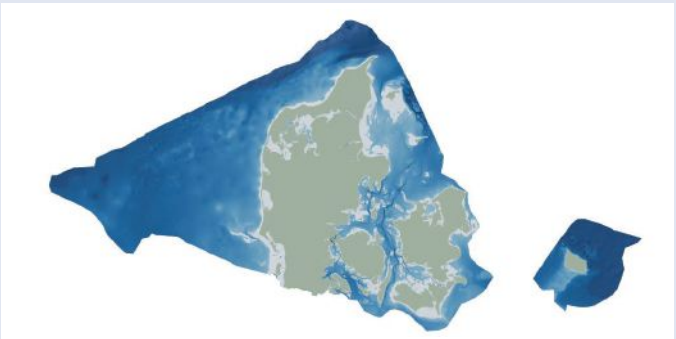

Bourbon Subsea Services

Stephan Midenet, CEO of Bourbon Subsea Services: "Contributing to the success of the Eolmed project is a one-off opportunity for BOURBON, leader in the installation of floating wind farms, to reaffirm its commitment to participate in the growth of the renewable energy industry. The project also demonstrates our ability to provide our energy clients with turnkey services mobilizing all the skills and assets of the group in EPCI mode, from the engineering phase to offshore installation. We are now focused on preparing the second stage of this project in which BOURBON will install the field's three wind turbines, in 2025, and connect them to the electricity grid."

DANISH GEODATA AGENCY AND EOMAP JOIN FORCES TO MAP DENMARK'S SHALLOWS

By using Satellite-Derived Bathymetry (SDB), the Danish Geodata Agency and EOMAP are joining forces to contribute to the European Marine Observation and Data Network (EMODnet) Bathymetry partnership, and to integrate the SDB data into the Danish Depth Model (DDM).

Using cutting-edge satellite technology, the cooperation will provide better mapping of shallow water areas lacking bathymetric coverage. This will also help improve the coverage of the DDM developed by the Danish Hydrographic Office, a part of the Danish Geodata Agency.


Bathymetry of the Danish Depth Model. (Credit: Danish Geodata Agency)

"Finding new ways to map shallow waters, where we only have very old data, and increasing the utilization of depth data for marine stakeholders and society is central in the goals of the Danish Hydrographic Office. Satellite technology shows great potential in this regard. We are therefore happy to contribute to this cooperation that benefits the users of both the DDM and EMODnet Bathymetry," said Elizabeth Hagemann, Head of Office in the Danish Hydrographic Office.

"Denmark is particularly rich in shallow waters, with considerable parts mapped more than 100 years ago. For filling data gaps in large areas, SDB is widely approved as a very efficient technology. Together with existing bathymetric data, this cooperation project will thus help create a seamless shallow water grid of the Danish coastline and its hundreds of islands," stated Knut Hartmann, COO of EOMAP.

As an additional benefit for marine stakeholders, the project will also be embedded into the largescale European model by EMODnet Bathymetry.

LONDON CALLING

ExCeL London to Host Oceanology International in March

The global ocean technology community will unite at Oceanology International 2024 (Oi24), ExCeL London, March 12–14, 2024. Championing the very latest in ocean tech innovation, key themes such as energy transition, climate change, offshore geotechnics, marine survey, and, of course, the application of the latest technology platforms are high on the agenda.

The three-day conference once again promises to showcase a burgeoning global marketplace, with a packed event schedule and targeted networking opportunities for professionals focused on exploring, protecting, and sustainably operating in the world's oceans.

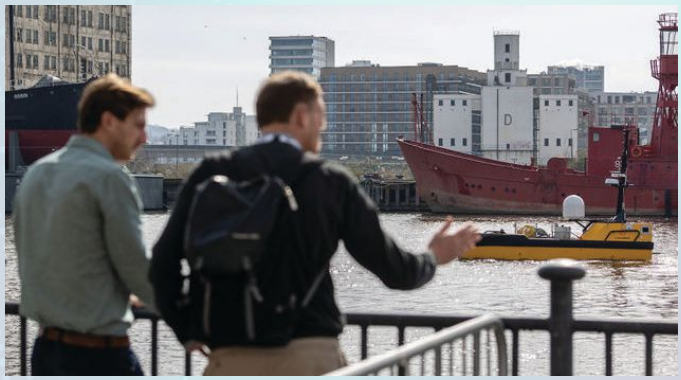
The exhibition floor is due to host 450+ exhibitors from 80+ countries, with 10+ International and Regional Pavilions. With exhibitor product development and R&D cycles often carefully aligned with Oi's return to London every two years, more than 100 companies are expected to conduct product or service launch activity.

DOCKSIDE DEMOS

On the Royal Victoria Dock, the much-anticipated "Dockside Demos" give visitors the opportunity to experience, firsthand, a range of different vehicle, imaging, sonar, and instrumentation technologies live and outdoors, in- and on- the water. Viewing platforms and micro theaters enable up-close scrutiny of the technology, with operators are on hand to provide more information.

"At this pivotal and exciting time for the ocean technology industry, our focus is to provide an event where missions are made possible," said David Ince, Oceanology International Portfolio Director.

"Demand for new solutions in the blue tech and energy transition markets is exploding, so we are looking forward to delivering an inspirational Oi event in London with the power to propel the direction, progress, and impact of the sector. The influence of Oceanology International is built on the scale, breadth, history, and reputation of our event, and I am confident that, once again, Oi will be a catalyst for ideas and innovation, with unprecedented access to comprehensive solutions, diverse content, and expertise."



ENGAGING STAKEHOLDERS

In addition to the plethora of technology on display in and around ExCeL's main hall, visitors on day 3 will have the opportunity to Catch The Next Wave (CTNW), an agenda of insightful back-to-back talks that this year will focus on innovation at the ocean-climate nexus. Among the highlights is an opening keynote by Sir David King, Emeritus Professor of Chemistry, University of Cambridge, and former Chief Scientific Adviser to the UK Government. CTNW aims to spark new thinking and ideas across disciplinary boundaries and between sectors, to address how advancing technologies can help navigate towards net zero but also mitigate any potential impact to essential biodiversity and ecosystem services.

OceanICT, a co-located event within the main exhibition hall, is an important reference point for visitors looking to engage with information and communication technology (ICT) experts and discover how recent breakthroughs are facilitating a smarter, more sustainable ocean through greater connectivity. It will connect AI, communications, satellite, IT, and IoT solutions providers with key ocean- and water-based end-user sectors from around the world.

"We are looking forward to Oceanology International 2024 as it provides us with an excellent opportunity to expand our network, fostering valuable connections within the marine and ocean industry," said Matt Grove, Regional Segment Manager, Environment, Seequent.

Returning event stalwarts will join first-time exhibitors to take advantage of the international ocean technology community's main marketplace and influence the direction of over 15+ key vertical industries, including offshore oil and gas; ports and harbors; marine renewables; maritime security; and marine science. They will meet buyers, network, conduct demonstrations and raise awareness of their brand over all three days.

oceanologyinternational.com

ENLIGHTEN SUPPORTS US COAST GUARD ON INTEGRATED DATA ENVIRONMENT

HII recently announced that its Enlighten subsidiary, based in Columbia, Maryland, supported the US Coast Guard in achieving a three-year "authority to operate" (ATO) status on its Integrated Data Environment known as SURVEYOR.

