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OCEAN NEWS & TECHNOLOGY

Unmanned Vehicles & Marine Robotics

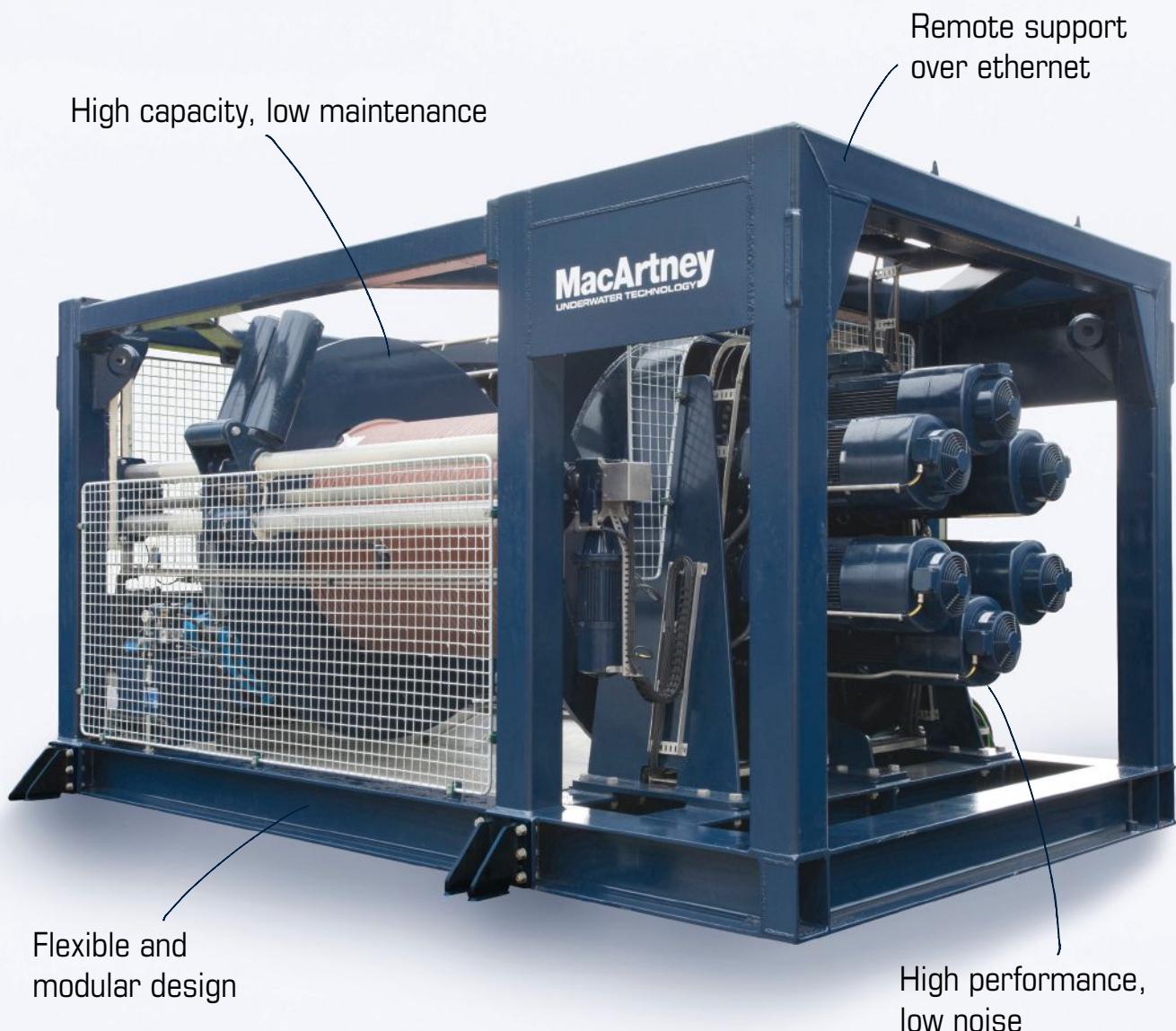
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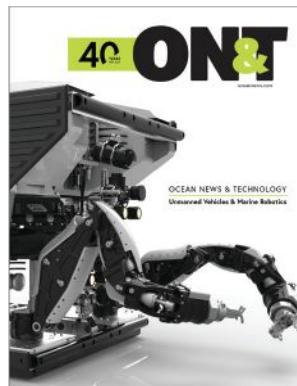
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## EDITOR'S NOTE

As the ocean industries embark on a new decade of exploration, it is somewhat poignant that ON&T enters its fifth decade in print. Founded in 1981, by the then editor Dan White, ON&T has grown to become a mainstay among industry professionals. Now in our 40th year, we would like to pay tribute to our editorial and production staff, both past and present, and of course thank our readers and advertising partners for their ongoing support.

Here's to an exciting new decade.

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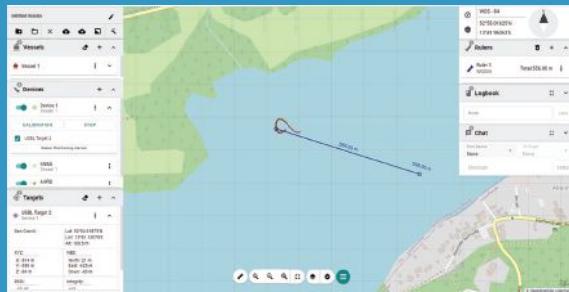
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LISA CHILIK

Tel: 574-261-4215

lchilik@tscpublishing.com

MIMI KING

Tel: +44 (0) 777 6017 564

mkting@tscpublishing.com

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# EXPLORING "FINAL FRONTIERS" CLOSER TO HOME

**BY NAEEM ALTAF***IBM Distinguished Engineer and IBM Space Tech CTO*

"Tango Delta—Touchdown confirmed—Perseverance is safely on the surface of Mars."

The landing of NASA's six-wheeled rover on the Red Planet was a much-needed moment of hope and human achievement in the midst of one of the most challenging periods in living memory.

Considering the huge costs and risks involved in space research, public support is essential. The price tag of the Perseverance mission is expected to reach almost \$3 billion over the lifecycle of the project. While a hefty figure, it's just a small fraction of the US\$650 billion that the US has spent on NASA since its inception in 1958. Add to that the investments of other nations and, more recently, those of private sector players like SpaceX and Blue Origin, and we may conclude that our collective global spending on space exploration over the past 70 years has been truly astronomical.

**OCEANS APART**

However, there is another frontier much closer to home that receives far less interest and support, but is crucial to our existence: the ocean. The Global Ocean Observing System (GOOS) estimates that investments in ocean science amount to about \$1 billion annually. This pales in comparison to our investments in space, and is out of kilter with the OECD's projection that the ocean economy will be worth \$3 trillion by 2030.

Yet to evaluate the significance of oceans on the basis of economics would be short-sighted. Oceans cover three-quarters of the Earth's surface and produce over 50 percent of our oxygen. Oceans regulate the world's climate systems, and we rely on them for food, transportation and natural resources. But human actions are threatening this most valuable resource. A recent UN Special Report on the Ocean reports that it is warmer, more acidic, more polluted, more depleted, less productive and less predictable than ever.

The good news is that advanced technologies are transforming our ability to understand and mitigate our actions. Powered by edge computing and drawing on renewable energy, fleets of artificially intelligent ships, drones, buoys, drifters and gliders can spend long durations at sea helping scientists on shore collect valuable data about the ocean.

A new generation of fully-autonomous marine research vessels are currently in development. Take ProMare's Mayflower Autonomous Ship which uses IBM AI and automation technologies to sense, think and make decisions as it traverses oceans collecting oceanographic and biological data. Highly-efficient, scalable, adaptive, and with ample capacity for carrying scientific equipment, these vessels have the potential to completely transform ocean science in the coming years.

**COLLABORATIVE GAINS**

This is not a zero-sum game where we need to choose to invest either in space or ocean exploration. In fact, ocean and space exploration have gone hand-in-hand since NASA launched the first civilian oceanographic satellite in 1978. Seasat paved the way for newer generations of ocean-observing satellites such as the recently launched Sentinel-6 Michael Freilich, which will help us monitor and mitigate the effects of climate change, helping us to map everything from sea level height, to ice flows and algal blooms.

Conversely, technologies developed for ocean science can help us in space. For example, IBM's edge computing technologies, designed for use in remote locations and similar to those used on the Mayflower Autonomous Ship, will be used on the International Space station as part of a DNA sequencing project called Genes in Space-3. The study aims to identify microbes on ISS that may cause a threat to future missions in space going to the Moon, Mars and beyond.

As we enter a golden age of space and ocean exploration, we need to embrace robotics, AI and autonomous technologies that can work alongside human scientists and explorers to gather data safely, efficiently, and at scale. In short, we need to explore Earth's frontiers in tandem—bringing to bear the same spirit of curiosity and courage that defines who we are, and which will determine where we go from here.

*IBM is supporting the Mayflower Autonomous Ship project with the technologies and expertise it needs to explore the ocean and advance understanding in critical areas such as global warming, ocean pollution and marine mammal conservation.*

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# ROVs FOR UNCREWED VESSELS



**By Mark Collins**

*BD Director, SMD Remote  
and Autonomous Systems*



The development of simple canoes and rafts enabled mankind to take to the water and catch food. As knowledge grew humans started going further afield on a quest to explore and conquer distant lands. This also gave rise to trade, the shipment of goods across the world's oceans, and the advent of larger faster vessels. In recent times, mankind has gone to sea to exploit its resources and build infrastructure for energy and communication industries. These vessels need not only transport goods to site but also have methods of deploying and installing equipment to the seafloor. Vessel purpose has evolved over time.

Clearly travel, the very act of moving humans, requires humans at sea. But for all the other activities, having people onboard can be questioned if it is not the primary reason these vessels go to sea.

Sending a person to sea is expensive. Vessels need to provide offices, accommodation, food, sanitation, and a safe environment for humans. In addition, companies need to provide training, insurance, medical and transfers. It all costs money.

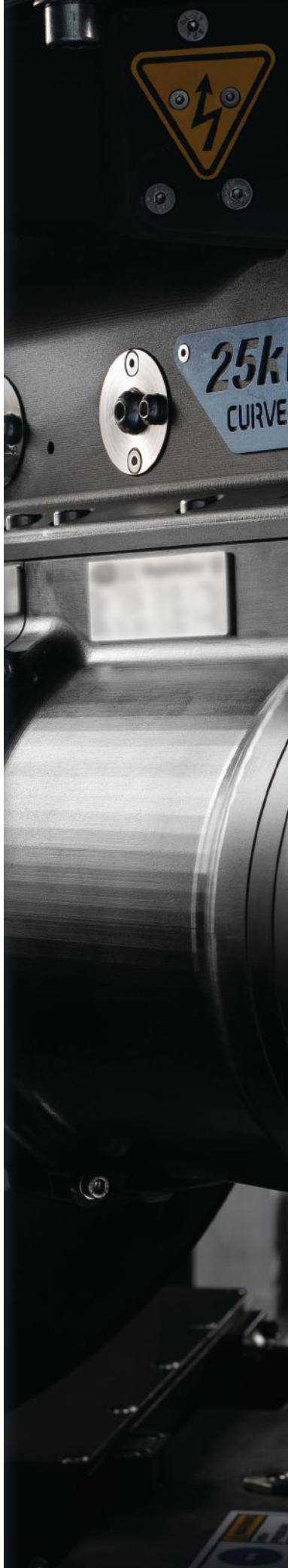
A figure I heard a few years ago was that it costs \$1.3 Million (USD) to send a person to sea, for a year, on an offshore construction vessel.

But change is afoot. Remote working is moving from being acceptable to being desired. Driven by a need to reduce cost, environmental and safety concerns, and a change in mindset to work-life balance. Communication and AI Technology is enabling this and moving at a staggering rate. As is the equipment that can use these technologies to conduct remote operations at sea and work for long periods without human intervention. Recently we have seen a rise in experimental uncrewed vessels. These are targeting the transportation of goods, data and survey operations and now subsea ROV operations. With it comes new opportunities for personnel to work from remote communication centers onshore, closer to family and friends.

## ROVs REIMAGINED

SMD, based in Newcastle, in the U.K., is well known for its heavy-duty subsea machinery. Celebrating its 50th birthday this year, the company has delivered many world firsts in subsea robotics. Over the past four years, SMD has invested R&D into its next-generation remotely operated vehicle technology. It has placed a heavy focus on enabling technology for over horizon control and uncrewed vessel applications. This is to support:

- » Cost reduction
- » Improved safety
- » Reduced CO2
- » Better performance





» Quantum EV heavy construction & science ROV. (Image credit: SMD)

The first project is SMD's ROV Evolution Program. The output of which is a new range of high-performance Electric ROVs with optimized variations for Offshore Wind, IMR, survey and heavy construction.



» Atom EV lightweight offshore wind and IMR ROV. (Image credit: SMD)

Up until now, ROVs have relied on operators onboard to ensure availability. SMD has put a lot of emphasis on efficiency and reliability to reduce this need.

#### DC POWER EFFICIENCY

A key part to the successful application of an uncrewed vessel is a reduction in size, weight and power to lower costs and CO<sub>2</sub> levels. SMD wanted to ensure that its ROV technology played its part in this too. The hard part is doing it without sacrificing performance and capability. SMD has achieved this by using an advanced DC power distribution and a powerful DC propulsion system on its new ROVs. It is 38% more efficient than an AC power system used by traditional hydraulic WROVs. Not only can this equate to a \$200,000/year fuel saving, but DC power also enables the use of smaller lighter umbilicals, and smaller, lighter launch and recovery equipment.

The new technology is well suited to low power and/or battery-operated vessels. SMD's new ROV range is battery compatible out of the box. A fully charged battery can be installed into the ROV before setting sail, the vessel can provide trickle charging so low power work can be conducted. When a demanding task is required the ROV battery can 'peak shave,' keeping demand from the vessel supply to a minimum.

#### FAILSAFE REMOTE OPERATIONS

The uncrewed vessel business case does not work if the equipment onboard is unreliable. This area has received particular attention from SMD. The number of moving parts in the new ROVs has been reduced. Moving parts tend to account for most wear and breakdown. Where a moving part is unavoidable—such as a thruster propeller—SMD has

taken steps to reduce the possibility of a failure stopping operations. The thrusters use a magnet coupling and hermetic sealing to enable continued operation even if a seal fails and the unit is flooded.

Redundancy plays a large part too. Each thruster is a standalone unit that can be isolated in the event of catastrophic failure. If this happens an advanced flight system compensates, retaining a level of control. The communication system is split between two interface units. If one fails, the other can take over. And the DC conversion process uses parallel units to share the workload. Should a fault occur these units can be isolated independently, for continued operation.

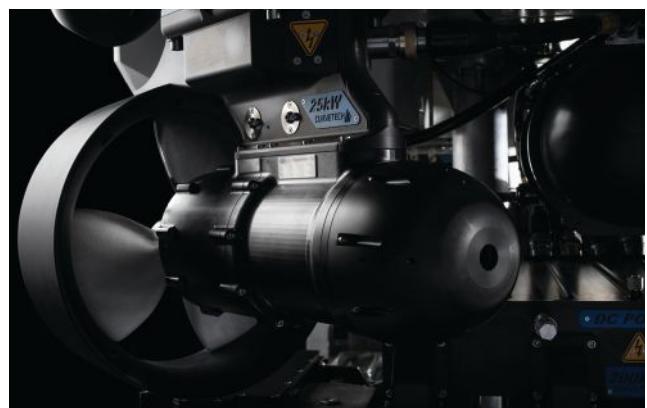
The final important area that has been considered is the communication interface between the ROV and the uncrewed vessel. An uncrewed vessel must be able to take command of the ROV in an emergency, recover to deck or move it to a safe location. Although protocols and standards have yet to be determined, SMD's control hierarchy permits a flexible level of over horizon third party access.

SMD is coming to the end of the development phase for the first two vehicles. This also includes an all new electric TMS and intelligent LARS range to compliment the ROVs. Open water trials are planned to start soon. A new dawn of remote subsea operations is nearly here.

To find out more about SMD's line of next-generation ROVs, visit: <https://www.smd.co.uk/our-products/electric-rov/>



» Example of redundant sub-assemblies used on SMD's new ROVs. (Image credit: SMD)



» SMD's new high-performance electric propulsion system. (Image credit: SMD)

## RESEARCHERS DISCOVER AN IMMENSE HYDROCARBON CYCLE IN THE WORLD'S OCEAN

Hydrocarbons and petroleum are almost synonymous in environmental science. Oil reserves account for nearly all the hydrocarbons we know. But the few hydrocarbons that trace their origin to biological sources may play a larger ecological role than scientists originally suspected.

U.S. National Science Foundation-funded researchers at the University of California, Santa Barbara and the Woods Hole Oceanographic Institution investigated this previously neglected area of oceanography for signs of an overlooked global cycle. They also tested how its existence might impact the ocean's response to oil spills.

"We demonstrated that there is a massive and rapid hydrocarbon cycle that occurs in the ocean, and that it is distinct from the ocean's capacity to respond to petroleum inputs," said David Valentine of UCSB. The research results appear in the journal *Nature Microbiology*.

In 2015, an international team published a study demonstrating that the hydrocarbon



» Scientists collect water samples from the Sargasso Sea. (Photo credit: David Valentine)

pentadecane was produced by marine cyanobacteria in laboratory cultures. The researchers extrapolated that this compound might be important in the ocean.

In next steps in the research, Valentine and colleagues visited the Gulf of Mexico in 2015 and then the west Atlantic in 2017 to collect samples and run experiments. The team sampled seawater from a region of the Atlantic known as the Sargasso Sea, named

for the floating sargassum seaweed swept in from the Gulf of Mexico.

It turned out that two types of marine cyanobacteria are adding as much as 500 times more hydrocarbons to the ocean per year than the sum of all other types of petroleum inputs to the ocean, including natural oil seeps, oil spills, fuel dumping and run-off from land. These microbes collectively produce 300-600 million metric tons of pentadecane per year, an amount that dwarfs the 1.3 million metric tons of hydrocarbons released from all other sources.