SURVEYOR is the US Coast Guard enterprise cloud-based data architecture launched in 2022, to consolidate Coast Guard data source silos and enable the use of data as an enterprise strategic asset for data-informed execution of Coast Guard business and mission operations.

Enlighten's cybersecurity measures helped fortify SURVEYOR, ensuring the protection of sensitive data crucial to the Coast Guard's operations. The three-year ATO status underscores the reliability, efficiency and advanced capabilities that Enlighten brings to the forefront of maritime data analytics.

"Enlighten has emerged as a lead partner in building our data fabric and advancing the capabilities of SURVEYOR," said Capt. Brian Erickson, the US Coast Guard's Chief Data and Artificial Intelligence Officer. "This partnership provides the Coast Guard with new tools utilizing big data for enhanced maritime and cybersecurity mission areas."

The collaboration between Enlighten and the Coast Guard significantly improved the platform's efficiency, allowing for streamlined data management and quicker access to critical information,

HII

ultimately bolstering the decision-making process. Enlighten's innovative solutions also empowered SURVEYOR with advanced technologies that enabled the Coast Guard to harness the power of big data to enable maritime safety and security.

"We are honored to contribute to the success of the Coast Guard's SURVEYOR platform," said Cody Hunt, Enlighten's Director of Product. "Achieving this significant milestone reflects our commitment to excellence and innovation in supporting critical national security initiatives."

The SURVEYOR program is named after the famous US Revenue Cutter SURVEYOR from the War of 1812.

NEW AMPHIBIOUS COMBAT VEHICLE TEST VARIANT DELIVERED TO US MARINE CORPS BY BAE SYSTEMS

BAE Systems has delivered the first production representative test vehicle (PRTV) of the new Amphibious Combat Vehicle 30 mm Cannon (ACV-30) variant to the US Marine Corps for testing.

ACV-30 is the third variant in the ACV family of vehicles designed, developed, and built since BAE Systems was selected as the prime contractor for the program in 2018. The vehicle mounts a stabilized, medium caliber Remote Turret System manufactured by KONGSBERG that provides the lethality and protection Marines need while leaving ample room for troop capacity and payload while keeping the crew under armor. The remote turret eliminates the space requirement of legacy turreted cannon systems and provides more room to transport troops or mission essential equipment and reduces weight for better mobility.


BAE

BAE Systems is currently in full-rate production with the ACV Personnel (ACV-P) variant and ACV Command and Control (ACV-C) variant, and is on contract for the design and development of an ACV Recovery (ACV-R) variant which will provide direct field support, maintenance, and recovery to the ACV family of vehicles.

Each customizable ACV variant in the family of vehicles provides true open-ocean and ship-to-objective capability, land mobility, survivability, and growth potential to meet the evolving operational needs of Marines around the world.

ACV production and support take place at BAE Systems locations in Stafford, Virginia; San Jose, California; Sterling Heights, Michigan; Aiken, South Carolina; and York, Pennsylvania.

UCUV DEMONSTRATOR DEVELOPMENT AGREEMENT AWARDED TO NAVAL GROUP FROM DGA

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

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

Aurore Neuschwander, Naval Group's Director of Drones, Autonomous Systems and Underwater Weapons, stated: "Naval Group is very proud to support the French Ministry of Armed Forces in the study of this innovative and disruptive naval capability. We will leverage the know-how we acquired in naval unmanned systems over the last ten years, and in particular our XL-UUV demonstrator, which will serve as a platform for technology integration and testing. This ambitious project will contribute to the creation of a French industry of excellence in naval unmanned systems, of which Naval Group will be one of the federators."

The first subsequent contract to this framework agreement will run for 24 months. It will enable the development of a version of the Autonomous Decision-Making Process (ADMP) designed to strengthen mission planning and monitoring, and secure surface and underwater navigation which are essential functions for an autonomous, enduring, multi-mission system.

Other follow-on contracts are planned in order to develop the technologies needed to meet the challenges of long endurance, underwater detection and sub-order implementation.

US NAVY ACCEPTS FIRST XLUUV
TEST ASSET SYSTEM FROM BOEING

The US Navy recently accepted delivery of the first Extra Large Unmanned Undersea Vehicle (XLUUV) Test Asset System, designated XLE0, from the manufacturer Boeing. The XLUUV, also known as *Orca*, marks a significant milestone in advancing the Navy's undersea capabilities.

The delivery of the Navy's first-ever *Orca* XLUUV Test Asset System, XLE0, is the culmination of nearly a decade's worth of research, design, manufacturing and testing by the Program Executive Office for Unmanned and Small Combatants (PEO USC) and the Unmanned Maritime Systems Program Office (PMS 406).

"This has been a very busy year for the XLUUV team, and their hard work is culminating in delivery of the Navy's first-ever unmanned diesel-electric submarine," said Capt. Scot Searles, Program Manager of the Unmanned Maritime Systems (PMS 406) program office. "We look forward to continued success with our Boeing teammates in fielding this important capability for the warfighter."

NAVSEA

XLE0 began in-water testing in Spring 2023 in Huntington Beach, California. Lessons learned from XLE0's testing will be applied to *Orca* XLUUV 1 through 5, which will be built and delivered to the Navy in the future.

The *Orca* XLUUV is a cutting-edge, autonomous, unmanned diesel-electric submarine with a modular payload section to execute a variety of missions critical to enhancing the Navy's undersea prowess. Configured to accommodate various payloads, the *Orca* XLUUV allows for the seamless integration of sensors, communication systems, and other mission-specific components, adapting to the evolving requirements of naval operations.

With its long-endurance capability, the *Orca* XLUUV can operate autonomously for extended periods. This allows for sustained operational presence and increased mission effectiveness in challenging undersea environments.

GE VERNOVA HYBRID-ELECTRIC PROPULSION
SELECTED FOR FLEET SOLID SUPPORT SHIPS IN UK

GE Vernova's Power Conversion business in the UK has been chosen by Team Resolute to supply advanced hybrid propulsion technology for three Fleet Solid Support (FSS) ships for the UK Ministry of Defense (MOD). This collaboration underscores the UK's commitment to enhancing the efficiency and sustainability of its naval operations.

Team Resolute is a consortium created by Spanish shipbuilder and defense company Navantia, shipbuilder Harland & Wolff and naval architects BMT to deliver the FSS program, for which Navantia UK, the UK subsidiary of Navantia, is prime contractor.

The 216-meter-long ships for the Royal Fleet Auxiliary (RFA) will be designed with an emphasis on minimizing carbon emissions. Equipped with energy-efficient technologies to decrease power consumption, they will be adaptable to use low-carbon, non-fossil fuels and future sustainable energy sources.

GE Vernova's advanced hybrid-electric propulsion technology will play a pivotal role in realizing these objectives by helping to optimize energy efficiency, power utilization, and power availability for the UK's new ship class and their multirole missions.

Under the contract, GE Vernova will design and manufacture SeaPulse Active Front-End (AFE) power converters and Power Take-Off/Power Take-In (PTI/PTO) hybrid electric induction motor-generators with resilient shock mounts and flexible coupling and hosing. The scope of GE Vernova's contract also includes commissioning, testing, sea trials, certification, and integrated logistics support (ILS) services to help ensure the seamless integration of the hybrid-electric propulsion technology into the FSS ships.

Delivery of GE Vernova's electric propulsion equipment for the first FSS ship is scheduled for 2025, with the second and third vessels planned for 2026 and 2027.


GE Vernova/FSS

POLISH NAVY ADDS NEW T20-S MODULE TO GAVIA AUV FLEET

Teledyne Gavia recently announced that the Polish Ministry of Defense (MOD) is bolstering its underwater survey capabilities by procuring the Teledyne RESON SeaBat T20-S Module for the group's GAVIA autonomous underwater vehicles (AUVs). These AUVs have been successfully employed by the Polish MOD for mine countermeasures (MCM) since 2014 and currently comprise a fleet of four GAVIA AUVs, each equipped with extensive capabilities.

The SeaBat T20-S Multibeam Echo Sounder (MBES), operating at 400kHz, delivers high-resolution bathymetric data with remarkable positional accuracy, aligning with the IHO standards for hydrographic survey. The T20-S Module empowers the automated detection of pipelines, enabling tracking and inspection by the AUV. This capability will be instrumental in the Polish Navy's critical underwater infrastructure inspections, a crucial aspect of modern seabed warfare.

Moreover, the T20-S Module offers valuable backscatter data for mine classification. It comes with the latest Teledyne PDS Cube software to streamline operations, facilitating raw data visualization, post-processing, mosaicking, and export directly into the onboard Command-and-Control system of the Kormoran Class MCMVs.

Since GAVIA AUVs have a modular design, these vehicles do not need to return to Teledyne Gavia for the T20 upgrades. Instead, the Polish MOD will receive new modules that can be user installed into their existing AUVs in Poland. The adaptability of GAVIA AUVs has made them a trusted choice for EOD/MCM operations.

T20-S Module on GAVIA AUV. (Credit: Teledyne Gavia)

UNCREWED SYSTEMS ON DISPLAY

The US Navy demonstrates innovation capabilities

Captain George Galdorisi
USN – retired

> UNMANNED SYSTEMS—ESPECIALLY UNCREWED MARITIME SYSTEMS—OFFER THE US MILITARY WITH AN ASYMMETRIC ADVANTAGE OVER POTENTIAL ADVERSARIES.

The informed readership of *Ocean News & Technology* understands that emerging technologies have changed the character of warfare at sea through the ages. Whether it was the transition from sail to steam, or the advent of steel warships to replace wooden ones, or the change from the battleship to the aircraft carrier to the centerpiece of the Navy fleet, these changes have helped the US Navy dominate at sea for an extended period.

Today, there are numerous technologies—some in development, some already in the field—that promise to rewrite the naval warfare playbook in the second half of this decade. Some of the most noteworthy include stealthy ships and bombers, more capable missiles, next generation fighter aircraft, quantum computing, artificial intelligence, and unmanned technologies in all domains.

The Navy stands on the precipice of another monumental technological advancement. The Navy's *Force Design 2045* document envisions a fleet of 500 ships—350 crewed and 150 uncrewed. This represents a once-in-a-generation paradigm shift for Navy fleet operations, and one that will place big bets on the emerging technologies needed to make uncrewed maritime vehicles more autonomous.

Unmanned systems—especially uncrewed maritime systems—offer the US military with an asymmetric advantage over potential adversaries. Ukraine's use of weaponized USVs to attack Russian naval vessels has demonstrated just one use of these multipurpose platforms.

The US Navy's emphasis on uncrewed maritime vehicles was on full display at a recent major international military-industry event. Held in Honolulu, Hawaii, in November 2023, TechNet Indo-Pacific hosted by AFCEA drew over 4,000 delegates from throughout the region. As in previous years, the conference featured keynote speakers as well as breakout panels.

KEYNOTE ADDRESS

Rear Admiral Eric Ruttenberg, Reserve Deputy Commander, US Pacific Fleet, delivered the event's opening keynote address. His presentation covered a wide range of challenges and opportunities facing the US Navy in the Indo-Pacific region. A substantial portion of his remarks were focused on uncrewed maritime vehicles.

Rear Admiral Ruttenberg noted that the most pressing need for US Pacific Fleet is innovation, that the velocity of innovation must accelerate, and that Pacific Fleet is looking for ways to get USVs forward to desired areas of operations. He highlighted Pacific Fleet's strong emphasis on unmanned because these platforms will enable warfighters to conduct missions in a contested environment that manned systems cannot do due to adversary anti-access/area denial (A2/AD) capabilities.

The admiral also stated that the US Navy must continue to evaluate unmanned systems in national and international exercises, experiments, and demonstrations. He placed special emphasis on the Navy's Integrated Battle Problem series—providing details of some of these events. He

A MARTAC Devil Ray T-38 USV taking part in a demonstration exercise. (Credit: MARTAC)

noted that these represent the pinnacle of experimentation with uncrewed maritime systems, and that these will continue through 2024 and beyond.

Rear Admiral Ruttenberg explained that the US Pacific Fleet, which is responsible for dealing with the United States principal adversary in the region, is leaning forward to leverage uncrewed technologies to perform a plethora of missions for a number of reasons, including their ability to reduce the risk to human life in high threat areas; to deliver persistent surveillance over areas of interest; and to provide options to warfighters that derive from the inherent advantages of unmanned technologies.

PANEL DISCUSSIONS

Later that day, a panel of subject matter experts in the field of uncrewed maritime vehicles highlighted many of the strides that the US Navy has made in getting these technologies into the hands of Sailors and Marines to evaluate them in a legitimate operational environment.

The panelists noted that the International Maritime Exercise series, held under the auspices of Commander Fifth Fleet and Commander Task Force 59 (CTF 59) in the Arabian Gulf, set the standard for uncrewed maritime vehicle experimentation and included operations with several regional partners. Navies of these nations explored the capabilities of various USVs from various manufactuers, such as Saildrone and MARTAC MANTAS, among others.

A key theme of the panel—and something that resonated with TechNet attendees from throughout the Indo-Asia-Pacific region—was the fact that the most recent RIMPAC/Trident Warrior exercise was a major coming out for USVs operating with the fleet. Building on the success of RIMPAC/Trident Warrior, the Integrated Battle Problems are increasingly evaluating USVs in broader and more intense set of missions.

Panelists explained that Australia has become a leader in USV experimentation. Autonomous Warrior 22 expanded the evaluation of USVs from Australia, New Zealand, the UK, and the US, featuring 30 different autonomous systems. Exercise Autonomous Warrior, the Australian Defence Force (ADF)-organized, Royal Australian Navy (RAN)-led, two-week exercise was built around a simulated, next generation naval battlespace. Its purpose was to test and evaluate uncrewed, robotic, and autonomous systems in Jervis Bay, in the nearby East Australian Exercise Area, and the skies above.

Finally, the panel noted that, building on the recent successes of uncrewed maritime vehicles in international exercises, experiments and demonstrations, a plethora of events designed to continue to place these systems in the hands of naval operators are planned throughout 2024 and beyond, especially those that feature uncrewed maritime vehicles performing increasingly autonomous missions.