In the future, the researchers hope to link the microbes' genomics to their physiology and ecology. The team has genome sequences for dozens of organisms that multiplied to consume the pentadecane in their samples. "The amount of information that's there is incredible," said Valentine, "and reveals just how much we don't know about the ecology of a lot of hydrocarbon-consuming organisms."

Hedy Edmonds, a program director in NSF's Division of Ocean Sciences, added: "There are many reasons to study compounds like this in the oceans—starting with the basic understanding we gain about marine chemistry and microbiology, to bigger questions about carbon cycling, and applied connections to understanding what happens to oil spills. It all starts with basic research."

## CSA OCEAN SCIENCES COMPLETES 2ND PWM SURVEY IN TRINIDAD

Water Monitoring Surveys are an important element of the marine environmental consulting services provided by CSA Ocean Sciences Inc. (CSA) in the U.S. and internationally. In Trinidad, the CSA team has completed the second annual Produced Water Monitoring Surveys in Guayaguayare Bay for a regional oil and gas operator. Both surveys were conducted to meet regional regulatory requirements.

The Produced Water Monitoring Surveys were designed to examine conditions in the vicinity of the operator's produced water discharge, which is within historic seagrass bed areas in Guayaguayare Bay off the southeast coast

of Trinidad west of Galeota Port. CSA's sampling design facilitated an understanding of marine environmental conditions within a 1,500 m radius of the produced water discharge outfall and seagrass beds 3 km east of the outfall. The CSA team mobilized a shallow draft vessel, survey equipment, operations specialists, and project scientists to acquire data in depths less than 15 m.

The CSA team collected seawater samples, sediment samples, and video and still imagery using a shallow-water drop camera system. Sediment and seawater samples were handled according to international protocols and laboratory guidelines, and

biological and physicochemical characteristics were analyzed. Using the data and imagery, CSA scientists documented the marine environmental conditions in these areas of Guayaguayare Bay and examined potential impacts to the environment.

During the survey, health and safety requirements were strictly implemented, including mitigations and practice to prevent the transmission of coronavirus. CSA's commitment to worker health and safety has enabled the successful completion of projects throughout its 50-year history.



» Keda Deonarine, CSA Ocean Scientist

# MACARTNEY DEVELOPS ADVANCED TELEMETRY SYSTEM FOR JASCO UNDERWATER LISTENING STATIONS

Years of development culminated in a MacArtney telemetry concept measuring and transmitting individual noise profiles for complex acoustic data tracking to help preserve and recover one of Canada's most iconic species—the Southern Resident Killer Whale.

Under the Canadian Species at Risk Act, the Southern Resident Killer Whale was recently concluded to be facing an approaching threat to survival and recovery. At Boundary Pass in the Salish Sea, an enhanced monitoring project provides an underwater sound picture of the Southern Resident Killer Whale's habitat, consequently rendering the most effective noise reduction measures.

The Jasco Underwater Listening Stations (ULS), commissioned by Transport Canada under the federal government's five-year Whales Initiative, will passively track endangered whales and thousands of commercial vessels frequenting British Columbia's southern ports on an annual basis.

On the system solution and scope of supply for the Jasco Applied Sciences ULS, Andrew Palmer, General Manager at MacArtney Canada Ltd. said: "MacArtney and Jasco have been working on the concept of the ULS for several years. The challenge was to develop a telemetry system that would not interfere with the acoustic data gathered by the Jasco hydrophone arrays. The scope of this project was one of the larger, if not the largest, development we've ever undertaken at MacArtney Canada Ltd., and I could not be more pleased with what we've accomplished."

## SCOPE OF SUPPLY

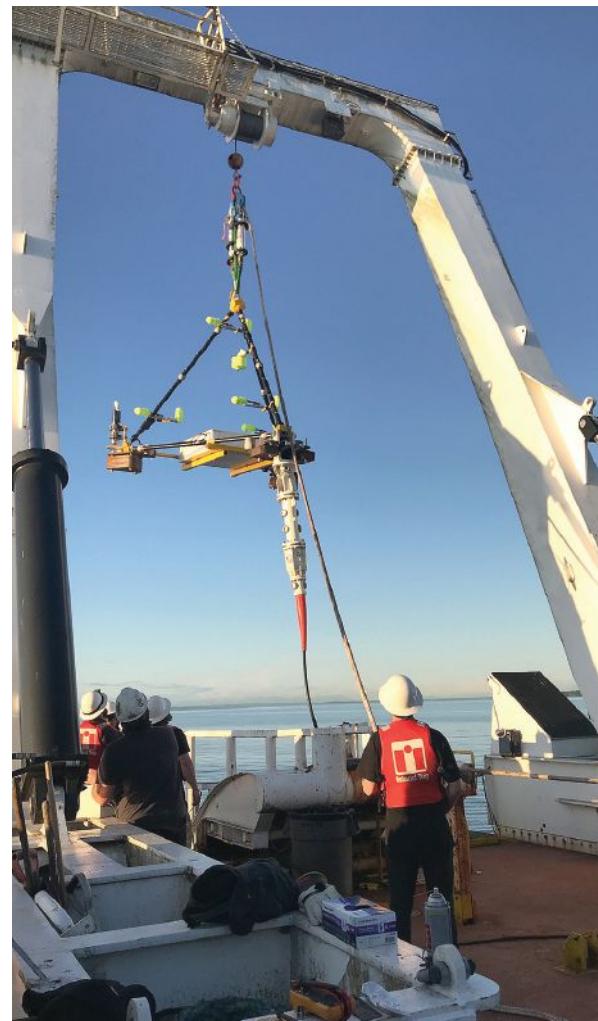
The project scope includes two Jasco Underwater Listening Stations, each comprising two MacArtney Mini-T multiplexer systems and one MacArtney LUXUS HD camera.

The MacArtney Mini-T multiplexers enable the Jasco ULS systems to provide real-time communications to a shore via a subsea fiber optic cable. The sensor suite aboard each ULS consists of various sensors, including:

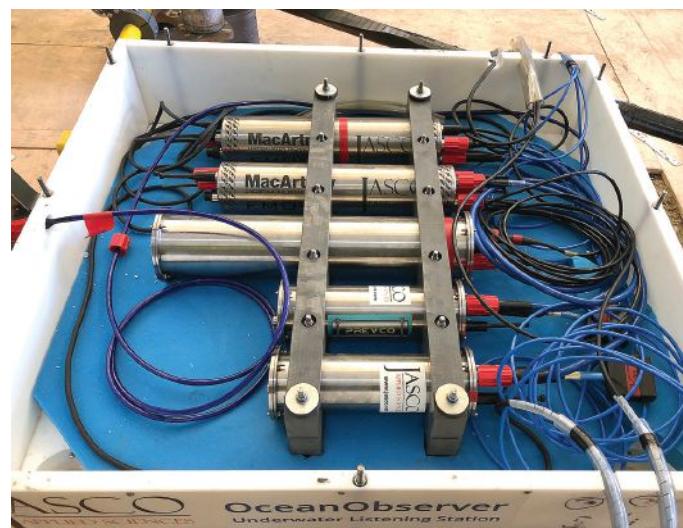
- An array of hydrophones
- High definition video camera
- LED light
- Acoustic Doppler current profiler (ADCP)
- Conductivity, temperature, and depth sensor (CTD)

MacArtney's line of EMO multiplexers enables multiple data streams and control signals to be transmitted simultaneously through a single optical fiber. This allows for real-time data transfer over vast distances through a smaller cable with minimal conductors. On the opposite end of the system, a de-multiplexer converts the data back into the original formats where it may be accessed via an interface from the rack-mounted console.

The data collected by the ULS systems will be used to create individual vessel noise profiles, to detect and track whales, and to monitor noise levels in the Boundary Pass for many years to come.



» Deployment of Jasco ULS comprising MacArtney Mini-T multiplexer systems. (Photo credit: MacArtney)



» MacArtney Mini-T multiplexer systems installed in Jasco Underwater Listening Station. (Photo credit: MacArtney)



▲ The SRV-8 is equipped with BluePrint Subsea Oculus 3D Imaging Sonar and Seatrac USBL Navigation. (Courtesy of Topaz Subsea in Australia)

## REDEFINING ROVs: OCEANBOTICS™ SRV-8



**By Robert Jechart**  
CEO of RJE International, Inc.  
and RJE Oceanbotics



**and Jeff Vos**  
Marketing, RJE International, Inc.  
and RJE Oceanbotics

**S**imply put, Oceanbotics™ is the latest division of RJE International, Inc. However, if you take a closer look, you will find that Oceanbotics™ represents far more than that. You will discover an interesting history, uncover exquisite design, experience intuitive technology, cutting-edge software, and witness a relentless dedication to the creation of a positive customer experience. This ceaseless drive to innovate recently culminated in the launch of the SRV-8, a professional-grade Remotely Operated Vehicle (ROV) that delivers next-generation maneuverability and versatility.

But first, a little bit of that history.

### CREATIVE ROOTS

A thirst for progress is something that unites the team at RJE International, Inc / RJE Oceanbotics. You could say that innovation is written into the team's collective DNA. This sense of technological curiosity was passed down from a famed Austrian-born inventor, Ernst Jechart, who created the modern-day portable atomic clock and happens to be the father of current company CEO, Robert Jechart. Ernst founded his own company after his employer, a large German engineering firm, rejected his new prototype for a miniature portable atomic clock. Ernst then went on to develop the modern-day atomic clock in the basement of his small house, in Germany. The new atomic clock debuted in 1972 and quickly caught the attention of organizations in the U.S. So much so, in fact, that the family decided to relocate to California and set up operations to meet demand from the American market. This paved the way for some groundbreaking technologies,

including the Global Positioning System (GPS) system that we all defer to today when using our phones for navigation. Ernst's invention was such a critical technological advancement that it is on display at the Smithsonian Space Museum.

RJE International, Inc. was formed in 1991. From humble beginnings—a spare bedroom as the first corporate HQ—the company has grown to become a 30-year leader in acoustic navigation systems, including the beacons for black boxes on aircraft and underwater mission critical products.

RJE's expansion into Remotely Operated Vehicles (ROVs) was a strategic move based on consistent feedback from clients in the ocean industries: that most ROVs were anything but user friendly, difficult to transport, complicated to pilot, equipped with rudimentary software, and overly expensive.

#### OCEANBOTICS™ SRV-8

RJE seized its opportunity to establish a fresh approach and began work on developing a next-generation ROV—one that addressed the shifting demands of marine and underwater professionals—which centered around the design concept of aerial drones.

This was the inspiration for RJE Oceanbotics™, created in June 2017. The Oceanbotics™ team immediately focused efforts on engineering the SRV-8 underwater ROV, the most maneuverable, intuitive, portable, and easy to use professional-grade ROV for the marine professional. Many operators describe the SRV-8 as a drone-like underwater experience for the submerged world—it pushes the boundaries of marine technology and innovation.

The SRV-8 vehicle performs the function of a mobile underwater sensor suite, a platform that is easily adaptable depending on the mission at hand. Applications include search & rescue (SAR), inspection (pilings, bridges, pipelines, ship hulls, platforms, etc.), aquatic farming, reef monitoring, defense, offshore, commercial diving, among several others. In most cases, the required end product for the customer is the video, sonar and data recordings of the mission, in digital format. RJE's state-of-the-art software transforms this into a seamless and easy task.

Eight dynamically vectored thrusters not only give this ROV its sleek profile but also provide pilots with unmatched maneuverability and precision control. The SRV-8 is powered by two lithium-ion batteries that allow for 6 to 8 hours of operation and its size allows for one-



» Kirt Ejesiak, Chairman & CEO of Arctic UAV/Sedna ROV, utilizes the SRV-8 for underwater surveying and observation purposes in the Arctic Waters. (Photo Courtesy of Arctic UAV/ Sedna ROV)



» The SRV-8 is powered by two lithium-ion batteries that allow for 6 to 8 hours of operation and its size allows for one-person portability. (Photo credit: RJE Oceanbotics)

person portability. The advanced and easy-to-use SubNav™ Software by Oceanbotics™ is fully integrated with BluePrint Subsea's Oculus Imaging Sonar and the Seatrac USB Navigation System, allowing for truly seamless integration. The SRV-8 and SubNav™ combine for intuitive control and a stress-free plug-and-play experience. How many other professional-grade ROVs can claim that? The SRV-8 is in a category of its own and it really is as good as it looks.

#### IN-FLIGHT EXPERIENCE

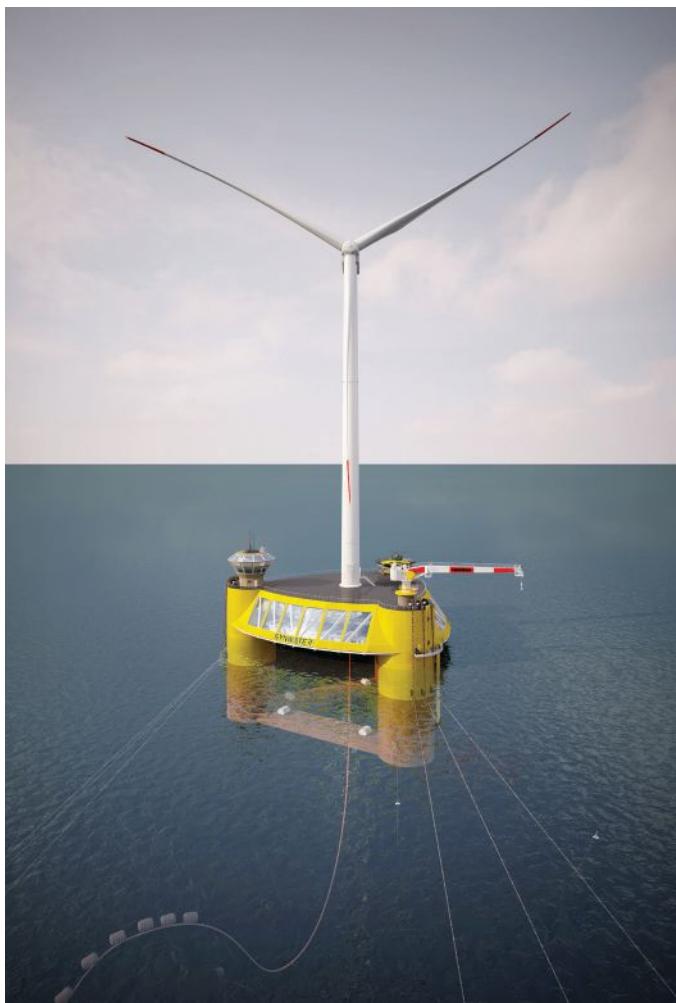
When it comes to operating the Oceanbotics™ SRV-8, the goal has always been to provide customers with an "Apple-like" underwater experience. Customers want to be able to take an ROV off the shelf, connect it up, drop it in the water and go. The rugged and durable SRV-8 ROV allows the user to do just that, while focusing entirely on the mission without worrying about the technicalities of the product.

ROV pilots want easy control and have a choice of either an Xbox controller or the "Flight Stick" set-up, which allows single handed and precise control of the vehicle—truly an instinctive way to fly.

The SRV-8 includes semi-autonomous flying capabilities via auto heading, auto depth and auto pitch modes easily accessible via the controller. Pilots have the choice to lock the SRV-8 in a particular heading/direction so that it will not turn. The SRV-8 can also be locked at desired depths—simply press the button and let the ROV hover in place. If you need to lock the SRV-8 in a particular angle to scan the seafloor or the bottom of a boat, then you can do that too. The pitch hold locks the SRV-8 in a desired angle with the ability to incrementally adjust the angle of view. Each hold is able to engage at the same time or can be engaged individually.

The SRV-8's advanced features translate into superior handling and faster completion of underwater tasks—this in turn saves customers valuable time and real money.

The RJE Oceanbotics™ team is currently working on a number of other innovative solutions for underwater professionals and pledges to push the boundaries of user-friendly and ergonomic underwater robotics technology. The SRV-8 is just the beginning. To find out more, visit: [www.oceanbotics.com](http://www.oceanbotics.com)



» A first FWD project implementation is to begin this year.



» The floating utility solution is easy to mobilize at short notice.

## FLOATING WATER UTILITIES: EUROPEAN INDUSTRY INITIATIVE PREPARES MARKET ENTRY

Floating WINDdesal (FWD) is a "floating water utility" and stands for a path-breaking technology supplying potable water to coastal regions worldwide. FWD essentially consists of a seawater desalination plant and a wind turbine, both supported by a floating semi-submersible structure.

The FWD development is carried out and supported by a European industry initiative with the participation of system partners (thyssenkrupp Industrial Solutions, CRIST Shipyard, SYNLIFT Industrial Products) as well as technology partners (Prysmian Group, Boll & Kirch Filterbau, AEROVIDE, StoGda Ship Design & Engineering, EMS Maritime Offshore).

Both project management and general planning lie with the Potsdam-based company SYNLIFT Industrial Products (SIP), recurring on many years of experience in the field of seawater desalination powered by renewable energies.

A first FWD project implementation—most probably in the Middle East—is to begin this year.

Through the innovative combination of flexible processing, integrated energy and load management and extra-long blade wind technology, FWD seawater desalination is almost entirely powered by wind energy.

With three module sizes in preparation, the daily water treatment capacity of this eco-water-utility is 15,000, 30,000 or 50,000 m<sup>3</sup> per day. Hence, the largest FWD module can provide drinking water for up to half a million people.

Applying the semi-submersible technology—originally developed for deep-sea oil drilling and today increasingly also used for offshore wind energy—locations with greater water depths can also be activated cost-effectively for FWD with a minimized impact of seawater desalination on the maritime and terrestrial environment.

The floating utility solution is easy to mobilize at short notice, ideal for emergencies and any kind of temporary mission. According to head of FWD project, Joachim Käufler (SIP), it also offers an additional potential:

"Our floating utility unit is mobile. If necessary, the entire plant can be relocated by sea. As a result of that, requirement for customers to provide securities and guarantees—indispensable for the long-term operation of stationary onshore desalination plants—is significantly reduced or, at best, not required at all. FWD is therefore intended to enable sustainable and cost-effective seawater desalination even in locations where conventional desalination could not be financed."