These, as well as other, discussions during TechNet Indo-Pacific made it clear that the Department of the Navy—and especially the US Pacific Fleet—is committed to an accelerated development path for uncrewed systems. This commitment serves as an important arrow in the quiver of US military innovation and is likely to help equip the US Navy with the tools needed to provide comprehensive security of the world's oceans. Upcoming exercises and initiatives, which ON&T will cover ongoing, will prove to be important opportunities to persuade a sometimes-skeptical Congress to continue supporting the development and integration of unmanned maritime systems.

George Galdorisi is a career naval aviator and national security professional. His 30-year career as a naval aviator culminated in 14 years of consecutive service as executive officer, commanding officer, commodore, and chief of staff. He is a 40-year Coronado resident and enjoys writing, especially speculative fiction about the future of warfare. He is the author of 18 books, including four consecutive New York Times bestsellers.

LAUNCH OF VANGUARD USV ANNOUNCED BY US NAVY

The US Navy's newest Overlord Unmanned Surface Vessel Vanguard (OUSV3) was recently launched from Austal USA's shipyard in Mobile, Alabama. Vanguard is the first USV for the Navy purpose-built for autonomous operations from the keel-up.

Vanguard is being jointly developed by a team led by Austal USA and L3Harris. Once outfitting and testing is completed, Vanguard will autonomously transit to San Diego, joining sister ships, OUSV2 Ranger and OUSV4 Mariner, as part of the Navy's USV Division 1. USVDIV 1 is the Surface Navy organization responsible for the experimentation and tactical development of USVs. The unit also operates two additional USVs, Sea Hunter and Seahawk, which were developed separately from the Overlord program.

"We are excited to see the progress the L3Harris and Austal teams are making on the construction of Vanguard," said Capt. Scot Searles, program manager of the Unmanned Maritime Systems (PMS 406) program office. "Designed and built as a USV from the beginning, Vanguard will bring new, built-in capabilities that our previous OUSVs did not possess."

The Overlord program is managed by the Navy's Program Executive Office for Unmanned and Small Combatants (PEO USC) and executed by PMS 406. The Overlord program has played a critical role in jumpstarting the Navy's experimentation with USVs and accelerating Fleet knowledge and experience in using USVs in operations. The knowledge gained from Overlord plays an important role in the development and refining of requirements for the Navy's future Large USV program.

The Program Office for Unmanned and Small Combatants (PEO USC) and the Unmanned Maritime Systems Program Office (PMS 406) lead the Navy's efforts to develop, deliver and sustain capable and affordable unmanned maritime systems to meet Fleet requirements.

Program Office for Unmanned and Small Combatants/US Navy

TASK FORCE 59 LAUNCHES TASK GROUP 59.1 TO FOCUS ON UNMANNED SYSTEMS

US Naval Forces Central Command's Task Force 59 has commissioned a new task group, known as Task Group 59.1, to focus on the operational deployment of unmanned systems teamed with manned operators to bolster maritime security across the Middle East region.

"We are bringing budding, relevant technology to warfighters and doing it fast," said Capt. Colin Corridan, Task Force 59 commodore. "Breaking the molds of the legacy acquisition model requires a level of connective tissue between industry partners and the end user operators, and 59.1 answers that bell. Our Sailors will be there to ensure seamless integration of new tech introduced to operators while in theater."

Lt. Luis Echeverria, a surface warfare officer with over 60,000 unmanned operating hours at sea across 34 operations and exercises with Task Force 59, assumed command of the task group, dubbed "The Pioneers." This opportunity for a junior officer such as Echeverria to assume command is a first for the unmanned task force and highlights the growing need for a cadre of experts at more junior levels to be in positions of leadership.

"Task Group 59.1 is ready to take the capabilities of TF 59's unmanned systems and charter new ground with manned and unmanned teaming concepts," said Echeverria. "We are 'the pioneers' for the future of our Navy, and I couldn't be more honored to lead this team."

In recent months, Task Force 59 has conducted a series of unmanned exercises to advance lethality at sea. The exercises used live munitions fired from a T-38 Devil Ray unmanned surface vessel to strike a training target. The munitions hit every time.

Corridan said these achievements require the next tactical step to be handled effectively.

"The innovative talent pool that is attracted to working with unmanned systems is unmatched, and the operator trust and experience with robots is ultimately developing the next generation of Sailors that will operate the hybrid fleet," Corridan said.

"The handpicked team that is 59.1, identified to pioneer this endeavor will be leading the way for the Navy in the hybrid fleet ecosystem. I'm very excited for what lies ahead for the pioneers."

Established in September 2021, Task Force 59 is the Navy's first Unmanned and Artificial Intelligence Task Force. It has tested, upgraded, evolved and operated with more than 23 different unmanned systems.

TF 59 integrates unmanned systems and artificial intelligence with maritime operations in the US 5th Fleet area of operations to help ensure maritime security and stability in the Middle East region.

GDMS AWARDED PRIME INTEGRATOR CONTRACT FOR TRIDENT II STRATEGIC WEAPON SYSTEM

General Dynamics Mission Systems announced that it was awarded a $335,071,035 cost-plus-incentive-fee and cost-plus-fixed-fee follow on contract as the prime integrator for the Trident II Fire Control System (FCS).

Under the FY24 FCS Omnibus Contract, General Dynamics will continue to provide full life cycle and operational support for all deployed Ohio-class ballistic missile submarine (SSBN) FCSs as well as continue the development, production and installation for all new Columbia-class SSBN FCSs through 2028. The contract includes options which, if exercised, would bring the cumulative value to $611,658,461.

General Dynamics Mission Systems supports the Navy's top priority with FCS development, production, sparing and installation activities for three Columbia-class hulls (US04, US05 and US06), and one United Kingdom Dreadnought-class hull (UK12). Concept development for the Trident II Missile Life Extension Two (D5LE2) will continue under this contract through detailed design.

"For more than 65 years General Dynamics Mission Systems has provided the US submarine force with highly reliable fire control systems. We look forward to continuing to provide the US and UK Navies with state-of-the-art, reliable, and innovative solutions.

Artist Rendering of a Columbia-Class Ballistic Missile Submarine. (Credit: GDMS)

These SSBN submarines are our nation's highest priority, and we take pride in delivering these systems on time and on budget," said Laura Hooks, vice president and general manager of Maritime and Strategic Systems at General Dynamics Mission Systems.

Work will be performed in Pittsfield, Massachusetts (83%); Bangor, Washington (4%); Kings Bay, Georgia (4%); Loanhead, Midlothian, United Kingdom (3%); Cape Canaveral, Florida (2%); Groton, Connecticut (2%); and Quonset Point, Rhode Island (2%). If all options are exercised, work will continue until October 2030.

US CONTINENTAL SHELF EXTENDED BY THE DEPARTMENT OF STATE

View from the bow of NOAA Ship Okeanos Explorer during the West Coast Mapping 2022 expedition. (Credit: NOAA)

The Department of State has released the geographic coordinates defining the outer limits of the US continental shelf in areas beyond 200 nautical miles from the coast, known as the extended continental shelf (ECS). The continental shelf is the extension of a country's land territory under the sea. Like other countries, the United States has rights under international law to conserve and manage the resources and vital habitats on and under its ECS.

The US ECS area is approximately one million square kilometers spread across seven regions. This maritime zone holds many resources (e.g., corals, crabs) and vital habitats for marine life. The Department of State led the ECS effort through the US ECS Task Force, an interagency body of the US Government composed of 14 agencies.

Determining the ECS outer limits requires data on the depth, shape, and geophysical characteristics of the seabed and subsoil. The National Oceanic and Atmospheric Administration (NOAA) and US Geological Survey (USGS) were responsible for collecting and analyzing the necessary data. Data collection began in 2003 and constitutes the largest offshore mapping effort ever conducted by the United States.

The United States has determined its ECS limits in accordance with customary international law, as reflected in the relevant provisions of the 1982 United Nations Convention on the Law of the Sea, and the Scientific and Technical Guidelines of the Commission on the Limits of the Continental Shelf.

THAYERMAHAN RAISES SERIES C FUNDING

ThayerMahan, a world leader in autonomous maritime surveillance solutions, closed $20 million in follow-on Series C funding led by Hanwha Asset Management.

Existing investors, including MC2, AE Industrial, I Squared Capital, and Yellow Sub Funding participated pro rata in the round. The investment follows a $30 million Series C investment led by MC2 in April 2023.

Founded in 2016, ThayerMahan provides maritime domain data solutions and related services for government and industry customers. The company leverages its expertise in underwater acoustics, artificial intelligence, remotely piloted systems, and maritime autonomy to deliver value to customers.

ThayerMahan products and services are used to detect marine mammals, mitigate offshore construction noise, and deliver a wide range of undersea detection and security services. After three years of rapid sales growth, the company is an emerging leader in offshore energy support services and national security applications.

BP BOARD APPOINTS NEW CHIEF EXECUTIVE

The bp board has appointed Murray Auchincloss as bp Chief Executive Officer. Murray, who has been interim CEO since September 2023, will continue as a member of the bp board.

His appointment has been made following a robust and competitive search process, carried out by the board over the past four months with support from international search advisers. This included detailed consideration of a range of candidates, including external to bp.

Helge Lund, Chair of bp said: "The board is in complete agreement that Murray was the outstanding candidate and is the right leader for bp. His assured leadership, focus on performance and delivery, and deep understanding of the opportunities and challenges in the energy transition will serve bp well as we continue our disciplined transformation to an integrated energy company."

Murray Auchincloss said: "Our strategy—from international oil company to integrated energy company, or IOC to IEC—does not change. Now, more than ever, our focus must remain on delivery—operating safely and efficiently, executing with discipline, and always focusing on returns.

REGISTRATION NOW OPEN

OCEANTIC NETWORK

IPF24 INTERNATIONAL PARTNERING FORUM

April 22-25, 2024 | New Orleans

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

Hosted by the Oceantic Network, formerly 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. With the rapid expansion of offshore wind on a global scale, IPF attendance helps secure your place as a leader in the industry.

Located in the heart of America's offshore energy industry, New Orleans will host 2024 IPF just as the Gulf of Mexico begins developing its offshore wind market. Gulf companies are already hard at work building America's next energy industry and moving to integrate new technologies like green hydrogen into offshore wind. Embracing its offshore energy past and embracing the future of offshore wind, New Orleans and the state of Louisiana are emerging as a center of experience, expertise, innovation, and heart of this new industry.

REGISTER TODAY

OCEANTIC NETWORK
oceantic.org
Oceantic Network
@oceanticnetwork

OCEANTIC NETWORK

AMERICAS

Canadian Underwater Conference & Exhibition (CUCE)
Toronto, Canada | March 24–26
www.underwaterconference.ca

Sea-Air-Space
National Harbor, MD | April 8–10
https://seaairspace.org/about

International Offshore Wind Partnering Forum (IPF)
New Orleans, LA | April 22–25
www.offshorewindus.org/2024ipf

Canadian Hydrographic Conference
St. John's, Canada | May 27–30
https://chc2024.org/en

H2O Conference
Halifax, Canada | June 3–5
www.h2oconference.ca

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

EUROPE

Oceanology International
London, UK | March 12–14
www.oceanologyinternational.com/london/en-gb.html

WindEurope
Bilbao, Spain | March 20–22
https://windeurope.org/annual2024

Hydrogen 2024
Amsterdam, NL | April 9–10
https://events.reutersevents.com/renewable-energy/hydrogen-europe

Undersea Defence Technology (UDT)
London, UK | April 9–11
www.udt-global.com

Offshore Wind Connections
Hull, UK | May 1–2
www.offshorewindconnections.com

Underwater Technology Conference (UTC)
Bergen, Norway | June 11–13
www.utc.no

Seanergy
Nantes, France | June 26–28
www.seanergy-forum.com/en/seanergy2024

OTHER REGIONS

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

Subsea Technology Eastern Mediterranean
Limassol, Cyprus | April 16–18
www.subseatechnologyconference.com

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

Australia Wind Energy
Melbourne, Australia | July 9–11
https://www.windenergyaustralia.com

International Conference on Ocean Energy (ICOE)
Melbourne, Australia | September 17–19
www.ocean-energy-systems.org/icoe/conferences/icoe-2024-melbourne-/

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

| 2024 EDITORIAL CALENDAR |

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

CONTACT US

EDITORIAL TEAM
Ed Freeman, Managing Editor
editor@oceannews.com
Inger Peterson, Newsletter Editor
pr@oceannews.com

ACCOUNT MANAGER
Lisa Chilik
Lchilik@tscpublishing.com
+1 574-261-4215

ACCOUNT MANAGER
Mimi King
mking@tscpublishing.com
+44 77 7601 7564

PUBLISHER
Technology Systems Corp.
8502 SW Kansas Ave, Stuart, FL 34997
+1-772-221-7720
advertise@oceannews.com

linkedin.com/company/oceannews
facebook.com/OceanNewsandTechnology
twitter.com/oceannews

JAMES FISHER CHRISTENS NEW LNG TANKER DESIGNED TO REDUCE EMISSIONS

Lady Maria Fisher. (Credit: James Fisher)

James Fisher and Sons plc (James Fisher) has christened its latest LNG dual-fuel 6,000 dwt chemical tanker, as part of the next phase of its 'fleet of the future.' The christening of *Lady Maria Fisher* follows the introduction of the *Sir John Fisher* and has been developed to the same pioneering specification—built by China Merchants Jinling (CMJL) shipyard.

The innovative construction and vessel design brings enhanced hydrodynamic performance, boosts efficiency and reduces greenhouse gas emissions. This reduction helps lower industry scope three emissions and will allow James Fisher customers to deliver on its sustainability targets.

Compared to traditional design, the vessel is capable of achieving a 45 percent reduction in carbon emissions, in addition to a 93 percent reduction in NOx and 45 percent reduction in SOx, with the added capability of further reducing emissions while in port as well as at sea.

Jean Vernet, CEO of James Fisher said of the new vessels: "With over 175 years of rich history in maritime, we're ideally positioned to introduce new and innovative solutions for a more sustainable future—and this vessel is no different. Reducing carbon emissions across the transportation sector is critically important if we are to meet the needs of a low carbon future. Our continued investment in developing the fleet of the future signals James Fisher's firm company commitment to achieving those targets."

Lady Maria Fisher entered the fleet in early 2023, following her sister vessel *Sir John Fisher* in November 2022.