Floating WINDdesal combines the aspects of security of supply, sustainability, flexibility and cost efficiency and therefore provides a consistent answer to one of the central challenges of our time—supplying clean drinking water under growing climate and demographic pressure.

## exactEARTH TO PROVIDE ADVANCED AIS SERVICES FOR MDA'S DARK VESSEL DETECTION PROGRAM

exactEarth Ltd. has signed an agreement with MDA to provide advanced Satellite-AIS data services as part of MDA's recently announced Dark Vessel Detection ("DVD") program for the Government of Canada. The DVD program is intended to detect and identify vessels that have switched off their AIS transponders and are engaged in illegal, unreported and unregulated ("IUU") fishing.

IUU fishing is a global problem that results in significant economic loss—estimated at \$23 billion per year by the Department of Fisheries and Oceans Canada—and leads to considerable damage to the

world's fishing population and habitat. exactEarth is part of the MDA-led project that is supporting the Government of Canada's commitment to help deter IUU fishing by using satellite technology to locate so-called "dark targets", those whose AIS transponders have been switched off. Under the terms of its agreement with MDA, exactEarth will provide advanced global Satellite-AIS data services to support pilot trials of the DVD program.

"exactEarth has been working with the global fisheries community for the last ten years and we are very pleased to expand our relationship with



» The DVD program is intended to detect and identify vessels that have switched off their AIS transponders and are engaged in illegal, unreported and unregulated fishing.

MDA and to be a part of this leading-edge project to help the Government of Canada in its important fight against IUU," said Peter Mabson, President and CEO of exactEarth. "IUU is a global issue and exactEarth's advanced Satellite-AIS and small vessel tracking capabilities provide an important and comprehensive real time information source in helping to detect and locate vessels that may be engaged in this type of illegal behavior."

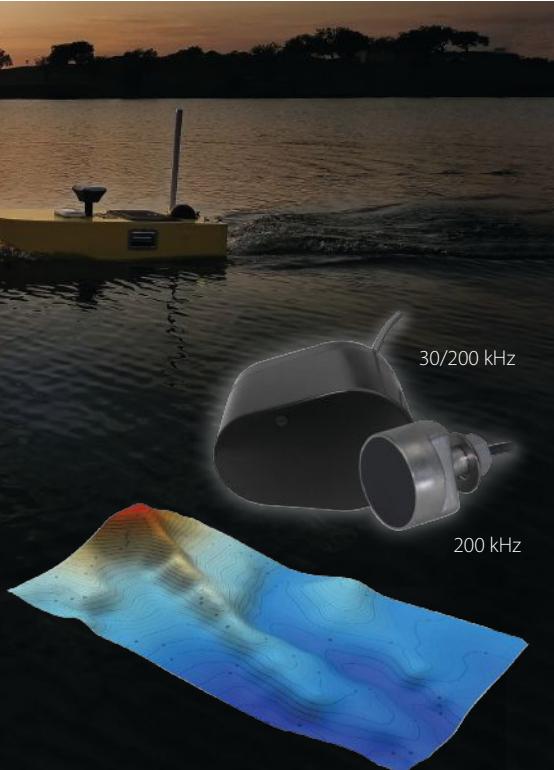
"MDA is pleased to play a critical role in helping the

Government of Canada assert its leadership position in the prevention of IUU," said Minda Suchan, VP of Geointelligence, MDA. "Combining exactEarth's industry-leading Satellite-AIS data with imaging from satellites like RADARSAT-2 is an important part in identifying dark targets and tackling this global challenge. Thanks to the Government of Canada and our partners, these types of vessels are going to have much more difficulty avoiding detection in the future."

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Photo and 3D Bathyscape courtesy of SimpleUnmanned, LLC



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# TAKING TO THE SKIES



**By Dr. Thomas Hiller**  
General Manager, THURN Group

**T**HURN Group is a UK-based manufacturer that specializes in technology development, integration, and the sales and service of highly engineered systems for the seabed and inland waterway survey industries. Since 2011, THURN has partnered with a long list of clients from the ocean industries, including offshore operators, survey services providers, and survey equipment manufacturers. As marine survey continues to explore the potential of increasingly remote operations, much of our work in recent years has centered around the integration of ever more advanced robotics as turnkey survey solutions, be them deployed on the water's surface or in the air.

## LIFT OFF

In early 2021, THURN Group launched the THURN QuickDip™ system for unmanned aerial vehicles (UAVs). This cutting-edge new system for autonomous airborne hydrographic survey can be supplied with a variety of in-water sensors and offers a range of benefits, which include rapid deployment and data collection from multiple sites of interest; autonomous, repeatable map-based surveys to monitor change detection; and the ability to safely collect data from difficult-to-access and dangerous waters, as well as restricted access waters, such as reservoirs.

THURN's integration with SPH Engineering's UgCS hardware and software allows the drone to fly at an accurate fixed height over

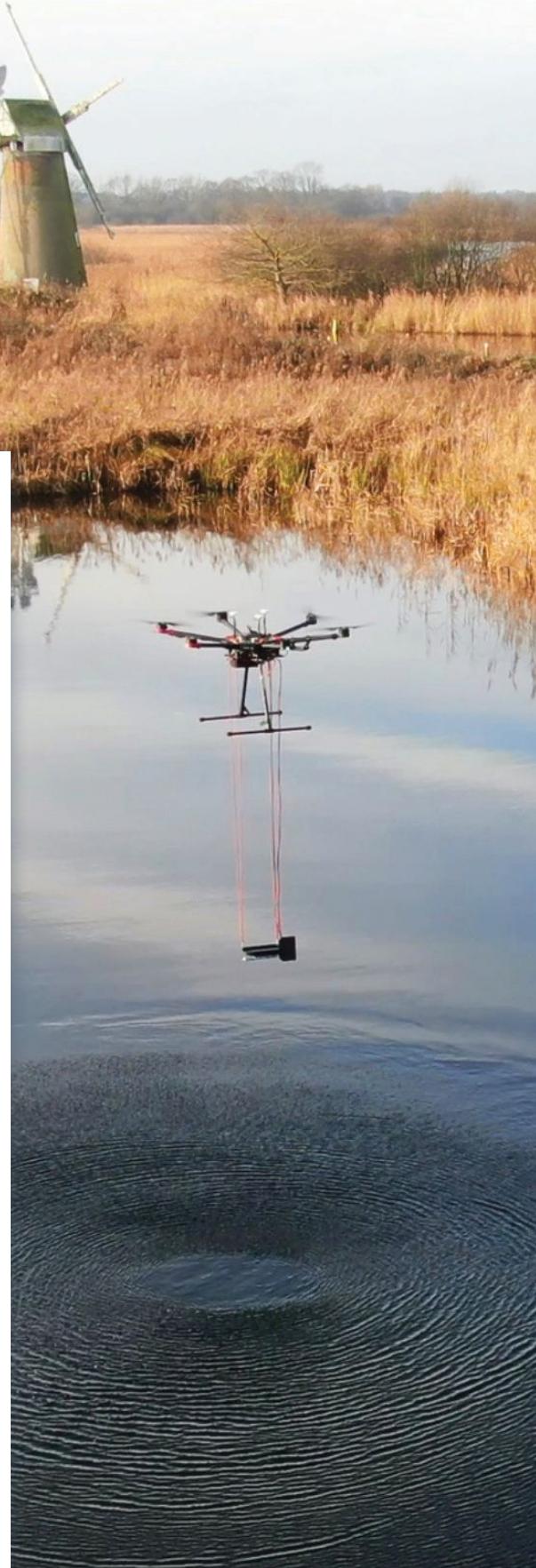
water using a map-based pre-programmed autonomous survey pattern, dipping the sensor into the water at known points and along pre-programmed paths and depths while taking continuous readings.

The drone-carried system is ideal for dangerous, inaccessible or very shallow waters, or where multiple quick missions are required in a short time over a wider area (for example sewage outflow lagoon systems). Risk is reduced as the launch and recovery of boats (manned or unmanned) in unfamiliar and unprepared settings carries much greater risk than a controlled UAV launch far from the water.

## INDUSTRY COLLABORATION

The QuickDip system was first launched in partnership with leading oceanographic and hydrographic instrument manufacturer Valeport. Integration with Valeport's miniSV&P (sound velocity and pressure) sensors enabled sound velocity profiles for correcting sonar depths. The THURN QuickDip+Valeport is now available with the Environmental range of sensors, including the Hyperion range of environmental sensors for the measurement of Turbidity, Chlorophyll a, Fluorescein, Rhodamine or Phycocyanin as well as the miniSVS, miniCTD, and SWiFT SVP.

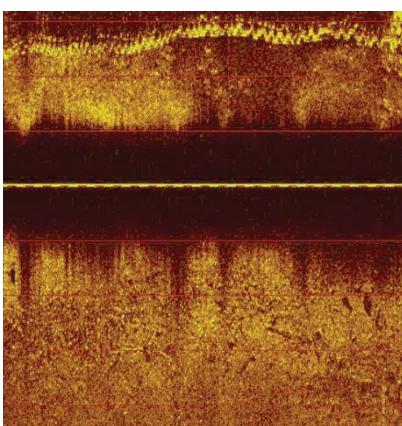
The latest addition to the range is the THURN QuickDip™+side-scan. This is a dipping side scan sonar system which can be manually flown or fly an autonomous pre-programmed search pattern. The side scan is a selectable 330kHz/800kHz



» The THURN QuickDip™ system for unmanned aerial vehicles (UAVs) allows surveyors to safely collect data from difficult-to-access and dangerous waters. (Photo credit: THURN)



▲ The THURN QuickDip™+side-scan is a dipping side scan sonar system that can be flown manually or fly an autonomous pre-programmed search pattern. The side scan is a selectable 330kHz/800kHz digital search and recovery sonar. (Photo credit: THURN)



▲ As the drone tows the side-scan along, this enables riverbed imaging either side of the flight track. (Photo credit: THURN)



» The UAV is able to follow a map-based pre-programmed autonomous survey pattern. (Image credit: SPH Engineering)

digital search and recovery sonar that sends out a pulse of sound to either side and receives the sound that echoes back off the seabed. As the drone tows the side-scan along, this enables riverbed imaging either side of the flight track. In other words, operators are able to render images of any submerged objects on a wide swathe of the seabed along the survey route. The width of the image depends on the useful range of the sonar, which depends on the sonar frequency and water environment.

## IMPRESSIVE RESULTS

Testing on rivers in the UK has proven the system to be highly successful and gave ranges of approximately 25 m/side on the low frequency and at least 15 m/side on the high frequency (higher frequency produces higher resolution).

UAV flight time with the side scan is around 15-30 minutes, a window that mostly depends on the wind conditions. At a survey speed of about 2-4 kts (1-2 m/s), this allows about 1.5-2 km of survey line per set of batteries with an area coverage of around 100,000 square meters.

## THE FUTURE

Now that the THURN QuickDip™ capability is available commercially, there are a whole range of sensors on the roadmap to be considered and integrated, from chemical to sonar to laser to radar, and even a sample-at-depth and quick-freeze system for environmental DNA lab analysis.

No question, 2021 is going to be an interesting year. THURN is reaching out to sonar and sensor manufacturers for solutions that address the challenges of surveying hard to navigate nearshore waters, rivers or lakes. If manufacturers are interested in seeing their sensors integrated into a pioneering airborne or surface autonomous system, then they should get in touch with the New Product Development team at THURN Group Acle.

For more information, contact [support@thurngroup.com](mailto:support@thurngroup.com) or visit [www.thurngroup.com](http://www.thurngroup.com).

» The QuickDip system was launched in partnership with Valeport and the integration of their miniSV&P (sound velocity and pressure) sensors. (Photo credit: THURN)



## HYDROSURV AND SONARDYNE JOIN FORCES

Uncrewed surface vehicle (USV) designer, builder and operator HydroSurv Unmanned Survey is joining forces with global marine technology specialist Sonardyne to develop and demonstrate transformative seabed-to-shore sensing and data acquisition technologies for offshore operations.

Through a collaborative project, part-funded by Innovate UK through its Robotics for a Safer World: extension project, HydroSurv's REAV-40 USV will be paired with intelligent seafloor and vessel-mounted instruments from Sonardyne. These will then be used in combination with internet-based cloud-services to provide an end-to-end seabed-data-to-shore service initially targeted towards the offshore wind industry.

Key elements of the project include a self-transiting USV, acoustic positioning of and data harvesting from seabed instruments, real-time gathering of geo-referenced current profile data and live relay of information to operatives onshore through secure cloud-based systems. The project will also demonstrate the ability to overcome potential navigational limitations working in and around wind farms.

The key instrument package includes Sonardyne's Mini-Ranger 2 Ultra-Short BaseLine (USBL) acoustic positioning system and its SPRINT-Nav hybrid acoustic-INS navigation instrument, which provides USV platforms with navigational redundancy both for when GNSS is compromised and where DVL bottom lock is out of range. Used in combination with Sonardyne's seafloor sensors and access to cloud-based services, this package provides an integrated suite of capabilities to maximize the use of USVs for intelligent data harvesting operations in remote offshore environments.

Founded in 2019, HydroSurv has seen rapid expansion of its technologies into inland and nearshore waters. This latest project, which officially launches in April 2021, will see the company now enter the offshore domain. The culmination of the project will be a series of demonstrations at an operational offshore windfarm site within the UK.



» HydroSurv's REAV-40, fitted with Sonardyne systems and paired with Sonardyne seafloor sensors and cloud computing, will provide advanced data harvesting capabilities. (Photo credit: HydroSurv)

"The coronavirus pandemic has further underlined the benefit of using resilient USVs and flexible instruments, which enable continuous data-flow without sending personnel offshore," said David Hull, Founder & CEO at HydroSurv. "This has never been more important than today to safeguard routine monitoring and survey capabilities. Over the longer term, this approach will reduce the cost, risk, time and carbon footprint of gathering operational data."

"Combining USVs like HydroSurv's REAV-40 with our seabed-data-to-shore technologies promises to bring a step change in the efficiency of asset monitoring and data gathering operations for the offshore wind industry," said Geraint West, Global Business Manager, Oceanographic, at Sonardyne. "Using USVs, which can be deployed at short notice, can vastly reduce operator logistics, emissions, risk to humans and costs and will allow operators faster access to operationally important information about their wind farms."

## UNDISTURBED BENTHIC SAMPLING WITH MULTIPLE CORERS

Traditional benthic samplers such as box corers must be deployed with sufficient momentum to ensure penetration of the seabed. This creates a bow wave that disrupts the surface layer of the seabed before the corer is able to collect a full sample.

The Multiple Corers available from world-leading seabed sampling experts Ocean Scientific International Ltd (OSIL) are able to overcome the traditional difficulties associated with benthic sampling and collect truly undisturbed sediment

samples. The multiple corers are landed on the seabed at slow speed which, in combination with the minimal footprint of the corer, prevents a bow wave from forming and driving away the delicate flocculant material that forms on the surface layer of the seabed.

The penetration speed is controlled by a hydrostatically damped piston and central weight system which enables up to 12 core tubes to be slowly driven into the seabed at a consistent rate. The core tubes are automatically sealed top and

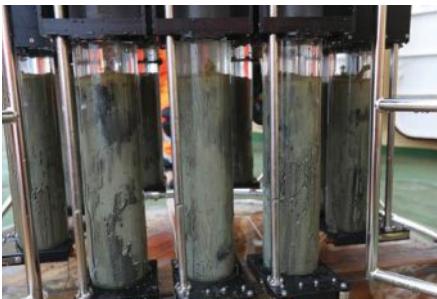
bottom immediately on commencement of the recovery process (using a hydrostatic seal at the top, and a mechanical seal at the bottom), capturing a pristine sediment sample together with the overlying supernatant water, and allowing the corer and samples to be rapidly recovered to the vessel without compromising the integrity of the sample. The transparent cast acrylic core tubes are removed individually and can be subsampled immediately or treated/preserved for later study.

The delicacy of sampling of these corers

has meant that their standard use is specified in a number of Environmental Impact Assessment studies, such as the Exploration and Exploitation Licensing procedures for marine mineral extraction, in addition to academic studies of the microbiology and flora/fauna of shelf and deep-sea sediments and analysis of the associated processes.

The Multiple Corers can be configured to accommodate varying numbers of core tubes, and delivery times for the corers and spares kept low, meaning even last-minute cruises are well supported, with systems remaining in constant use for many years.

OSIL have an abundance of global experience in the construction and operation of a wide range of sediment coring equipment, including the industry standard Multi Corer and the unique Giant Piston Corer which is capable of achieving cores up to 60 m in length. OSIL also offer a full design, build and implementation service for all of their heavy offshore equipment.