Since entering service in 2023 *Sir John Fisher* and *Lady Maria Fisher* have primarily serviced our long-time customer P66 with plans for work around the coastline of Northern Europe, allowing *James Fisher Everard* to service further existing long-term contracts.

GREEN LIGHT FOR MARINE MINING ON NORWEGIAN CONTINENTAL SHELF

On January 9, 2024, the Storting (Norwegian parliament) decided to open the Norwegian shelf for exploration and possible extraction of seabed minerals.

The Norwegian Offshore Directorate (formerly The Norwegian Petroleum Directorate) has contributed to the opening process, among other things by coordinating work on the impact assessment and preparing a resource assessment.

The Norwegian Offshore Directorate has mapped vast areas in the northern Norwegian Sea since 2017 and taken samples and collected data about minerals and metals found on the seabed. The Norwegian Offshore Directorate did this by means of their own expeditions, and in cooperation with expert communities at the universities in Tromsø and Bergen.


A sulphide sample, obtained during an expedition to the Mohns Ridge in 2020. (Credit: Øystein Leiknes Nag, Norwegian Offshore Directorate)

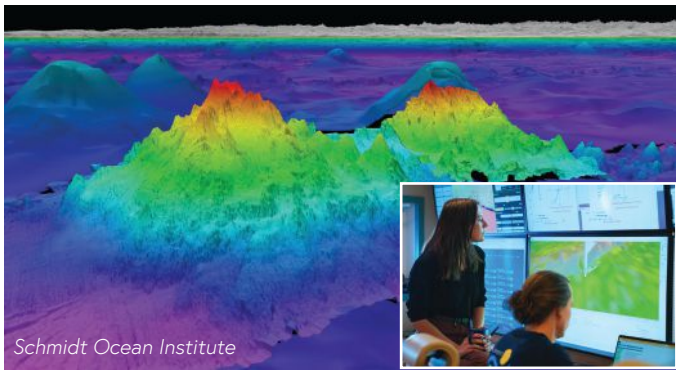
FOUR NEW SEAMOUNTS DISCOVERED
IN WATERS BETWEEN COSTA RICA TO CHILE

The crew of Schmidt Ocean Institute's research vessel *Falkor (too)* recently discovered four underwater mountains—the tallest of which is over 1.5 miles high—on a January transit from Golfito, Costa Rica, to Valparaiso, Chile.

The new seamounts, which range in size from approximately 1,591 meters to 2,681 meters, add to the crew's discovery last November of an underwater mountain that was twice the height of the Burj Khalifa at 1,600 meters in international waters off Guatemala.

Using multibeam mapping, Schmidt Ocean Institute's marine technicians and trained hydrographic experts, John Fulmer and Tomer Ketter, confirmed that the seafloor features had not been previously included in any bathymetric database. The seamounts were found as the technicians plotted a course to examine gravity anomalies during the transit from Costa Rica to Chile.

"We were fortunate enough to be able to plan an opportunistic mapping route using these gravity anomalies in satellite altimetry data," said Fulmer. "Examining gravity anomalies is a fancy way of saying we looked for bumps on a map, and when we did, we located these very large seamounts while staying on schedule for our first science expedition in Chile at the start of this year."



Whenever sea conditions permit, the crew collects mapping data as the research vessel moves, or transits, from one location to another. Since 2012, scientists on Schmidt Ocean Institute's research vessels *Falkor* and *Falkor (too)* have mapped about 1.5 million square kilometers and discovered 29 seamounts, hills, and trenches. Underwater mountains and trenches often host deep-sea coral reefs, sponges, and anemones living alongside organisms that find food, shelter, and a rocky surface to cling to along mountain slopes.

BEYOND GRAVITY SUPPORTS NASA PACE MISSION

NASA is using a navigation receiver from Beyond Gravity for a new climate protection satellite. NASA's PACE climate mission uses satellite technology to monitor changes in global marine biology, aerosols (small particles floating in the atmosphere) and clouds.

PACE will provide important information about aerosols such as dust, pollen, and smoke. These particles can affect air quality and lead to asthma and respiratory diseases in humans.

The centimeter-precise position of the satellite in space is determined with the help of technology from Beyond Gravity. The more precise the positioning, the more accurate the data that the satellite delivers.

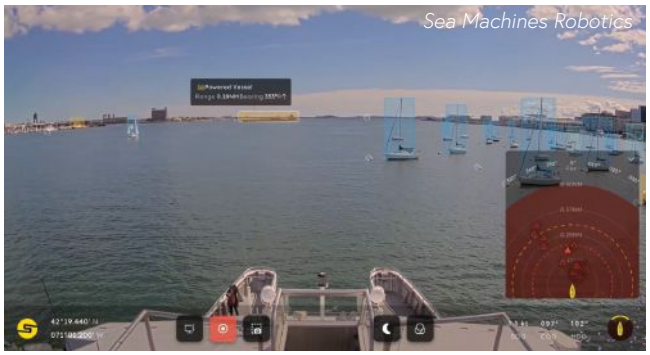
PACE stands for Plankton, Aerosol, Cloud, Ocean Ecosystem and will provide better insight into ocean health by measuring the distribution of phytoplankton, which consists of tiny plants and algae that support the marine food web.


NASA

SEA MACHINES RECEIVES ADDITIONAL ROUND OF FUNDING

Cleantech venture capital pioneer Emerald Technology Ventures has invested into Sea Machines, a developer of autonomous control systems and advanced perception technology for maritime vessels. This $12 million funding round, which was joined by Nabtesco Technology Ventures (NTV), Chevron Technology Ventures, Ingram Industries, RKKVC, Level 2 Ventures, and IMC Ventures, will help Sea Machines hone its technological edge and grow its market presence. This adds to a financing in 2023 led by the Geekdom Fund.

Boston-based Sea Machines Robotics is a global leader in autonomous piloting systems meant to help sea vessels navigate and operate with greater efficiency, productivity, and capability. Its proprietary technology allows onboard computers to maintain precise control of vessel position, steering, and speed during a voyage, reroute as needed to avoid traffic and obstacles, and use streaming data to improve operations. The startup also develops solutions for computer vision, remote command and control, and advanced data collection along shipping routes, among other applications.


Sea Machines Robotics

AQUA COMMS SIGNS SPECTRUM AGREEMENT WITH ENERGY SCIENCES NETWORK

Aqua Comms has announced a long-term lease agreement for Trans-Atlantic subsea spectrum with Energy Sciences Network (ESnet) for 25% of a fiber pair between New York, Dublin and London. This agreement marks the first Trans-Atlantic spectrum acquisition by ESnet, the high-performance network built to support scientific research, funded by the US Department of Energy's (DOE's) Office of Science and managed by Lawrence Berkeley National Laboratory.

ESnet serves as the DOE research community's "data circulatory system," providing services to tens of thousands of scientific researchers throughout the entire national laboratory system, its supercomputing facilities, and its major scientific instruments, as well as peering with more than 270 research and commercial networks worldwide.

Secured for 15 years, this quarter-fiber-pair will provide a dedicated 5 Tbps data pipe that will be a foundational element of ESnet's long-term trans-Atlantic strategy to accommodate rapid increases in data traffic from DOE science collaborations and facilities, including ramping up for the high luminosity upgrade of CERN's Large Hadron Collider.

ADCP/DVL

NORTEK AS
Vangkroken 2 1351 Rud, Norway
+47 67 17 45 00
inquiry@nortekgroup.com
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

NAUTILUS MARINE SERVICE GMBH
Alter Postweg 30
Buxtehude, 21614, Germany
+49 (0) 4161 55903 16
sales@nautilus-gmbh.com
www.vitrovex.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 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 LLC
600 Jackson Ct.
Satellite Beach, FL 32937 USA
+1 321 610 4635
info@arcticrays.com
www.arcticrays.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.

DEEPSEA POWER & LIGHT
4033 Ruffin Rd.
San Diego, CA 92123
858 576 1261
858 576 0219
sales@deepsea.com
www.deepsea.com

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

SUBC IMAGING
327 Memorial Drive
Clarenville, Newfoundland and Labrador
A5A 1R8, Canada
1 709 702 0395
team@subcimaging.com
www.subcimaging.com
Ian McMillan, Director of Sales & Partnerships

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

REMOTE OCEAN SYSTEMS
9581 Ridgehaven Ct.
San Diego, CA 92123
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, ethernet control, compact size rated to 6,000-meter depth. We also have a fully staffed engineering department to help with your special requirements.

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, and Subsea Applications. SIDUS serves 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

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

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

SUBSEA DATA SYSTEMS
8502 SW Kansas Avenue
Stuart, FL 34997
+1 202 430 7074
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.

WINCHESTER INTERCONNECT
(Formerly Falmat Cable)
1810 Diamond Street
San Marcos, CA 92078
760 471 5400
sales@falmat.com
www.falmat.com
Shawn Amirehsani

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

CONNECTORS

BIRNS, INC.
1720 Fiske Place
Oxnard, CA 93033-1863 USA
+1 805 487 5393
+1 805 487 0427
USA +1 888 247 6788
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
sales@birnsaquamate.com
www.birnsaquamate.com
Michelle DeTerra

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

DIGITAL VIDEO RECORDING SYSTEMS

DIGITAL EDGE SUBSEA, LTD
Doubletree Court, Cavendish St.
Ulverston, Cumbria LA127AD
+44 (0) 1229 206456
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 six models. The EdgeDVR has become an essential part of any ROV and Diving system offshore, easy to use and reliable. The system is capable of recording simultaneous High Definition and Standard Definition video, together with auto creation of Dive, Video, Photo and Anomaly logs. Multi channel digital overlay is also available for all recorded channels, logos and realtime survey data can be displayed. With around 500 systems now offshore, we have a proven record of reliability.

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

EQUIPMENT RENTAL

OKEANUS SCIENCE & TECHOLOGY, LLC
255 Equity Blvd.
Houma, LA 70360
985 346 4666
985 346 8444
Bleblanc@okeanus.com
www.okeanus.com
Benton LeBlanc

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

SeaCatalog Vendor

FIBER OPTIC PRODUCTS/ SERVICES

OCEAN SPECIALISTS, INC.
8502 SW Kansas Avenue
Stuart, FL 34997
+1 772 219 3000
+1 772 219 3010
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.

GEOTECHNICAL SERVICES

BLUEFIELD GEOSERVICES
Stuart, Florida 34997 USA,
Bath, BA1 5EB, UK
+1 772 219 3000 (US Office)
+1 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 DISCOVERY
Pirsenteret
N-7462 Trondheim, Norway
+47 73 54 55 00
+47 73 51 50 20
km.seatex.sales@km.kongsberg.com
www.kongsberg.com/discovery
Finn Otto Sanne at
finn.otto.sanne@kongsberg.com

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

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

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.

MARINE VENTURES INTERNATIONAL, INC. (MVI)
8524 SW Kansas Avenue
Stuart, FL 34997
+1 772 419 9627
+1 772 419 9628
info@marineventures.com
www.marineventures.com

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

MOTION SENSING EQUIPMENT

KONGSBERG DISCOVERY
Pirsenteret
N-7462 Trondheim, Norway
+47 73 54 55 00
+47 73 51 50 20
km.seatex.sales@km.kongsberg.com
www.kongsberg.com/discovery
Finn Otto Sanne at
finn.otto.sanne@kongsberg.com

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

NAVIGATION & POSITIONING SYSTEMS

EVOLOGICS GMBH
Ackerstrasse 76
13355 Berlin, Germany
+49 (0) 30 4679 862 0
+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
19 Chapin Road, Building C
Pine Brook, NJ 07058
+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 dedicated to providing quality, reliability, and cutting-edge technology to customers worldwide to meet their sea, land, air, and space requirements. Our products guide spacecraft and strategic missiles, navigate autonomously undersea, provide navigation and fire control for ground vehicles, and control motion aboard both military and commercial aircraft.

KONGSBERG DISCOVERY
Pirsenteret
N-7462 Trondheim, Norway
+47 73 54 55 00
+47 73 51 50 20
km.seatex.sales@km.kongsberg.com
www.kongsberg.com/discovery
Finn Otto Sanne at
finn.otto.sanne@kongsberg.com

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

NETWORKS & DATA COMS

EVOLOGICS GMBH
Ackerstrasse 76
13355 Berlin, Germany
+49 (0) 30 4679 862 0
+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.

KONGSBERG DISCOVERY
Pirsenteret
N-7462 Trondheim, Norway
+47 73 54 55 00
+47 73 51 50 20
km.seatex.sales@km.kongsberg.com
www.kongsberg.com/discovery
Finn Otto Sanne at
finn.otto.sanne@kongsberg.com

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

OCEANOGRAPHIC INSTRUMENTS/SERVICES

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

- **Metocean Equipment Leasing:** Acoustic Doppler Current Profiler ADCPs (including StreamPro & RiverRay), Ice Profilers, AZFP, acoustic releases, wave/tide gauges, pingers, satellite beacons, CTD+DO+Tu profilers, DO & turbidity loggers, weather station, cages, flotation, bottom frames.
- **Oceanographic Products:** Acoustic Zooplankton Fish Profiler (AZFP), Ice Profiling Sonar (IPS) & shallow water Ice Profiler (SWIP), AZFP6-ice (AZFP combined with IPS), instrument cages and bottom frames. Custom acoustic products and system integration.
- **Consulting:** Field work, data collection, analyses, acoustics, remote sensing, oceanographic mooring design, numerical modelling and system integration.
- **Manufacturer's Representative:** Teledyne Marine, Deep Water Buoyancy, Valeport, Trimble, Hemisphere, ANB Sensors, SOFAR and WERA Oceanographic HF Radar.

STAR-ODDI
Skeidaras 12, 210
Gardabaer, Iceland
+354 533 6060
+354 533 6069
baldur@star-oddi.com
www.star-oddi.com
Baldur Sigurgeirsson

Miniature data loggers with a wide range of sensors: temperature, depth, pressure, salinity, conductivity, tilt-acceleration and compass heading. From shallow to deep ocean, for short or long-term studies. Used for movement analysis of underwater equipment and environmental monitoring. Choose between small and economical or larger sized higher accuracy, fast response and rechargeable loggers. Easy to mount on gear.