» Core tubes are automatically sealed at recovery using a hydrostatic seal to maintain a pristine sediment sample.  
(Photo credit: OSIL)



» The delicacy of sampling with these corers has meant that their standard use is specified in a number of Environmental Impact Assessment studies. (Photo credit: OSIL)

## A Vehicle Used to Search all Environments...

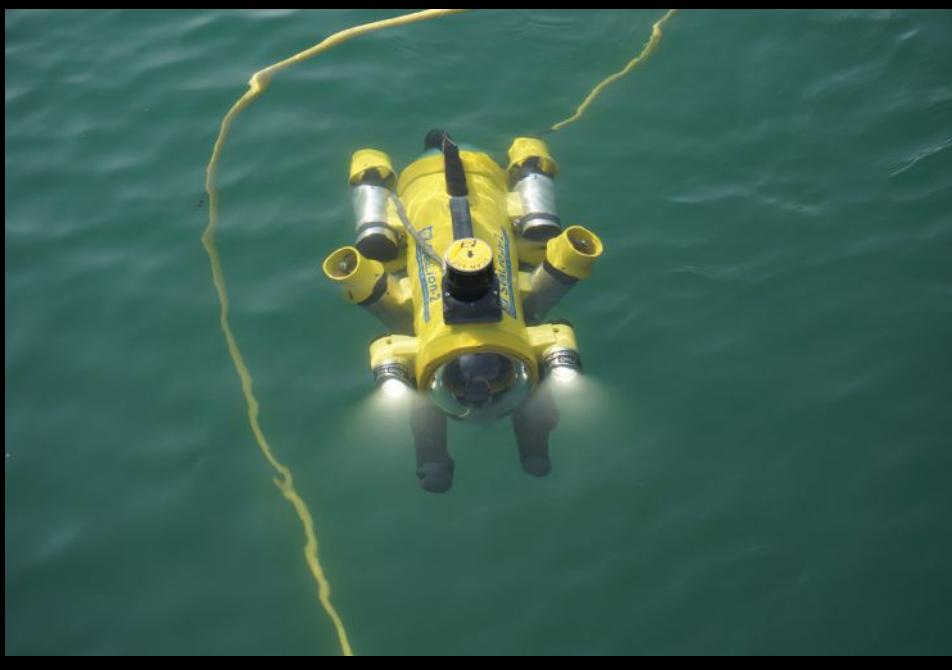
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» Reefscan data was timestamped and georeferenced then analyzed using Machine Learning models to give percent cover of the main benthic communities. (Photo credit: Australian Institute of Marine Science)



## ASSESSING THE IMPACTS OF CLIMATE CHANGE ON THE GREAT BARRIER REEF WITH A WAM-V ASV

The Australian Institute of Marine Science (AIMS), in partnership with Queensland University of Technology, utilized a WAM-V Autonomous Surface Vehicle (ASV) manufactured by Marine Advanced Robotics to conduct an acoustic and optical survey of John Brewer Reef in the Great Barrier Reef system of North-Eastern Australia.

The goal of the project was to evaluate the use of ASVs for reef health assessments. Specifically, the ability to autonomously complete shallow water bathymetric surveys and conduct optical surveys utilizing AIMS' machine vision camera system (Reefscan). The WAM-V ASV was launched and recovered from AIMS' Research

Vessel (RV) Cape Ferguson. The WAM-V ASV enabled shallow water surveys and close approaches to sensitive areas.

"The trial demonstrated that ASVs such as the WAM-V in particular, due to its shallow draft and stability, have the potential to be a game changer for our operations, by complementing our traditional diver-based survey methods with essential image and structural base maps," said Paul Rigby, AIMS Technology Development Group. "Such autonomous technologies will allow us to scale what we do, in spatial and temporal terms, and enhance our ability to measure and understand change without increasing demands on scientific field staff."

The ability to collect useful data in the deeper water sections of the reef as well as across the reef flat was a welcome benefit of the WAM-V ASV platform. All Reefscan data was timestamped and georeferenced with the data then analyzed using Machine Learning models to give percent cover of the main benthic communities.

"The work that AIMS does is absolutely critical to understanding the impacts of climate change on critical habitats like the Great Barrier Reef," said Mark Gundersen, President & CEO of Marine Advanced Robotics. "We are proud that the WAM-V technology was able to provide new capabilities in this ongoing

effort and we look forward to future campaigns of this important combination of cutting-edge technologies."

Marine Advanced Robotics is a San Francisco Bay Area based marine robotics company with an innovative class of watercraft based on their patented WAM-V technology. The WAM-V vessel class is the leader in stability, portability, and efficiency. WAM-Vs can be found all over the world performing critical tasks in the maritime environment.

For more information about WAM-V technology, visit: [www.wam-v.com](http://www.wam-v.com).

## TCARTA AWARDED NOAA GRANT

TCarta Marine has been awarded a Small Business Innovation Research (SBIR) Phase II grant from the National Oceanic and Atmospheric Administration (NOAA). The research focuses on enhancing Satellite Derived Bathymetry technology for application in the coastal waters of Alaska.

Satellite Derived Bathymetry (SDB) extracts water depth measurements from multispectral satellite imagery using

advanced physics-based algorithms. Traditionally, this technology has yielded the most accurate results in clear, calm waters; however, TCarta has recently taken the lead in expanding SDB applications to more challenging marine environments worldwide.

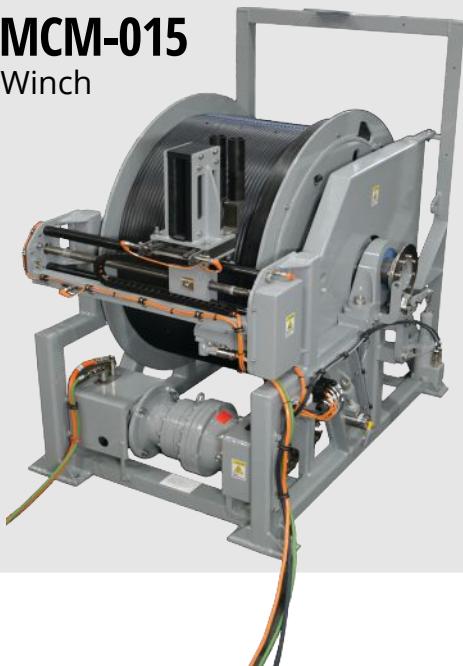
The NOAA SBIR Phase I research, which began in 2020, expanded the potential sources of satellite imagery for the Alaskan coast as there is just a small window of acquisition time exists during the summer months. An important Phase I result was the development of automated tools to assess

water clarity in daily satellite images to monitor water clarity for suitable conditions for SDB image tasking or planning airborne LiDAR surveying.

In Phase II, TCarta has shifted focus to SDB data processing and hydrographic analysis by developing new ways to improve confidence in the seafloor depth measurements derived from Alaskan imagery and creating workflows involving AI to identify and minimize errors in SDB measurements and enhance interoperability of SDB with other technologies.



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Okeanus Science & Technology, LLC, formed in 2013, is an organization wholly focused on providing the oceanographic professional with all of the tools necessary to complete a project on time and on budget, no matter the water depth or location.

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11989-A FM 529  
Houston, TX 77041, USA  
+1 713.460.1400

### **Houma Office**

2261 Denley Road  
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+1 985.346.4666



## CHECK THE TECH

# INTELLIGENT MARINE ROBOTICS

▲ The SR-Surveyor M1.8 allows operators to streamline survey logistics and optimize data capture for bathymetric studies, habitat mapping, structure inspection and search and rescue efforts in coastal and inland waters. (Photo credit: SeaRobotics)

In recent decades, marine robotics has proven to be the key enabling technology in the execution of increasingly complex at-sea missions. One clear manifestation of this is the ascendency of Autonomous Surface Vehicles, or ASVs. While early ASVs (back in the 1990s) were mostly inspired by aquaculture, modern-day advances in multibeam sonar, data processing, and GNSS positions have ushered in a new era of high-quality data acquisition. Today, ASVs are the preferred means of instrumentation among hydrographers.

### PARADIGM SHIFT

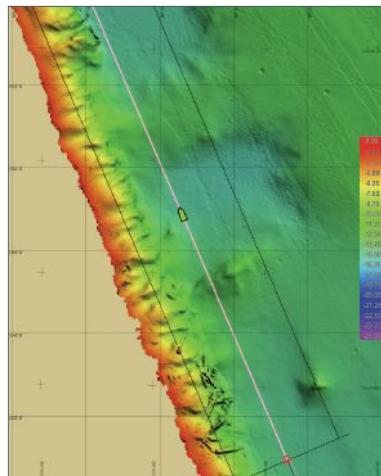
Although the use of unmanned surface vehicles still lags somewhat behind other branches of marine robotics, such as ROVs and AUVs, the surging interest in ASVs is testament to how technologists continue to redefine the way we work at sea. In 2021, regardless of application or domain, operators are increasingly motivated to deploy automated marine systems in the name of efficiency gains (by reducing topside support) and safety (by keeping people out of harm's way).

This trend is evident in the growing market for rapidly deployable, plug and play systems built for surveyors looking to chart hazardous, remote to access, or hard-to-navigate waters. The premise

is simple—these agile, robust ASVs unlock the potential for increasingly remote operations, allowing hydrographers to spend less time on the water collecting data and more time on dry land interpreting real-time, decision-critical information.

### SR-SURVEYOR M1.8

Since its inception in 1999, SeaRobotics has designed and manufactured a range of pioneering ASVs, from compact, tightly integrated units to more sizable hulls equipped for challenging offshore activities. More recently, however, the Florida-based team has concentrated efforts on developing industry-leading man-portable ASVs for inland and coastal survey. This ongoing R&D push culminated in the launch of the SR-Surveyor M1.8, in 2019.



» The SR-Surveyor's sensor suite is designed to collect large swath data with unmatched efficiency and accuracy. (Image credit: SeaRobotics)

"We have a twenty-year track record of custom engineered ASV solutions to fit very specific customer requirements," explains SeaRobotics' VP Programs Lou Dennis. "This partnership, with both the private and public sectors, has afforded us exclusive and valuable insight into how our clients see ASV technology influencing their day-to-day practices in the near and mid-term future. This cumulative experience helped us identify a gap in the market for an easy-to-use ASV like the

SR-Surveyor M1.8, engineered to streamline survey logistics and optimize data capture for bathymetric studies, habitat mapping, structure inspection and search and rescue efforts."

#### UPDATED FOR 2021

The speed at which the Blue Economy is advancing means that there is an almost constant drip-feed of sensor tweaks and software upgrades, all geared to extend and enhance ASV functionality. Updated for 2021 is the SR-Surveyor M1.8's, is the integration of EdgeTech's DW 4-24kHz Sub-Bottom Profiler with the EdgeTech 2205, delivering large swath data collection with unmatched efficiency and accuracy.

The hull payload bays, are tightly packed into the pontoons, are designed to support ACDPs (Acoustic Doppler Current Profiler) or Dual Frequency Single Beams, as well as an AML micro SV sensor to capture surface sound velocity measurements. The ASV's 16 channel mapping LiDAR Velodyne Puck LiDAR captures a 360-degree view of all data points, making it the ideal feature for inspecting inland and coastal infrastructure, such as near-shore pipelines, bridges, piers, and underwater rigs. Also new for 2021 is the ASV's integrated onboard ADL Advantage RTK Rover Radio for receiving Base Station broadcasted position corrections.

Put simply, the SR-Surveyor M1.8 is one of the only man-portable systems on the market that offers such a diverse range of data sets simultaneously: two frequencies of side scan, motion tolerant side scan, wide swath bathymetry, backscatter, LiDAR point cloud data, and discharge data, and now sub-bottom profiles—all in a 1.8-meter package.

#### FORCE MULTIPLIER

Clearly, the more data per survey line the better. The concept of force multiplication is nothing new when it comes to marine survey, but the advent of rapidly deployable ASVs means that multi-boat campaigns are becoming increasingly accessible and straightforward to orchestrate, be them in the shallows or the deep. Compact ASVs of this nature are no longer conceptual; they are instrumental to staying competitive. When it comes to marine survey, ASV utilization—with or without the support of a manned topside vessel—drives efficiencies; fuel consumption, man hours, and the need for high value assets are drastically reduced, which ultimately drives down the cost of data.

So, what's next for the SR-Surveyor M1.8, in the age of remote survey operations? According to Dennis, the future of ASVs is finally a commercial reality:

"Right out of the box, the SR-Surveyor M1.8 represents the best-in-value for autonomous marine data collection. What's more, our team of engineers at SeaRobotics is equipped to work with clients to incorporate a certain degree of asset customization. Increasingly, this centers around multi-boat deployment and control. To this end, we are currently working on an XL Module that will provide additional sensor payload capacity, extra propulsion thrusters, extended battery capacity, and heightened communication and command interfacing with other networked sensors packages."

To find out how SeaRobotics can enhance your hydrographic survey capabilities, visit: <https://www.searobotics.com/products/autonomous-surface-vehicles>



» The advent of rapidly deployable ASVs means that multi-boat campaigns are becoming the key to unlocking operational efficiencies and keeping people out of harm's way. (Photo credit: SeaRobotics)

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## TDI-BROOKS INTERNATIONAL COMPLETES TWO EBS PROGRAM OFFSHORE ANGOLA

TDI-Brooks International, Inc. has recently completed Environmental Baseline Studies (EBS) for both Cabinda Gulf Oil Company Limited (CAGBOC) for the Republic of Angola and ExxonMobil. TDI-Brooks safely and efficiently deployed the R/V *Proteus* to blocks 0 and 14 for CAGBOC and Block 15 for ExxonMobil offshore Angola to complete these programs.

For CAGBOC water column and sediment sampling included collecting 63 sediments samples, 27 water samples and 9 water column profiles. Chevron operates in Angola through its subsidiary Cabinda Gulf Oil Company Limited. Chevron operates two of the four concessions that it owns in Angola. It operates Block 0 offshore Cabinda and Block 14, which lies west from Block 0, through its subsidiary Cabinda Gulf Oil (CABGOC).

For ExxonMobil at Block 15, 56 Sediment Samples, 55 SPI/PV Image Samples, 14 Plankton Samples, 42 Discrete Water Samples, 14 Discrete (Surface) Water Samples and 14 CTD Water Profiles were collected. ExxonMobil has a 40-percent interest in Block 15 which has recoverable resource potential of approximately 4 billion gross oil-equivalent barrels. Block 15 was Angola's second-highest-producing block in 2016, and facilities continue to operate with very high levels of reliability.

The TDI-Brooks vessel earmarked for this project was the R/V *Proteus*, a multi-use vessel suited for a wide variety of oceanographic research duties. The *Proteus* is outfitted with TDI-Brooks' complete geotechnical tool kit including 20-m JPCs and 40-m CPT-Stinger/Samplers along with other TDI-Brooks standard SGE, HF, survey, EBS, cable route, etc. services. The *Proteus* has a Kongsberg EM-710 (1x1) hull-mounted MBES for surveys to

~2,500 m water depth. The crew adhered to strict COVID-19 protocols and mitigation measures ensuring a safe and healthy work environment.

The *Proteus* is also equipped with satellite communications (voice, fax, and email), differential GPS, geophysical survey gear and large a-frames with high-speed winches for coring or geotechnical work. The *Proteus* is in ABS class and had an extensive technical refit in 2009 and 2014 making her suitable for extended voyages. Her current configuration allows up to 25 Guests /Scientists and 10 Crew.

TDI-Brooks provides laboratory analysis on sediment and water samples via their state-of-the-art laboratory facility in College Station, Texas. The environmental, geochemical, and geotechnical laboratories provide high-quality analytical services and scientific interpretation. All 3 laboratories are staffed with highly skilled scientists and chemists who have worked in partnership with federal and state agencies as well as the private energy and environmental industry for over 25 years.



» TDI-Brooks recently deployed the R/V *Proteus* to blocks 0 and 14 for CAGBOC and Block 15 for ExxonMobil offshore Angola. (Photo credit: TDI-Brooks)



» The *Proteus* is outfitted with TDI-Brooks' complete geotechnical tool kit including 20-m JPCs and 40-m CPT-Stinger/Samplers. (Photo credit: TDI-Brooks)

## SEICHE AND DEEP VISION TO DEVELOP REAL-TIME CAMERA SYSTEM

Seiche Ltd and Deep Vision Inc. have signed an MoU to establish a collaborative relationship in support of their respective business interests. Seiche has expertise in the field of maritime environmental monitoring; Deep Vision has expertise in the field of computer vision and unsupervised machine learning.

Under this MoU, the two companies will advance collaborative efforts to develop a real-time camera-based system that can automatically detect, geo-locate, and quantify the presence of marine mammals and other maritime assets. The system will be

resilient under all weather conditions and operable at both surface level and above, e.g., mast mounted for ships. By leveraging state-of-the-art unsupervised machine learning techniques, the system will be truly autonomous.

Mark Burnett, CEO of Seiche Ltd, said: "We are excited to be working with Deep Vision and their cutting-edge technologies, particularly their software capabilities that can rapidly assess changes in the environment and automatically tune detection algorithms to optimize performance. Our Seiche camera systems are currently providing environmental monitoring to clients around the world, and this is an important next step in the provision of this technology to further protect marine life."

# PIONEERING 3D PRINTING INNOVATION FOR FLOATING OFFSHORE WIND

Expert support from Marine-i is helping 3D printing specialist J-Supplied to develop large scale technology to produce bespoke parts for the floating offshore wind industry, such as custom-designed turbine blades. Part funded by the European Regional Development Fund, Marine-i aims to help the marine tech sector in Cornwall and the Isles of Scilly grow through harnessing the full potential of research and innovation.

From its base in Cornwall, J-Supplied has established a strong reputation as a provider of 3D printing machines and manufacturer of 3D-printed products. The emergence of floating offshore wind as a major strategic growth area for the

marine tech industry in south west England has prompted the company to diversify into this area, as their Managing Director, Martin Jewell, explains:

"The ability to print large scale, low volume products are currently restricted by the commercially available equipment on the market. Typically, these can only manufacture products up to a 3m x 1m footprint. We identified the offshore renewable energy sector as the focus for a major innovation project to address this issue. Our vision is to have 'warehouse size' gantries that would enable a 5 axis robotic 3D Printer to produce very large products, such as turbine blades. This would break completely new ground for our industry."



Marine-i, is providing a comprehensive package of RD&I support which includes market analysis by Marine-i partner, Offshore Renewable Energy Catapult, highlighting the most important commercial opportunities for the technology in floating offshore wind, and bespoke research by the University of Plymouth Digital Fabrication Laboratory, to develop processes to optimise this new technology.

Professor Lars Johanning of University of Exeter, lead partner for Marine-i, added: "J-Supplied should be applauded for the scale and ambition of their thinking. As well as being a major commercial opportunity for their business, this new process would have huge benefits for the global floating offshore wind industry."



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## HORNS REV 2 OFFSHORE WIND FARM TOPS 10 BILLION KWH

Since HRH The Crown Prince inaugurated Ørsted's offshore wind farm Horns Rev 2 in 2009, the 91 wind turbines at the 35 km<sup>2</sup>-sized wind farm have generated enough wind power to cover 3 percent of the total Danish power consumption.

Horns Rev 2 is located in the North Sea, 30 km off the Danish west coast, and was the world's largest offshore wind farm at its inauguration in autumn 2009 with a total production capacity of 209 MW. At the time, the wind farm was expected to supply clean energy corresponding to the annual power consumption of 200,000 Danish households.

### EXCEPTIONALLY GOOD LOCATION

However, Horns Rev 2 has exceeded all expectations, explains Allan Due Overbeck, Head of Operations at Horns Rev 2:

"Since 2009, the total power generated by Horns Rev 2 corresponds to the annual power consumption of more than 3 million Danish households. Technically, this means that over an 11-year period, Horns Rev 2 can document an exceptionally high capacity factor of approx. 50 percent. This shows that the North Sea holds fantastic wind power potential and given its size, is the perfect location for offshore wind farms."

At the same, Horns Rev 2 was also the first offshore wind farm to be located so far offshore and in waters with such high waves. Consequently, there was considerable focus on quality and logistics in designing the wind farm right from the outset.

Therefore, the 91 wind turbines are placed in a fan formation to better utilize the wind, and the foundations are constructed of both steel and concrete in order to be able to withstand the



▼ Horns Rev 2's O&M organization is based in Esbjerg and includes approx. 40 employees.

extreme conditions offshore. Moreover, it was the first time in history that an accommodation platform was installed in connection with an offshore wind farm.

Horns Rev 2 proved that it was possible to generate offshore wind power on a large scale far from shore, and the experience gained from the wind farm has contributed to reducing the costs of renewable offshore wind energy, so that the European offshore wind projects being decided at the moment are fully competitive with power generated using fossil energy sources.

Allan Due Overbeck: "From the very start, we've had to develop new ways of working and organizing the service and maintenance tasks as the wind farm is located about one and a half hours away by boat from the harbor in Esbjerg. Our dedicated and skilled employees help to ensure that we can always maintain a high level of availability, while maintaining high safety standards."

The offshore wind farm produces most electricity in the cold and windy winter months when electricity consumption in Denmark is also at its highest. However, the wind conditions in the North Sea vary greatly from month to month. The current production record was achieved in January 2014 with 135,399,000 kWh, while production during a normal winter month is approx. 90,000,000 kWh.



## NEW REPORT SHOWS OSW RENEWABLES HAS POTENTIAL TO BE NEXT GREAT INDUSTRY

The Business Network for Offshore Wind has released its annual U.S. Offshore Wind Market Report & Insights. The report identifies 2021 as a year of defining consequences for the U.S. offshore wind industry. After years of expansion, primarily due to state government actions, the U.S. offshore wind industry is primed for exponential growth under the Biden Administration. The 2021 report breaks down opportunities for industry growth building off of 2020 developments and outlines the actions needed for the U.S. to capitalize on this growing global industry.

"The U.S. offshore wind market is on the cusp of what could be the next great American industry," said Liz Burdock, CEO of the Business Network for Offshore Wind, the only non-profit focused on growing the offshore wind industry and its supply chain. "The question is, will federal action be taken quickly to spur private capital investment needed to create local port infrastructure, conduct research, ship building, and private project development? In the process, we must carve out space for the next generation of the U.S. workforce that will help shape how America uses clean energy. The global offshore wind industry is surging ahead, and the U.S. is behind."

Credentialed news media may obtain a copy of the proprietary 2021 U.S. Offshore Wind Market Report & Insights report to quote from (but not repost). Insights include: a compilation of offshore wind-related public and private investments, the number of gigawatts of offshore wind capacity with offtake pathways, and a breakdown of the more than 400 supply chain contracts awarded to date. The report also examines how the U.S. fares against established European offshore wind markets and emerging markets in both Europe and Asia, and forecasts key 2021 developments.

"To-date, trailblazing states and private sector investment into the U.S. offshore wind industry has totaled more than \$3.4 billion. The Biden Administration has made it clear that offshore wind is an important part of America's clean energy portfolio," added Burdock. "The offshore wind industry better buckle-up, 2021 is only the start of a thrilling ride."



The Business Network publishes its report annually for its members on the state of the U.S. market. It includes state-by-state capacity procurements, increases in government targets, project timelines, and the latest supplier contracts and industry developments. The Business Network also hosts the International Partnering Forum (IPF), the largest offshore wind event in the Western Hemisphere. This year, IPF will be held in two parts: in person and virtual. IPF Together will take place in Richmond, Virginia August 24-26 and IPF Virtual will be held online April 22, May 13, and June 17.

Members of the Business Network for Offshore Wind may access 2021 U.S. Offshore Wind Market Report & Insights through the Member Portal.



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## SUSTAINABLE MARINE UNVEils 'NEXT-GEN FLOATING TIDAL ENERGY PLATFORM'

Canada's Ocean Supercluster has announced three new projects with a total value of \$12 million from its Accelerated Ocean Solutions Program (AOSP) stream. Led from British Columbia, the new \$4.15 million *Field Validation of Energy Storage System Project* will introduce a novel battery-based Energy Storage Systems (ESS) suited to larger marine vessels helping to achieve significant greenhouse gas (GHG) reductions in Canada and worldwide. Additionally, the project will benefit Canadians by creating 23 jobs with the potential for 115 indirect jobs and new economic activity, helping grow the ocean economy in a digital, sustainable, and inclusive way.

Batteries are increasingly deployed on vessels to help meet ambitious GHG emissions reduction targets, but to date, batteries have not been a viable solution for larger vessels needing extended periods at zero emissions. Corvus Energy is developing an energy-dense multi-megawatt hour battery-based ESS to fill the market void and bring ESS to marine industries.

The *Field Validation of Energy Storage System Project*, led by Corvus Energy with its partners Seaspan Ferries, VARD Marine, BC Hydro, and UBC will conduct a commercial study and field trial of the new Corvus ESS that will support the development of the system and bring it to market. Canada's Ocean Supercluster will provide \$2 million in funding for the project, with \$2.15 million coming from industry partners.

Seaspan Ferries, who is providing both cash and in-kind support for the project, represents an end-user customer and will operate the ESS on a cargo ferry which will result in emissions reductions and lower operating costs. BC Hydro will collaborate by learning more about the shore charging demands that battery-powered vessels will place on the grid and investigate demand management opportunities, and UBC will have personnel supporting the project through the development and provision of methodologies for measuring emissions.

A worldwide movement is taking place to electrify marine vessels using batteries. The *Field Validation of Energy Storage System Project* will enable Corvus and its partners to be first movers in the supply chain for energy storage on board large vessels such as cruise ships, Ro-Pax and Ro-Ro ferries, and merchant cargo vessels, reaffirming their market leadership and boosting Canadian exports as global leaders in GHG reduction.

"We call this new battery system Blue Whale, because it will be deployed with massive energy storage capacity to allow longer durations of zero-emission operation," said Corvus EVP Strategy & Business Planning, Sean Puchalski.

"Its unique rack-free modular stacking design and compact cell packaging help achieve the industry's highest energy density, but also pose interesting challenges for materials handling and installation. We are extremely grateful for OSC funding to be



» Seaspan Ferries is supporting the field validation of Corvus Energy Storage System.



» Corvus Energy's Blue Whale battery system.

able to validate our installation procedures in addition to ESS performance prior to commercial product release."

Speaking of the announcement, Kendra MacDonald, Canada's Ocean Supercluster CEO said:

"It's on our ocean where some of the biggest opportunity to address climate change and generate economic value exist. This newest Ocean Supercluster project is led from BC with a total value of more than \$4 million and will answer the call for viable solutions to electrify larger marine vessels. This project will see the creation of 23 new jobs and the potential for 115 indirect jobs over the life of the project."

## FIRST LEASE FOR WAVE ENERGY RESEARCH PROJECT IN FEDERAL WATERS

The Bureau of Ocean Energy Management has announced they have issued a lease for the first wave energy research project in federal waters off the U.S. West Coast. This lease represents another step forward in achieving the Biden administration's goals to address climate change and promote offshore renewable energy production.

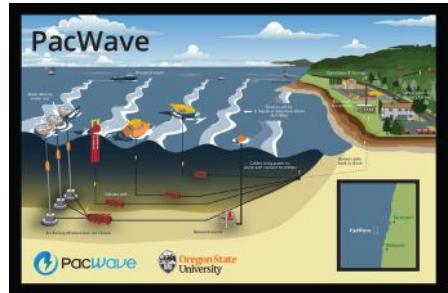
"This is the first time a lease has been issued to support the testing of wave energy equipment in federal waters off the U.S. West Coast," said BOEM Director Amanda Lefton. "Ocean waves contain a tremendous amount of energy, and this opportunity offers exciting potential to demonstrate the viability of wave energy technology and expand the nation's renewable energy portfolio."

The federal marine hydrokinetic energy (MHK) research lease was offered to Oregon State University (OSU) for the

PacWave South project, a proposed open ocean wave energy test center, to be located approximately six nautical miles off Newport, Oregon. The project area is approximately 1,696 acres or 2.65 square miles.

Marine hydrokinetic technology harnesses energy from ocean waves, tides and currents, and converts it into electricity to power our homes, buildings and cities. Wave energy converters that will be tested at PacWave South are floating or underwater devices that are moored to the seafloor and capture energy from the moving waves.

The project will consist of four test berths to support the testing of up to 20 wave energy converter (WEC) devices, with an installed capacity not to exceed 20 megawatts, to demonstrate the viability of wave energy. A WEC device converts the



kinetic and potential energy associated with moving ocean waves into electrical or mechanical energy.

Lease issuance by BOEM is a prerequisite for a license from the Federal Energy Regulatory Commission (FERC), which is the federal agency that would approve project construction and operations. The PacWave research lease is the first MHK lease to be issued off the West Coast under the joint BOEM-FERC authority over marine hydrokinetic projects on the U.S. Outer Continental Shelf (OCS), and the agencies will collaborate closely throughout the leasing and licensing processes.

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## NORWAY AUTHORITIES APPROVES PDO FOR PARTIAL ELECTRIFICATION OF SLEIPNER

The Ministry of Petroleum and Energy has approved a revised plan for development and operation (PDO) for partial electrification of the Sleipner field center. The field center will be tied to the Utsira High area solution, and Sleipner is expected to cut emissions by more than 150,000 tonnes of CO<sub>2</sub> per year.

"Partial electrification of the Sleipner field center will contribute to major cuts in emissions from our activities and provide significant assignments for the supplier

industry in a demanding time. As the authorities have approved the PDO, we can keep developing the Norwegian continental shelf (NCS) towards the goal of zero greenhouse gas emissions in 2050," says Arne Sigve Nylund, executive vice president for Technology, Projects and Drilling in Equinor.

In June, Equinor and its partners Vår Energi, LOTOS and KUFPEC submitted a revised plan for development and operation (PDO) to the authorities. The investments are in the size of

NOK 850 million. Sleipner is scheduled to be tied in to the Utsira High area solution by the end of 2022.

"Sleipner is an important field on the NCS contributing enormous value to Norwegian society. The partners have focused on being in the forefront of technology development and innovation to carry out for example carbon capture, injection and storage at the field. The decision to partly electrify the field helps the partners in their effort of further developing the field,"

says Kjetil Hove, executive vice president for Development and Production Norway in Equinor.

The Sleipner field center solution involves laying a power cable from Sleipner to the Gina Krog platform, which will be tied to the power from shore Utsira High area solution.

The Utsira High area solution was originally planned for the four fields: Johan Sverdrup, Edvard Grieg, Ivar Aasen and Gina Krog. The Sleipner field center and the Gudrun, Gina Krog, Utgard, Gungne and Sigyn tie-in fields will now receive power from shore through the area solution.

In June, Aibel was awarded the EPCIC contract (engineering, procurement, construction, installation and commissioning) for Sleipner modifications. The contract for production and laying of cables was awarded to the NKT cable supplier.

Worth around NOK 400 million, the EPCIC contract will require approximately 170 man-years distributed on two years at Aibel's offices in Stavanger and at their yard in Haugesund. Purchase of equipment from sub-suppliers is expected to be in the size of NOK 150 million.



» The Sleipner field center in the North Sea. (Photo credit: Øyvind Gravås and Bo B. Randulff)

### CALL FOR WAVE ENERGY DEVELOPERS

A new opportunity for wave energy developers to advance their technology is on its way, thanks to the EuropeWave project. The project is calling on wave developers to give input into its Pre-Commercial Procurement (PCP), a tender which will open in June 2021.

Wave energy developers can find out more about the planned process and are invited to register their interest in the future tender via a Prior Information Notice (PIN). On 14 April, a consultation webinar will be held to allow direct

feedback and questions from participants. Advance queries can be submitted up to a week ahead of the webinar.

The EuropeWave project aims to accelerate the design, development, and demonstration of cost-effective wave energy converter (WEC) systems to produce clean electricity and will select the best technologies across three key challenge areas: performance, reliability & survivability, and affordability.

Developers can record their interest in the PIN and submit queries in advance of the consultation here: <https://www.publiccontractsscotland.gov.uk>

#### KEY DATES:

- 7 April: Deadline for queries prior to consultation
- 14 April: Open consultation via a public webinar
- 21 April: Deadline for queries following consultation
- June 2021: Call for tender opens
- September 2021: Call for tender closes

## SIEMENS GAMESA AND CROSSWIND PARTNER UP AT HOLLANDSE KUST NOORD OFFSHORE PROJECT

Driving the global energy revolution, Siemens Gamesa Renewable Energy and CrossWind have executed the contract to deliver the turbines for the 759 MW Hollandse Kust Noord offshore wind park. It includes the supply of 69 SG 11.0-200 DD offshore wind turbines and a 15-year service and a maintenance agreement. Final conditions are planned to be met in the coming months, converting the contract into a firm order for Siemens Gamesa. The Notice to Proceed has been signed, following the issuance of the irrevocable permit from the Dutch authorities to CrossWind in December 2020.

The Hollandse Kust Noord project is the third project of the Dutch national offshore wind roadmap based on subsidy-free tenders. As the first project for Siemens Gamesa with joint venture partner Shell, and the second offshore project with joint venture partner Eneco, the companies are keen to join forces and create a broader renewable-energy future. CrossWind's parent companies Shell and Eneco have already taken the Final Investment Decision.

CrossWind is a joint venture between Shell (79.9%) and Eneco (20.1%), specially created for this offshore wind project. Construction work on Hollandse Kust Noord is expected to commence in 2023 with turbine commissioning planned to be completed the same year. When operational, the offshore wind power plant will be able to generate renewable energy equal to the energy needs of 1 million Dutch households.

"As our first project with Shell and our second offshore project with Eneco, we're extremely excited to grow our partnership with both companies through Hollandse Kust Noord," says Marc Becker, CEO of the Siemens Gamesa Offshore Business Unit, who continues, "Siemens Gamesa is at forefront of delivering solutions that contribute to decarbonizing the power sector, and simultaneously aid in securing a green recovery from the COVID-19 pandemic. We're happy to lend our expertise in offshore wind and help The Netherlands achieve zero greenhouse gas emissions from their energy supply by 2050. On an even more local level, the long-term Service agreement ensures direct economic benefits for years to come."

"We are looking forward to continue this partnership to deliver the offshore wind park at Hollandse Kust Noord in The Netherlands," said Tjalling de Bruin, CEO, CrossWind. "With contracts in place, final investment decision taken, and turbines instated with the latest technologies, we will be able to deliver clean energy by 2023."

The Netherlands is planning to build six offshore wind zones between 2015 and 2030 on the path to achieve carbon neutrality and combat climate change. Of these zones, Siemens Gamesa offshore wind turbines will be installed at all three awarded zones when construction is completed: exclusively at Hollandse Kust Zuid and Hollandse Kust Noord and co-installed at Borssele.

Offshore wind has been determined to play a decisive role in the Dutch movement towards carbon neutrality and combatting climate change. Under the Ministry of Economic Affairs and Climate Policy, the Dutch national government is aiming for a minimum of 55% reduction of greenhouse gas emissions in 2030 compared to 1990. The Netherlands also wants to achieve zero greenhouse gas emissions from the energy supply by 2050. Both an acceleration of deployment of offshore wind and a focus shift from "cost reduction" to "minimal



CO2 design" change is needed to reach both 2030 and 2050 targets.

The SG 11.0-200 DD offshore wind turbine provides a high degree of reliability in demanding offshore wind projects from its strong performance, swift time-to-market, and low risk. The machine features a 200-meter diameter rotor utilizing the 97-meter long Siemens Gamesa B97 Integral Blade. It furthermore provides an increase of 9% in Annual Energy Production compared to the SG 10.0-193 DD offshore wind turbine.

Over 1,000 Siemens Gamesa Direct Drive offshore wind turbines have been installed in all major offshore wind markets globally. They include the UK, Germany, Denmark, The Netherlands, Belgium, Taiwan, and the USA, among others. Furthermore, confirmed orders for more than 1,000 additional Offshore Direct Drive turbines have been received, with both firm and conditional orders planned for the markets mentioned above and new offshore markets including France and Japan.

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» Ocean Infinity's Armada Fleet. (Image credit: Ocean Infinity)

## OCEAN INFINITY ACQUIRES MMT

Ocean Infinity and MMT recently announced an acquisition that brings together MMT's deep expertise and established track record as a distinguished marine survey and data analytics provider and Ocean Infinity's best-in-class robotic technology and operational expertise.

The combined force will maximize the potential of Ocean Infinity's fleet of Autonomous Underwater Vehicles (AUVs), and the soon to be launched Armada fleet of uncrewed, low-emission, robotic ships. The company will be uniquely placed to support its international clients' data acquisition requirements, working across multiple sectors including, energy, subsea cables, government and defense.

Following the acquisition by Ocean Infinity, MMT will continue to operate under the MMT brand. The enlarged group will have a headcount of over 300 people and will operate from an expanded geographical footprint with offices in the US, Sweden, UK, Singapore and Norway.

Per-Olof Sverlinger, CEO of MMT said: "These are two world-leading companies with highly complementary competencies that are joining to strengthen our unique positions and our continued international expansion and development. This is a highly positive development for all MMT stakeholders. Our clients will continue to receive our trademark, personalized levels of support, but will now also be able to access an expanded range of services. For our team it opens many exciting opportunities and the chance to be on the cusp of the wave at a time of real change in our industry."