VALEPORT LTD
St. Peters Quay
Totnes TQ9 5EW
United Kingdom
+44 1803 869292
sales@valeport.co.uk
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 and Environmental, Current, Sound Velocity and Tide Gauges. Valeport has supplied the subsea sector for over fifty years, supporting the hydrographic and oceanographic communities with a comprehensive portfolio of products that deliver highly innovative solutions. Valeport's worldwide customer base that includes the environmental monitoring, water survey, energy, dredging, civil engineering and scientific research sectors. Our philosophy of keeping development and manufacturing entirely in-house, assures our customers of our expertise and commitment to providing the highest levels of quality, performance and service.

ROPE

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

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

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

SONAR SYSTEMS

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.

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 underwater housings for a total package that is small, rugged, and will provide years of maintenance-free use. Products include multibeam, mechanical scanning, and sidescan sonars.

MASSA PRODUCTS CORPORATION
280 Lincoln St., Hingham, MA 02043
+1 781 749 4800
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
Nygardsviken 1, 5165
Laksevag, Norway
+47 56 11 30 66,
info@saivas.com
www.saivas.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 mS/cm, 0.002 ºC.
- 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

EVOLOGICS GMBH
Ackerstrasse 76
13355 Berlin, Germany
+49 (0) 30 4679 862 0
+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.

SUBCTECH GMBH
Wellseedamm 1-3, 24145 Kiel,
Germany
+49 431 22039 880
+49 431 22039 881
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.

TELEMETRY

EVOLOGICS GMBH
Ackerstrasse 76
13355 Berlin, Germany
+49 (0) 30 4679 862 0
+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.

METOCEAN TELEMATICS
21 Thornhill Drive Dartmouth,
Nova Scotia B3B 1R9 Canada
+1 902 468 2505
+1 902 468 4442
emily@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.

UNCREWED MARITIME VEHICLES

EVOLOGICS GMBH
Ackerstrasse 76
13355 Berlin, Germany
+49 (0) 30 4679 862 0
+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.

GENERAL DYNAMICS MISSION SYSTEMS' BLUEFIN ROBOTICS PRODUCTS
553 South Street
Quincy, MA 02169
+1 617 715 7000
justin.reid@gd-ms.com
www.gdmissionsystems.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/

ISE proudly stands as a global leader in the delivery of modular AUVs, ROVs & submersibles specializing in systems up to 6km. As we mark our 50th anniversary, ISE takes pride in a legacy of innovation at depth, contributing significantly to the evolution of robotics and underwater technology and providing customized solutions for naval, industrial, and scientific companies worldwide.

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.

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

WINCHES, HANDLING, & CONTROL SYSTEMS

OKEANUS SCIENCE & TECHNOLOGY LLC
11989-A FM 529
Houston, TX 77041
+1 713 460 1400
Bleblanc@okeanus.com
www.okeanus.com
Benton LeBlanc

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

SeaCatalog Vendor

Sea the Difference

Photos: Aft deck and control room of CSA's R/V Dolphin

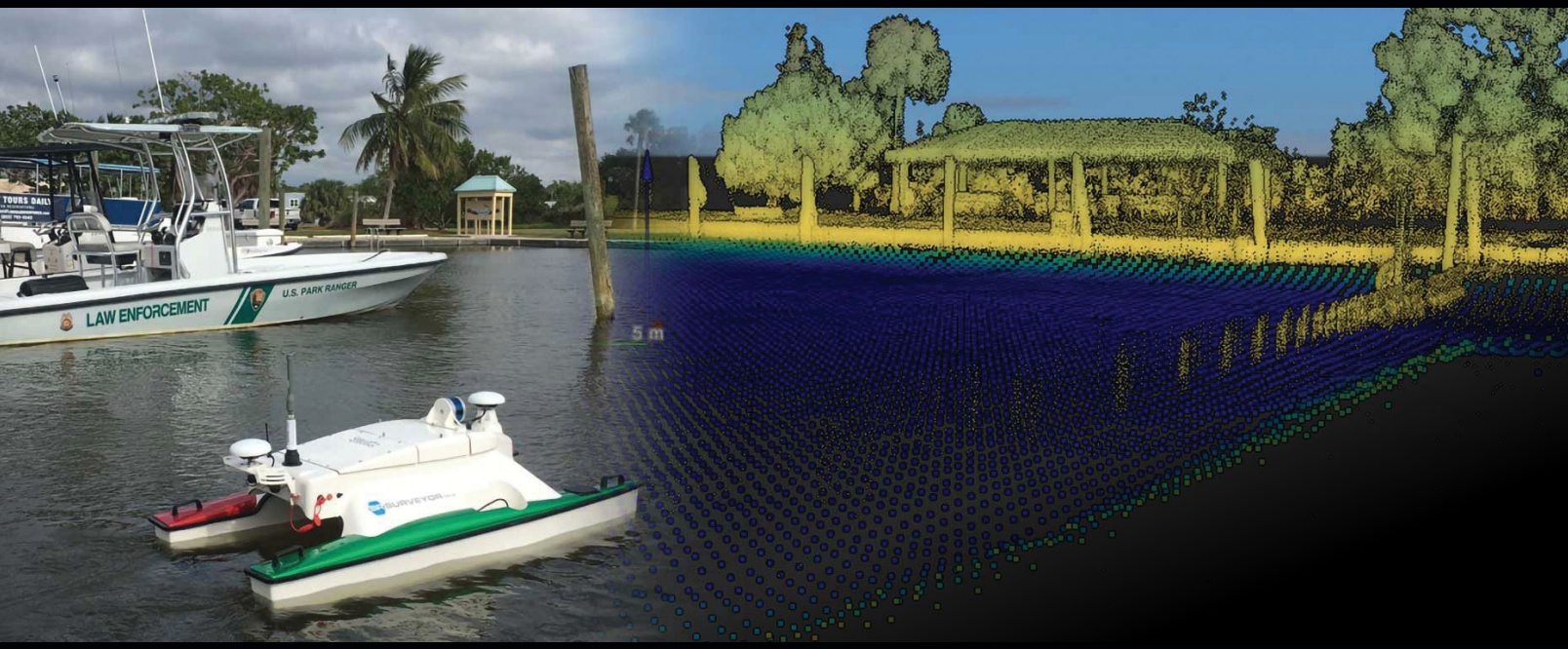
From Coastal to Deep Sea

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

| ADVERTISERS INDEX |



Intelligent Marine Robotics

Solutions that put you in control

Autonomous Surface Vehicles

ROVs for Hull & Tank Cleaning

Engineering & Design

Manufacturing & Fabrication

We engineer and manufacture unmanned systems for an increasingly data-centric world.

Our portfolio of marine robotics and specialized services provide commercial, government, and defense markets around the globe with solutions to optimize the efficiency and sustainability of inter-coastal and offshore activities.

SEA ROBOTICS

AN ADVANCED OCEAN SYSTEMS COMPANY

SeaRobotics.com

EMPOWERING

World leading electric underwater robotics

Seaeye eM1-7

Electric Manipulator

- Seven function work class manipulator
- Compatible with most work class ROVs
- Maximum reach 1,990mm
- Lift capacity 122kg/454kg (max/min reach)
- Precise position and force feedback
- Modular self-contained joints
- Wrist camera option
- Diagnostic power and status LEDs
- Interchangeable parallel and intermeshing jaw options
- On-board processing for advanced kinematics

saabseaeye.com

SAAB TECHNOLOGIES

SAAB