Ola Oskarsson, founder of MMT said: "We are a company with unique knowledge and unique employees, with a passion for what we do. As part of Ocean Infinity, we can create new opportunities for our clients and our team and enjoy continued growth. Ocean Infinity has the ambition to be at the absolute forefront of technology when it comes to future analysis of the sea and seabed, which is a perfect combination for our skillset. I am proud of our past and extremely excited about our future."

Oliver Plunkett, Ocean Infinity's CEO said: "When we started Ocean Infinity, we revolutionized the industry with the deployment of AUVs on an unprecedented scale and we are set to push the boundaries again with our fleet of uncrewed low-emission robotic vessels. To achieve our ambition of transforming operations at sea through innovation and technology we need the very best people who share our passion for creating safer and more sustainable ways of working. I'm thrilled that we are being joined by a highly impressive group of new colleagues from MMT who collectively bring with them decades of knowledge, experience and a track record of excellence. With the team from MMT alongside us I have no doubt we will exceed all expectations and create the leading ocean and seabed data analytics business in the world."

## OPTIME'S ROCS SUCCESSFUL IN ITS FIRST OPERATION FOR AKER BP

Optime's subsea system, Remotely Operated Controls System (ROCS) has completed a successful subsea operation for Aker BP. The ROCS eliminates the umbilical during well completions. This is not just a first system use, but also a first type of operation for the industry.

ROCS was deployed during a completions operation for a production well for Aker BP on the Ærfugl-field on the Norwegian Continental Shelf in late February.

"This is a major achievement! Optime has developed ROCS over several years and from looking at the total work hours available internally, we have spent a significant share of resources on this development. Together with Aker BP we have now achieved success on the first operation offshore. I believe that is a great accomplishment and the start of a major industry transition with this system," says Optimes CEO, Jan-Fredrik Carlsen.

### ROCS Simplifies Operations

Through ROCS, Optime is contributing to increased efficiency for the oil and gas industry in numerous ways. ROCS is remotely controlled topside, using an advanced technological controls unit providing improved functionality, without a large hydraulic system, including a costly and heavy umbilical.

"We have now completed a successful operation on the Ærfugl-field using Optimes ROCS. The operation was planned in great detail, allowing for a safe execution. Imbedded in Aker BP is the continuous drive towards technology that permanently improves our subsea well operations. ROCS is a good example of that, as it reduces HSE risk, optimizes operations and also reduces the overall cost for us," said Mads Rødsjø, head of Aker BP's subsea well operations.

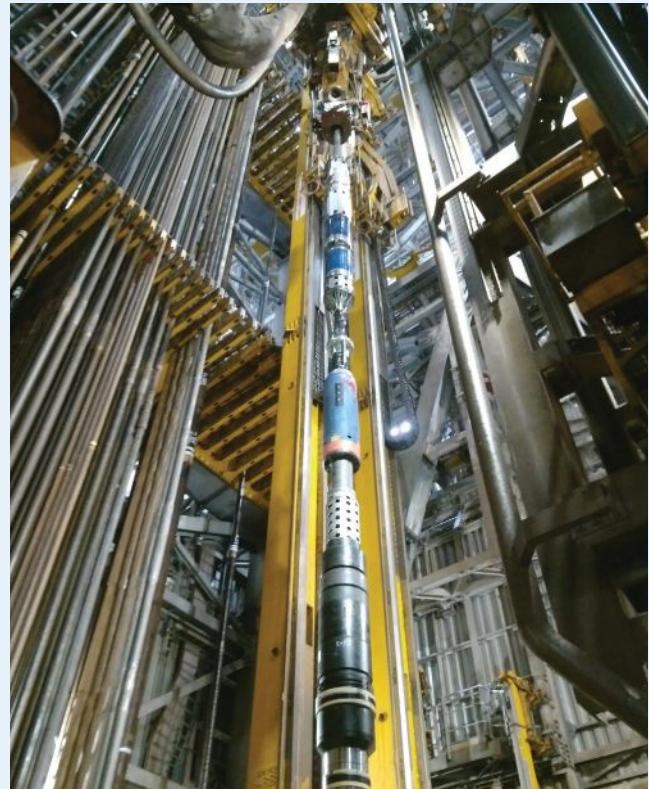
"Through the use of ROCS we have been able to move tonnes of actual equipment from the rig, as well as mechanical and hydraulic interfaces, into a simple and efficient software. This is truly digitalization," added Rødsjø.

Optime signed a frame agreement with Aker BP January of 2019. The agreement includes work on Aker BP's subsea systems for two years, with an additional 2 year extension.

"Aker BP and their competence as well as focus to leverage innovative technology, is fundamental to continuous industry improvements. This reduces the environmental footprint, improves efficiency, increases safety, and reduces cost—we believe it will create a new industry norm," said Jan Fredrik Carlsen.



» ROCS ready for operation in one lift. (Photo credit: Optime)



» ROCS ready for operation, assembled and tested.  
(Photo credit: Optime)

## SRV-8 PROFESSIONAL-GRADE UNDERWATER DRONE/ROV

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» The Aquaterra Energy AQC-CW riser is designed to withstand repeat make and breaks, whilst offering a gas tight metal-to-metal seal. (Image credit: Aquaterra Energy)

## AQUATERRA ENERGY INKS MULTI-MILLION-DOLLAR RISER WELL INTERVENTION DEAL

Aquaterra Energy, a leader in global offshore engineering solutions, has secured a multi-million-dollar (USD) riser contract with a marine vessel owner and operator, for deeper water well intervention projects mainly in the Asia Pacific region.

Aquaterra Energy will deliver a large-bore (7 3/8") AQC-CW completions and workover riser system with automated handling package that will operate in water depths of up to 1,500 m. The system has been designed to withstand repeat make and breaks, whilst offering a gas tight metal-to-metal seal. The solution can be operated from a lightweight intervention vessel, semisubmersible or from a jack-up rig as a surface riser, open water subsea riser or as a landing string.

The NACE compliant technology and unique pipe to connector attachment eliminates welding – making the riser lighter offering enhanced water depth deployment capacity. In addition, the ability to pressure test each connection upon make up provides enhanced environmental reassurance against well bore fluid discharge.

James Larnder, Managing Director of Aquaterra Energy said: "This project marks a key milestone in our Asia Pacific success story, whilst also diversifying our AQC riser offering into deeper water operations. All our systems are intelligently engineered to be efficient with no wasted materials and a focus on quick connection to reduce operational time whilst assuring integrity. Importantly, these efficiencies also support our own and our customers' decarbonization efforts."

Aquaterra Energy will manage the entire project scope via its in-house engineering and project management teams. Throughout the project, Aquaterra Energy will provide fatigue utilization and management through riser monitoring hardware to extend asset life, as well as automated hands-off connector makeup and umbilical handling equipment to improve safety and enhance offshore efficiency.

## MORGAN & EKLUND DEPLOYS ADVANCED SURVEY SYSTEM FOR AGGREGATE MINING

Morgan & Eklund, Inc (M&E), a hydrographic survey company specializing in nearshore and specialized surveys for ports, harbors, and infrastructure, recently released details of the successful deployment of its new Autonomous Survey Vessel (ASV) service to obtain high resolution multibeam bathymetric data to map and monitor sand and aggregate mining pits. Central Florida is home to vast resources of high-grade sand deposits that is used for beach nourishment and golf course operations throughout the state of Florida. Sand mining operations in Florida uses hydraulic and mechanical methods for excavation, which requires precise placement of hydraulic cutter-suction dredges for the efficient removal of sand and aggregates. M&E completed construction surveys to verify the submerged pit floor conditions and direct excavation efforts for future production.

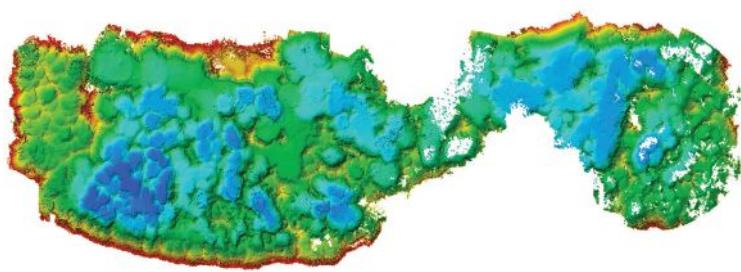
The survey is the first of its kind to use the SR-Surveyor M1.8 to map dredging pits in Florida. In addition to mapping the dredge pits, the SR-Surveyor M1.8 used its light detection and ranging (LiDAR) sensor to gather point cloud data to image the pit embankments and dredged stockpile to compare the volume of sand removed from the pit to volume available to haul to a beach.

The SR-Surveyor M1.8 is a unique platform, having a stable catamaran hull design and multi-sensor package. The sensor package includes the EdgeTech 2205 multibeam, 540 kHz and 1600 kHz dual frequency side-scan, and AML SV sound velocity sensors and Velodyne LiDAR for mapping features above the water surface. The SR-Surveyor M1.8 is an ideal platform to survey inland lakes, areas with limited access, dams, tailing ponds, and other areas where vessel operations are limited.

M&E's corporate strategy is to develop a standalone Remote Vehicle Services Division that supports the M&E beach and shore survey services and evolve their hydrographic survey services using the autonomous acquisition of data whenever possible, providing cost effective, efficient, and safe operations.

Throughout its 35 year corporate history, M&E has adapted to the latest technologies and field methodologies to provide the most accurate, and unbiased data to their clients. Their proven methods and deliverables can be attested by long term customers and history of successful projects.

To find out more about M&E's autonomous remote survey capabilities, visit: <https://www.morganeklund.com/services/autonomous-remote-surveys>



» Garcia Farm's sand mine in Florida. (Image credit: M&E)

## FRAMO SUPPLIES MARINE PUMPING SYSTEMS TO LARGE OFFSHORE WIND FARM

The Alfa Laval company and world-leading pump manufacturer Framo, will supply pumping systems for foundations of Scotland's largest offshore wind farm project. It is the second order for pumping systems in this application and marks an important milestone as it applies the company's extensive experience from the offshore industry to renewable energy applications.

The order from Saipem, a global leader in engineering, drilling and construction in the energy and infrastructure sectors, comprises Framo pumping systems. They will be used in a so-called suction bucket technology in the installation of Seagreen, Scotland's largest offshore wind park. Once finalized it will include 114 turbines producing 1075 MW to supply 1.3 million households with low-carbon energy. Framo pumping system technology will secure and safely anchor the wind turbine platforms to the seabed.

"This second order for our Framo pumping systems used in suction bucket foundations to wind farms is an important milestone for us as it cements our position in this application and takes our long-proven and validated technology from offshore oil platforms to renewable applications," said Sameer Kalra, president of the Marine Division in Alfa Laval. "Our knowledge and experience from delivering innovative and reliable products to the offshore industry is now also making a



» Framo suction anchor pumping system (SAPS) in action. (Image credit: Framo/Nagelld)

difference within renewable energy, to the benefit of our customers and the environment."

Suction anchor technology has an environmentally friendly footprint. Besides lowering costs due to the increased installation speed, the concept provides for easy decommissioning and a practically noise-free installation.

The technology of suction and bucket foundation has secured and safely anchored platforms and offshore installations around the world since the 1990s. Now, the concept of bucket foundation has been adapted for offshore wind turbines foundations. Framo is meeting the market demand by offering complete pumping systems required for the installation of the turbine foundations.

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## ROTECH SUBSEA CLINCHES KEY US WIND CONTRACT

Rotech Subsea has clinched a major US offshore wind IRM contract on the United States' Eastern Seaboard. Rotech Subsea's entry into the US market is being viewed as a coup for the company which has re-established itself as market leader in providing non-contact Controlled Flow Excavation (CFE), Suspended Jet Trenching technology and related subsea services since emerging from a non-compete period in 2015 following the 2011 sale of technology that had taken the sector by storm.

The US contract, which is Rotech Subsea's first in the country since its return to the sector, saw the subsea, trenching and excavation pioneer mobilise its next generation RS2

system this week to complete de-burial and re-burial of a cable end off the Rhode Island coast. The company's new RSGC cable grab and cutter tool will also be deployed.

"We have gained a lot of interest from the USA market and Rotech feel the timing is now right to service the West after establishing ourselves as market leader in Europe and the Far East again. Breaking back into the Americas for a major player in the subsea cable installation and maintenance sector is another milestone achievement," said Director of Subsea, Stephen Cochrane.

"Our state-of-the-art RS2 CFE and Suspended Jet Trenching tool was selected for its high volume output performance, making it the optimal method for cable de-burial and re-burial due to its ability to fluidise and displace large amounts of sediment and subsea material with ease.

"We have an unrivalled track record in renewables in Europe and it's a real endorsement for us that we were selected for this de-burial / re-burial work over other tools available in the region due to the safe, non-contact method and productive operational speeds of more than double that of competing Mass Flow Excavation tools."

Rotech Subsea's in-house research, development and engineering team has created a suite of 14 tools that has established Rotech Subsea as market leader in providing non-contact Controlled Flow Excavation (CFE), Suspended Jet Trenching technology and related subsea services. The dedicated in-house R&D team continue develop their technology, with further game changing enhancements to CFE due to be unveiled in 2021. [www.rotech.co.uk](http://www.rotech.co.uk)



» Rotech Subsea's new cable grab and cutter tool. (Image credit: Rotech Subsea)



## NKT COMPLETES BRITNED REPAIR OPERATION

Speed was essential when the BritNed interconnector needed to be repaired, and NKT was awarded the turnkey contract to bring the 450 kV mass impregnated (MI) HVDC power cable back into operation.



After the initial notification, NKT quickly mobilized staff and equipment for localizing the fault, de-burial and cut and seal operation onboard a subcontracted vessel. The damaged power cable section was found at approximately 100 km off the Dutch coast at a water depth of 40-50 meters. The repair works were then executed successfully despite severe weather conditions by the skilled crews of cable-laying vessel NKT Victoria supported by DP2 Assister. The operation was executed within 29 days and the connector is now back in full service.

For BritNed, the operation went according to plan.

"We are very pleased with the result of the repair operation and look back on a very good cooperation with NKT," said Dennis Stufkens, Operations Director of BritNed.

NKT is one of the leading companies in the market providing both stand-alone repair

operations and customized service packages ensuring the fastest mobilization time in the market.

"The uptime of interconnecting power cable systems is central to the transition to renewable energy in Europe, and we are proud to have demonstrated once again our repair preparedness by quickly mobilizing our skilled repair team and equipment. The operational success was ensured by an efficient collaboration of all parties involved, minimizing the outage time and bringing BritNed back into operation," says Axel Barnekow Widmark, Executive Vice President and Head of Service in NKT.

The BritNed interconnector is part of the investments made by the national grid operators National Grid (UK) and TenneT (Germany/Netherlands) to ensure security and diversity of energy supply needed to drive the transition to renewable energy.

# GLOBAL OFFSHORE TO PROVIDE CABLE CARE TO EQUINOR WIND FARMS

Global Offshore, a leading provider of cable installation, repair and trenching services to the offshore renewables, utilities and oil & gas markets, and part of the Global Marine Group, announced today a multi-year cable maintenance and management framework agreement with Equinor.

The framework agreement will see primary contractor, Global Offshore, supply cable management services and perform associated call off services, comprising of active cable maintenance as well as unplanned repairs. The agreement gives Equinor access to Global Marine Group's fleet of cable ships and CTVs, including their versatile cable laying ships, *Global Symphony* and *Normand Clipper*, equipped with one of Global Offshore's Q1400 jet trenchers.

A first for Global Offshore, which traditionally carries out work on offshore cables, the framework agreement covers the onshore and offshore export cables at Equinor's Dudgeon wind farm, as well as the offshore export cables at Hywind and Sheringham Shoal, with the potential to cover other wind farms in the future. The framework agreement is the latest in a long list of contracts for Global Offshore's Complete Cable Care service.

The Complete Cable Care solution is designed to proactively maintain cable assets and respond quickly to power cable damage, bringing increased standards of readiness and responsiveness to the industry. The service is supported by a maintained stock of universal power joints, as well as access to qualified jointers, prepared to respond rapidly to a fault or incident.

Director of Power Cable Maintenance at Global Offshore, Andrew Lloyd, said: "We have been providing an unsurpassed cable care service to the offshore renewables industry since the very first European wind farm installation 20 years ago. In the present day, we manage multiple framework agreements, covering over 2,500 km of subsea power cable as part of our Complete Cable Care solution, utilizing pre-engineered scenario plans alongside access to the right cable spares, joints, jointers and assets, to support our clients' operations."

"Though our first to include the maintenance of onshore cables, our framework agreement with Equinor is one of many Complete Cable Care contracts we have in place with OFTOs and wind farm owners across the globe. Being chosen as Equinor's primary contractor further cements our position as the number one cable care provider in the industry."

The framework agreement will mark the second contract for Global Offshore at Equinor's Hywind offshore wind farm. In Autumn 2017, Global Marine Group carried out the survey and trenching activities, involving cutting and jetting techniques, of the subsea export and four inter-array cables at the Hywind Scotland Pilot Park, a five turbine, 30MW floating wind farm, located 25-30 km off Peterhead, North-East Scotland.



» Equinor will have access to Global Marine Group's fleet of cable ships, including their versatile cable laying ships, Global Symphony and Normand Clipper (pictured). (Photo credit: Global Marine Group)

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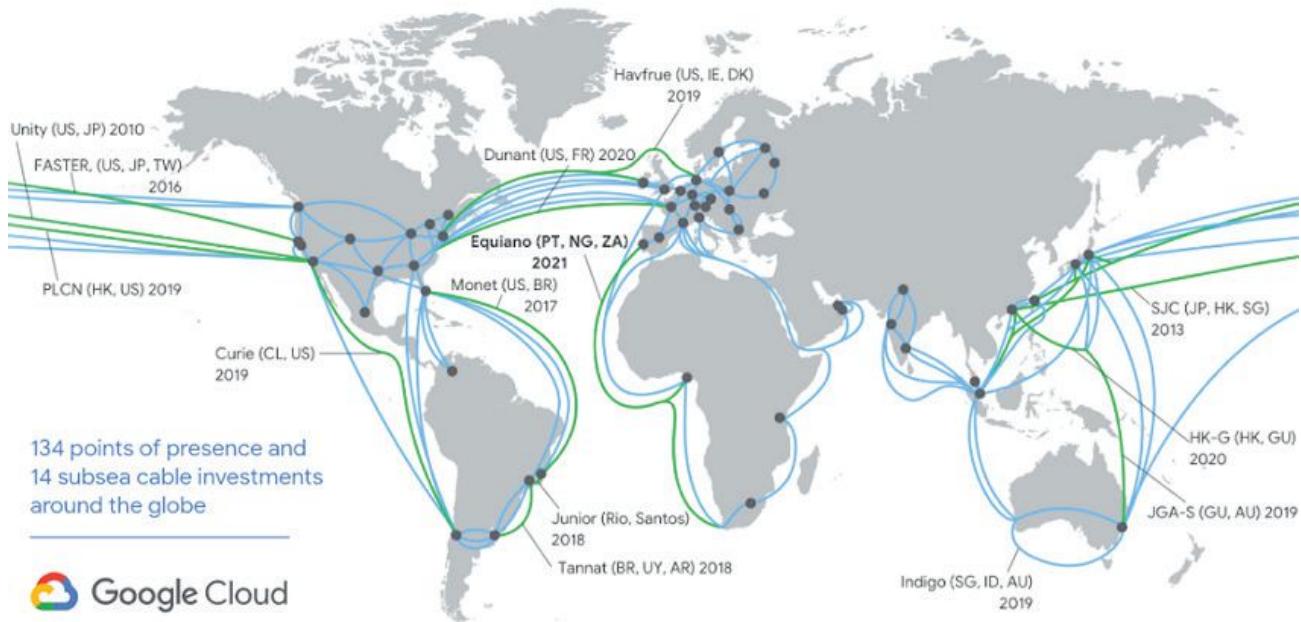
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» Google's global submarine cable network. (Image credit: Google)

## USING SUBMARINE CABLES TO DETECT EARTHQUAKES

Seismologists at Caltech working with optics experts at Google have developed a method to use existing underwater telecommunication cables to detect earthquakes. The technique could lead to improved earthquake and tsunami warning systems around the world.

A vast network of more than a million kilometers of fiber optic cable lies at the bottom of Earth's oceans. In the 1980s, telecommunication companies and governments began laying these cables, each of which can span thousands of kilometers. Today, the global network is considered the backbone of international telecommunications.

Scientists have long sought a way to use those submerged cables to monitor seismicity. After all, more than 70 percent of the globe is covered by water, and it is extremely difficult and expensive to install, monitor, and run underwater seismometers to keep track of the earth's movements beneath the seas. What would be ideal, researchers say, is to monitor seismicity by making use of the infrastructure already in place along the ocean floor.

Previous efforts to use optical fibers to study seismicity have relied on the addition of sophisticated scientific instruments and/or the use of so-called "dark fibers," fiber optic cables that are not actively being used.

Now Zhongwen Zhan (PhD '13), assistant professor of geophysics at Caltech, and his colleagues have come up with a way to analyze the light traveling through "lit" fibers—in other words, existing and functioning submarine cables—to detect earthquakes and ocean waves without the need for any additional equipment. They describe the new method in the February 26 issue of the journal *Science*.

"This new technique can really convert the majority of submarine cables into geophysical sensors that are thousands of kilometers long to detect earthquakes and possibly tsunamis in the future," says Zhan. "We believe this is the first solution for monitoring seismicity on the ocean floor that could feasibly be implemented around the world. It could complement the existing network of ground-based seismometers and tsunami-monitoring buoys to make the detection of submarine earthquakes and tsunamis much faster in many cases."

The cable networks work through the use of lasers that send pulses of information through glass fibers bundled within the cables to deliver data at rates faster than 200,000 kilometers per second to receivers at the other end. To make optimal use of the cables—that is, to transfer as much information as possible across them—one of the things operators monitor is the polarization of the light that travels within the fibers. Like other light that passes through a polarizing filter, laser light is polarized—meaning, its electric field oscillates in just one direction rather than any which way. Controlling the direction of the electric field can allow multiple signals to travel through the same fiber simultaneously. At the receiving end, devices check the state of polarization of each signal to see how it has changed along the path of the cable to make sure that the signals are not getting mixed.

In their work, the researchers focused on the Curie Cable, a submarine fiber optic cable that stretches more than 10,000 kilometers along the eastern edge of the Pacific Ocean from Los Angeles to Valparaiso, Chile. (Although Zhan says the technique could be used on many of the hundreds of submarine cables that criss-cross the globe.)

On land, all sorts of disturbances, such as changes in temperature and even lightning strikes, can change the polarization of light traveling through fiber optic cables. Because the temperature in the deep ocean remains nearly constant and because there are so few disturbances there, the change in polarization from one end of the Curie Cable to the other remains quite stable over time, Zhan and his colleagues found.

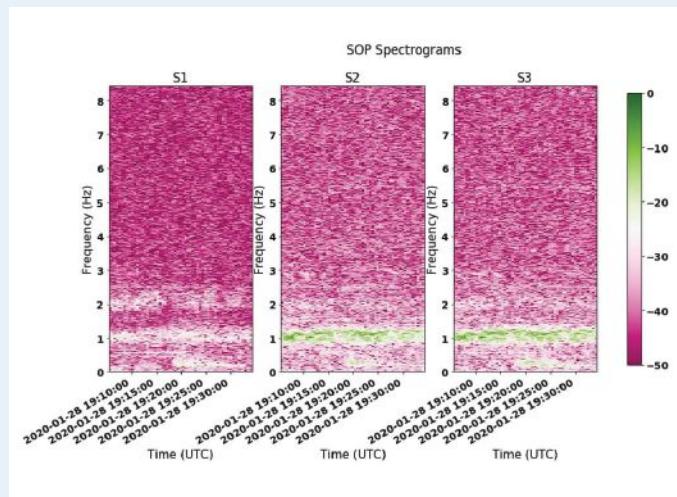
However, during earthquakes and when storms produce large ocean waves, the polarization changes suddenly and dramatically, allowing the researchers to easily identify such events in the data.

Currently, when earthquakes occur miles offshore, it can take minutes for the seismic waves to reach land-based seismometers and even longer for any tsunami waves to be verified. Using the new technique, the entire length of a submarine cable acts as a single sensor in a hard-to-monitor location. Polarization can be measured as often as 20 times per second. That means that if an earthquake strikes close to a particular area, a warning could be delivered to the potentially affected areas within a matter of seconds.

During the nine months of testing reported in the new study (between December 2019 and September 2020), the researchers detected about 20 moderate-to-large earthquakes along the Curie Cable, including the magnitude-7.7 earthquake that took place off of Jamaica on January 28, 2020.

Although no tsunamis were detected during the study, the researchers were able to detect changes in polarization produced by ocean swells that originated in the Southern Ocean. They believe the changes in polarization observed during those events were caused by pressure changes along the seafloor as powerful waves traveled past the cable. "This means we can detect ocean waves, so it is plausible that one day we will be able to detect tsunami waves," says Zhan.

Zhan and his colleagues at Caltech are now developing a machine learning algorithm that would be able to determine whether detected changes in polarization are produced by earthquakes or ocean waves rather than some other change to the system, such as a ship or crab moving the cable. They expect that the entire



» Stokes vectors S1 (left), S2 (center), S3 (right) generated by the M7.7 earthquake off Jamaica, which provide quantitative analysis of SOP (State of polarization). X-axis time, Y-axis frequency in Hertz, with color code showing intensity of spectral components. Green indicates higher spectral density compared to white and pink. The 7.7M earthquake is barely visible green/white spike below 0.5 Hz. The stronger 1 Hz line is due to environmental oscillations.

detection and notification process could be automated to provide critical information in addition to the data already collected by the global network of land-based seismometers and the buoys in the Deep-ocean Assessment and Reporting of Tsunamis (DART) system, operated by the National Oceanic and Atmospheric Administration's National Data Buoy Center.

The new Science paper is titled "Optical polarization-based seismic and water wave sensing on transoceanic cables." Zhan's co-authors on the paper include Caltech graduate student Jorge C. Castellanos (MS '18); Google researchers Mattia Cantono, Valey Kamalov, Rafael Muller, and Shuang Yin; and Antonio Mecozzi of the University of L'Aquila in Italy.

Tahe research at Caltech was funded by the Gordon and Betty Moore Foundation.



**SAAB SEAEDGE**





**By Capt. Edward Lundquist,  
U.S. Navy (Ret.)**

## HYDRONALIX USVS OFFER SIMPLE, AFFORDABLE SOLUTIONS

Tony Mulligan started his small company in 2002. Thanks to investments from the Navy's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) program, Advanced Ceramic Research (ACR) developed unmanned air vehicles (UAVs), such as the Silver Fox, that were eventually deployed in Iraq and Afghanistan. One of Mulligan's SBIR successes was the Coyote UAV, which could be launched from the ground or dropped from aircraft out of sonobuoy tubes. Some of the aircraft systems and technologies developed at ACR are still flying with the Air Force and NOAA.

That small business was sold to a prime, and the founder, Tony Mulligan, had a non-compete agreement that kept him out of UAVs. So, Mulligan started another company that focused on

unmanned surface vehicles (USVs). Through the SBIR process of "extend derive and complete," a number of the technologies that started out when Mulligan ran ACR continued to evolve and transition into work he was performing with his new company, Hydronalix, based in Sahuarita, Ariz.

When the Navy retired the Silver Fox system and brought the equipment back from the Middle East, there was an inventory of about 200 aircraft. The equipment was completely operable, and with the sensors, ground control stations, spares, and everything needed to operate them, the Navy and Hydronalix decided to experiment with unmanned surface vehicles using the Silver Fox components. That formed the genesis of a series of new SBIR efforts that has transitioned to a product line of USVs developed by Hydronalix.

▲ The Hydronalix water sampling robotic vessel can be used for a wide range of environmental and scientific purposes. (Photo credit: Hydronalix)

## EMILY TO THE RESCUE

Eventually, the Hydronalix USVs transitioned to support expeditionary EOD divers and Marines, serve as gateway buoys to connect underwater systems to above-water networks, and even penetrate hurricanes to report data back to NOAA. That technology became the very successful EMILY series of boats used for rescue, surveying and reconnaissance around the world.

The small water-jet-powered Emergency Integrated Lifesaving Lanyard, known as EMILY, is used for lifesaving and can reach people in distress faster than a swimmer or someone on a surfboard. The brightly colored remote-controlled boats weigh just 25 pounds and can travel at up to 22 miles per hour. They also can carry a two-way radio, camera and lights for night missions. The EMILY can be thrown in the water, tossed off a boat or bridge, or dropped out of an airplane. The device has a tether option so a swimmer in distress can grab it and be pulled to safety.

"We have 72 miles of coastline, and some of the most famous beaches in the world," said LACFD Lifeguard Chief Fernando Boiteux, "but we also have rivers, streams, lakes and reservoirs. We rescue people in distress, and if something or someone is missing in a body of water, our technical rescue team will find it and recover it."

## SONAR EMILY

According to Los Angeles County Fire Department Lifeguard Chief Fernando Boiteux, LACFD received a grant to evaluate the first two EMILY systems in 2012, and conducted the testing at Zuma Beach in Malibu, California, to see what the capabilities were.

"Since that initial evaluation we created a technical rescue team, and they are trained to use robotic system, including our Sonar EMILY unit, to assist us in search and rescue missions, and work in conjunction with other teams. We have both Rescue EMILY and Sonar EMILY available 24/7/365 to respond to incidents along the full 72 miles of the L.A. County coastline, as well as inland SAR responses, to look for missing swimmers or objects in water."

A higher-powered Swiftwater EMILY version, which is better suited for rougher water, is also available.

According to Mulligan, more than 50 domestic fire departments use EMILY, including New York City, Austin, Houston, and Norfolk, Va. The company also has clients in 33 foreign



» The brightly colored remote-controlled boats weigh just 25 pounds and can be thrown in the water, tossed off a boat or bridge, or dropped out of an airplane. (Photo credit: Hydronalix)

countries and has operated or supported missions in more than 50 countries.

Sonar EMILY version is equipped with the Johnson Outdoor Humminbird sonar and comes with the postprocessing SARHAWK software. The Sonar EMILY is used to conduct bottom surveys, find underwater objects and inspect bridge foundations. Combined with additional sensors, this platform is also ideal for port security, providing persistent surveillance around piers and ships.

Both the Rescue and Sonar EMILY are about 4 feet long. The sonar variant has a sonar unit that can measure water depths and produce side-scan and down-scan images of bridge substructures and streambeds, as well as an optional topside camera to view the underside of bridges. The Michigan Department of Transportation has four Sonar EMILY units to inspect bridging footings for scouring after heavy rain and snow melt. One of their contractors, Great Lakes Engineering, has one, too.

## RECONNAISSANCE DATA

Casey Collings, an engineer and diver with GLEG, said Sonar EMILY provides valuable intelligence before the divers enter the water, especially when the water visibility is low.

"We want to get some reconnaissance of what is down there before we actually get in the water. We don't want to go in blind. If we're going into murky water with zero visibility, EMILY helps us understand what we should be

seeing. With EMILY, we can make out exactly what's down there. We may still have to dive, but now we know what we're getting into. We save a lot of time. More importantly, it's really important for diver safety," says Collings.

Hydronalix CEO Mulligan said his company is working to make transportation departments in other states aware of the success that Michigan is having. Most recently, the Montana Department of Transportation has procured Sonar EMILY.

"Sonar EMILY can be used to create sonar maps of the sea floor or look for bodies or missing objects," said Mulligan. "We used Sonar EMILY in the Bahamas after Hurricane Dorian severely damaged Great Abaco Island, and closed Marsh Harbor, to ensure a safe channel to enable ships to navigate into ports to deliver relief supplies."

The Hydronalix water sampling robotic vessel can be used for a wide range of environmental and scientific purposes, from detecting "black water" dumps by large ocean-going ships off the coasts of Europe to potentially measuring the amounts of plastic microfibers in the oceans and our water supply.

With support from the Office of Naval Research, EMILY is being upsized to a 65" and 75" Autonomous Mobile Buoy for military intelligence, surveillance and reconnaissance (ISR) platform equipped with tracking cameras, radar, weather station, and sonar imaging.

Mulligan said Hydronalix has several exciting near-term opportunities for expanding into new markets with its growing line of robotic unmanned surface vessels. And Hydronalix is growing. When Mulligan started his new company in 2010, he had a one-person team, and one Phase I SBIR. Today, Hydronalix has 28 employees. "The SBIR investments help us generate new technologies that create more growth on the commercial side."

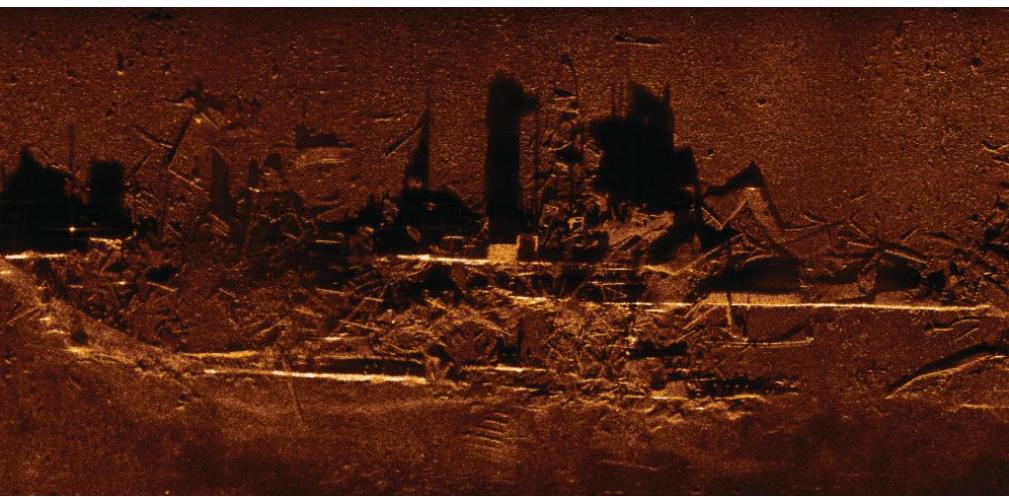


» EMILY, is used for lifesaving and can reach people in distress faster than a swimmer or someone on a surfboard. (Photo credit: Hydronalix)

## SUCCESSFUL SEA TRIALS FOR ECA GROUP'S UMISAS SONAR

FECA GROUP's UMISAS sonar completed a series of sea trials in the second half of 2020 in preparation of their integration in AUVs and Towed Sonars for the Mine Countermeasures replacement program for the Belgian and Royal Netherlands navies.

As part of the program to replace the naval Mine Countermeasures capability of the Belgian and Royal Netherlands navies, which includes the supply of twelve minehunters equipped with unmanned systems (Toolbox), ECA GROUP recently announced the completion of sea trials of its UMISAS sonar for both the AUVs and Towed Sonars of the rMCM program. The next step is the on-going production of the UMISAS sonars for their



» UMISAS 120 VHF sonar image of S.S. Ferrando collected off the coast of Hyères, France. Image size: 40 m x 135 m / Image resolution 3 cm x 3 cm. (Image credit: ECA)

integration in the A18-M and T18-M adapted to the rMCM program. This integration will take place between October 2021 and March 2022.

ECA GROUP decided to develop its own range of Synthetic Aperture Sonars in 2014 and launched an internal program. SAS sonars proposed by partners did not fulfil ECA GROUP's internal requirements:

- Their weight, size or power consumption would have led to a too big and too heavy AUV whereas ECA GROUP's MCM AUV was targeting the size of an A18-M medium-size AUV.
- Impossibility to precisely synchronize the SAS and the inertial navigation of the AUV in order to fully exploit the benefits of a new technique protected by an ECA GROUP patent for both SAS imagery and AUV navigation.

The A18-M AUV and T18-M Towed Sonar have the best performance when fitted with UMISAS sonars. Thus, these drones are exclusively commercialized with UMISAS sonars.

### UMISAS: A New Generation of Synthetic Aperture Sonars

ECA GROUP's research and development in the field of sonars started back in 2014 together with its development of new

generation AUVs in the A18 range. Driven by operational needs of Navies requesting high performance and more compact unmanned solutions for mine detection missions, ECA GROUP brings on the market their own sonar technology to be fitted on its naval drones and fully integrated into its unmanned systems.

The UMISAS sonars are interferometric synthetic aperture sonars (InSAS) used for mine detection missions as part of Mine Countermeasures operations at sea. The UMISAS sonars aim to obtain a spatial resolution of about 3 cm x 3 cm to optimally classify small and irregularly shaped objects on the seabed.

The positioning of the platform required to form the synthetic antennas is an integral part of the UMISAS processing chain. UMISAS directly uses the data from the A18-M or T18-M navigation grade inertial unit to perform SAS processing, thus

eliminating the use of low-cost navigation sensors used by some commercial SAS systems on the market which perform only the short-term navigation required to produce focused SAS imagery, but do not allow for geo-referencing of the SAS images or improved positioning of the AUV by exploiting the SAS and, above all, are much less reliable.

### UMISAS Sonar Joins the ECA Group Drone Family

The UMISTM Toolbox developed by ECA GROUP is a comprehensive solution for stand-off and autonomous mine clearance missions at sea to be operated from the ship or from the shore. It contains: a USV INSPECTOR125 surface drone, AUV A18-M underwater drones and T18-M towed sonars for mine detection, SEASCAN and K-STER C MIDS (Mine Identification and Disposal System) for mine identification and neutralization as well as UMISOFT, a comprehensive software suite for mission planning, drone control and data management.

UMISTM drones perform accurate navigation and positioning, obstacle detection and avoidance with a high level of performance, and one of the key elements, which will guarantee the expected high level of performance of the system, is the quality of imagery provided by these drones, which the ECA GROUP's UMISAS Synthetic Aperture Sonar can offer.

### UMISAS Provides Superior Coverage Rate

UMISAS, an Interferometric Synthetic Aperture Sonar (InSAS), is an innovative underwater imaging technology that considerably improves seabed surveys by providing ultra-high resolution imagery at superior coverage rates, i.e., 4 times greater in terms of coverage and between 5 and 10 times greater in terms of resolution compared to conventional side scan sonars. Combining several dozens of acoustic pings to form an image with a much higher resolution, UMISAS processes raw data into 3 cm X 3 cm resolution images, constant with range, together with high area coverage rates (i.e., 1 square nm per hour for the UMISAS 240 fitted on the T18-M).

"This combination of resolution, area coverage and accurate positioning is what makes UMISAS unique. It allows for a high detection and classification probability, even of stealthy mines, which are a challenge for other sonars." Marc Pinto, Naval Robotics Scientific Advisor at ECA GROUP

#### Drones + Sonar = Better Mission Performance

ECA GROUP is one of the few manufacturers capable of developing the drones as well as the InSAS sensor, optimizing both in an integrated system approach ensuring a seamless integration and successful mine detection and classification operations. This integration expertise is a real asset to the global performance of the system:

- Close collaboration between trajectory control, navigation and positioning, sonar signal processing systems, allowing system tradeoffs to be made at the right place.
- Greatly facilitated electrical and mechanical integration of the InSAS sensor into the drone as both were designed together.
- Optimized Size-Weight-Power and Cost.

#### AI Driven Real-Time Processing Increases Autonomy

In addition, ECA GROUP engineers have focused on real-time InSAS processing on Graphical Processing Units leveraging significant progress in COTS computer hardware driven by AI applications:

- Thus, the real-time InSAS processor is very compact and has a low and optimized power consumption, inferior to 30 W, which increases mission duration.

UMISAS' systems operate on 2 frequency bands: High Frequency & Very High Frequency:

- Permitting a superior signal to noise ratio and thus a high contrast imagery at long range, even in harsh environments, including multipathing in shallow waters and high absorption in warm waters.

#### Providing Hi-Res Bathymetry Images

Finally, UMISAS has a pair of vertically superposed arrays for reception on each side of the platform for interferometric processing, allowing for high resolution of the bathymetry which is co-registered with the imagery for improved environmental assessment.

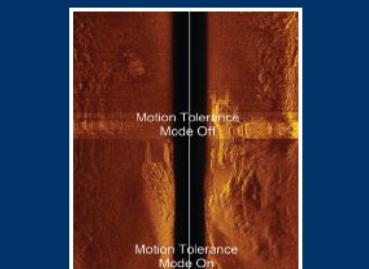


» A18-M AUV fitted with UMISAS 120 system. (Photo credit: ECA)

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## L3HARRIS AWARDED SYSTEMS INTEGRATION CONTRACT FOR US NAVY FRIGATE PROGRAM

L3Harris Technologies has been awarded a contract by Fincantieri Marinette Marine for the shipboard integration and production of major subsystems onboard the U.S. Navy's guided-missile frigate FFG 62. L3Harris is prepared to support the Navy's plans to build at least 10 ships. The value of the L3Harris program could exceed \$300 million if all design, development, and production options are awarded.

L3Harris is the largest member of the Fincantieri FFG team and will provide integrated systems that include the electric and propulsion systems, bridge

and navigation systems, and aviation integration services. The diversified capabilities that L3Harris delivers on the Constellation-class Frigate program will distribute the power and propulsion needed to meet the U.S. Navy's mission requirements throughout the world.

"We're excited by the opportunity to join the Fincantieri Marinette Marine team on the Frigate program and we look forward to bringing to bear industry-best speed, innovation and affordability as we deliver the advanced integrated capabilities that will ensure

the Navy's ability to operate this ship with impunity upon any sea," said Sean Stackley, President, Integrated Mission Systems, L3Harris.

The Navy recently awarded a contract to Fincantieri to design and build the FFG,



» L3Harris will provide Fincantieri Marinette Marine with integrated systems that include the electric and propulsion systems, bridge and navigation systems, and aviation integration services. (Image credit: L3Harris)

## US MARINE CORPS AWARDS BAE SYSTEMS SIGNIFICANT CONTRACT FOR ADDITIONAL ACVS

BAE Systems has received a \$184 million contract option from the U.S. Marine Corps for more Amphibious Combat Vehicles (ACV) under full-rate production.

The order demonstrates the Marine Corps' confidence in a program that is on track to deliver this critical capability to the Marines.

This contract award will cover production, fielding, and support costs for the ACV personnel carrier (ACV-P) variant. BAE Systems was awarded the first full-rate production contract option in December for the first 36 vehicles. This option on that contract increases the total number of vehicles under full-rate production to 72, for a total value of \$366 million.



» BAE's ACVs bring enhanced combat power to the battlefield. (Photo credit: BAE Systems)

"The exercising of this option validates years of teamwork in partnership with the Marines to provide the most adaptable amphibious vehicle possible to meet their expeditionary needs," said John Swift, director of amphibious programs at BAE Systems. "The ACV was designed to meet the Marines' needs of today while allowing for growth to meet future mission role requirements."

The ACV is a highly mobile, survivable, and adaptable platform for conducting rapid ship-to-shore operations and brings enhanced combat power to the battlefield. BAE Systems is under contract to deliver two variants to the Marine Corps under the ACV Family of Vehicles program: the ACV-P and the ACV command variant (ACV-C). A 30 mm cannon (ACV-30) is currently under contract for design and development and a recovery variant (ACV-R) is also planned.

The Marine Corps selected BAE Systems along with teammate Iveco Defence Vehicles for the ACV program in 2018 to replace its legacy fleet of Assault Amphibious Vehicles (AAV), also built by BAE Systems. BAE Systems was also recently awarded an indefinite delivery indefinite quantity (IDIQ) contract worth up to \$77 million for the ACV program that includes the provision of spare and replacement parts, testing equipment, and other services.

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

# EXPEDITIONARY SURVEY BOAT HYDROGRAAF NAMED AT DAMEN SHIPYARDS DEN HELDER

On Friday, February 26, 2021, the naming ceremony and transfer of the Expeditionary Survey Boat (ESB) *Hydrograaf* of the Royal Netherlands Navy took place at Damen Shipyards Den Helder (DSDH).

Due to the coronavirus measures currently in force, the naming ceremony and handover took place in an adjusted manner, whereby the majority of the invitees were present via a livestream. The naming was also carried out remotely, whereby outgoing State Secretary of Defense Barbara Visser shattered the bottle of champagne against the ship in Den Helder with the press of a button. The ceremony was attended physically and at an appropriate distance by deputy commander of the naval forces rear admiral Nacht Hulsker, captain of the ESB lieutenant at sea 2 (OC) van Amerongen, director of projects DMO commander Kreiter, deputy director of DSDH Peter van den Berg and the responsible project leader of DSDH.

The design and construction of the *Hydrograaf* was realized in close collaboration between the DMO and DSDH. Peter van den Berg of DSDH commented: "Our project manager, together with the Ministry of Defense team, delivered a high-tech performance in the design and construction of this new type of ship."

After construction, the *Hydrograaf* was allowed to receive a maximum weight of 24 tons, in connection with the maximum permissible loading weight of the Davits hoisting installation on ships such as HNLMS *Johan de Witt*. At the same time, the ship must reach a speed of at least 20 knots, with very low noise requirements and limited space for recording all hydrographic equipment.

After the naming ceremony, the ESB was symbolically handed over by DSDH to Defensie Materieel Organisatie's (DMO) Director of Projects, commander Kreiter, followed by a toast to the vessel and her crew.

The ESB will provide up-to-date information about the soil conditions and the situation below the waterline in places where that insight is required. With this information, the Royal Netherlands Navy (RNLSN) supports expeditionary maritime operations and provides an environment in which ships can navigate safely. The main tasks of the ESB are:

- Gathering environmental information to make decisions about the (im)possibilities of an amphibious operation;
- Performing hydrographic survey operations in support of emergency relief operations;
- Supporting with civil hydrographic tasks on the national continental shelf (NCP).

The sixteen-meter-long ESB can be deployed from the so-called big decks, such as Zr. Ms. *Johan de Witt*. The ESB can independently perform hydrographic surveys under tactical

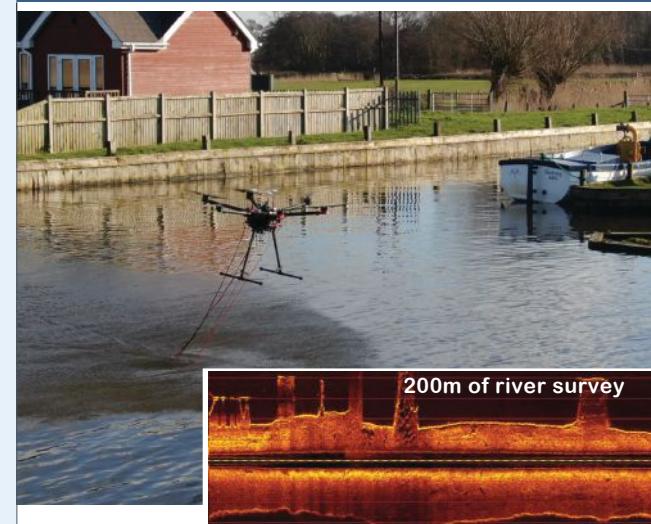


» *Expeditionary Survey Boat Hydrograaf will provide up-to-date information about the soil conditions and the situation below the waterline*

conditions at a greater distance from the mother ship. She is a fully fledged platform that is comparable to a hydrographic survey vessel (HOV) and meets the highest survey standards.

The name *Hydrograaf* was chosen in honor of the National Inspection Vessel *Hydrograaf* from 1910.

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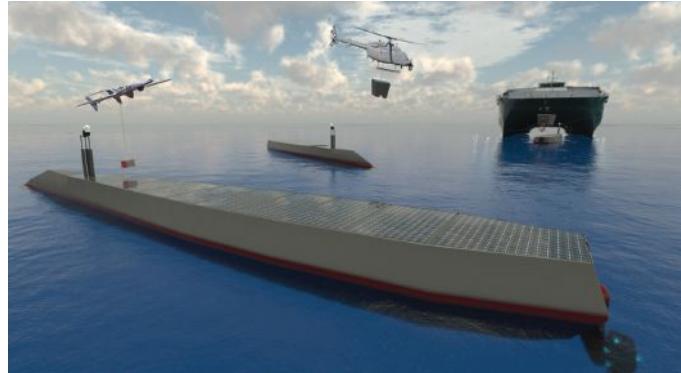
## L3HARRIS TO DESIGN LONG-ENDURANCE AUTONOMOUS SURFACE SHIP CONCEPT FOR DARPA

L3Harris Technologies has been selected to design an autonomous surface ship concept for the U.S. Defense Advanced Research Projects Agency (DARPA) to demonstrate the reliability and feasibility of an unmanned ship performing lengthy missions.

L3Harris was chosen for phase one of the two-phase No Manning Required Ship (NOMARS) program. The L3Harris design concept will streamline NOMARS' construction, logistics, operations and maintenance life-cycle. The company teamed with VARD Marine to validate the concept and design of the architecture and hull, mechanical and electrical systems.

The L3Harris design features an advanced operating system that can make decisions and determine actions on its own—without direct human interaction. This concept optimizes autonomous surface ship operations to support the U.S. Navy's future missions.

"L3Harris continues to pioneer innovative autonomous solutions that offer fully automated and integrated ship control and preventative maintenance systems to the U.S. Navy and its



» The L3Harris design concept will streamline NOMARS' construction, logistics, operations and maintenance life-cycle. (Image credit: L3Harris Technologies)

allies," said Sean Stackley, President, Integrated Mission Systems, L3Harris. "The NOMARS program selection reinforces our commitment to deliver highly reliable and affordable autonomous solutions that transform the way the U.S. Navy conducts its future missions."

| For more information, visit:  
[WWW.L3HARRIS.COM](http://WWW.L3HARRIS.COM) |

## SUBSEA CRAFT AND BAR TECHNOLOGIES SIGN NEW AGREEMENT

SubSea Craft Ltd and BAR Technologies have signed a new five-year contract to further development of VICTA—the world's most advanced Diver Delivery Unit. As part of the deal, SubSea Craft will co-locate with BAR Technologies, moving production facilities to the purpose-built building at The Camber in Portsmouth, UK.

Scott Verney, Subsea Craft CEO, said: "The two teams are already working closely together to get VICTA ready for her transfer to our Trials, Testing & Training facility in Portland, Dorset where we will conduct sea trials ahead of launch later this year. This

extended partnership and move will only help to further strengthen our efforts and future proof our businesses."

As SubSea Craft's principal partner, BAR Technologies has been integral to the build of VICTA—designing and optimizing the hull and control system to enable truly remarkable performance both on the surface and submerged.

John Cooper, BAR Technologies CEO, added: "Our ability to scale a solution combined with our leading in-house simulation capabilities mean that both

teams will benefit from the breadth and versatility of our combined team under this partnership."

BAR Technologies and SubSea Craft began collaborating on the VICTA development in 2018. VICTA is the world's most sophisticated Diver Delivery Unit (DDU). Its distinctive form combines the characteristics of a fast surface craft with those of a specialist submersible.

| For more information, visit:  
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## SENTIMENT, FUNDAMENTALS AND TECHNICALS ARE MOVING COMMODITY MARKETS

BY G. ALLEN BROOKS | Author, *Musings From the Oil Patch* | [www.energymusings.com](http://www.energymusings.com)

### CRUDE OIL:

Since the end of 2020, WTI crude oil futures prices have climbed over 30 percent, reaching the previously unimaginable \$64 per barrel level. People were growing optimistic for an oil demand recovery later this year. Driving prices higher is the arrival of multiple COVID-19 vaccines pulling forward prospects for control of the virus. Imagining an end to economic lockdowns, coupled with massive government infusions of stimulus, means visions for significant economic growth—good for oil demand.

OPEC's decision to cut back its output has helped erase much of the global oil inventory glut that built when COVID-19 forced a global economic shutdown last spring. The recent Texas blackout further aided the inventory drawdown, supporting higher oil prices. These fundamental trends, while still somewhat tenuous due to the overhang from excess oil production capacity, are encouraging.

Market participants wonder whether OPEC+, which has worked hard to restore its dominant role in the global oil market, will remain disciplined to lift prices higher. Based on the decision out of the group's March 4 meeting to hold output flat in April, while allowing Russia et al to add roughly 150,000 barrels a day of new supply, suggests it has that discipline—at least for another month. Re-straining supply growth at a time when demand is uncertain is critical for keeping oil prices elevated, exporter incomes growing and optimism rising.

Financial market technical factors are also supportive of higher oil prices. The value of the U.S. dollar has fallen, making oil cheaper for foreign buyers as oil is priced in dollars. The Biden administration's push for massive financial stimulus is coming at the expense of a strong U.S. dollar. This stimulus and associated debt increase will further diminish the dollar's value,

contrary to its historical support from U.S. presidents. The dollar's value also partly explains the strong stock market performance of emerging market and small cap stocks, both of which traditionally are associated with higher commodity prices, especially crude oil.

The strong performance of cyclical stocks—those whose revenues and earnings depend on stronger economic activity—also suggests support for higher commodity prices. Investors are wondering whether these trends signal we are embarking on another super-cycle for commodities in which global economic activity drives consumption and investment higher. The scales appear to be tipping in favor of stronger commodity demand, which means higher prices. That is especially true given years of underinvestment in commodity productive capacity, limiting future supply just as demand grows.

The oil and gas industry leads the commodity producers' commitment to better corporate financial stewardship, which means limited output growth, improved balance sheets with reduced debt levels, and returning more cash to shareholders. Whether that discipline holds, as oil prices soar and supply/demand balances become tighter, remains to be seen. In the meantime, the trend in oil prices is higher. How fast and how high remain unknown.

### NATURAL GAS:

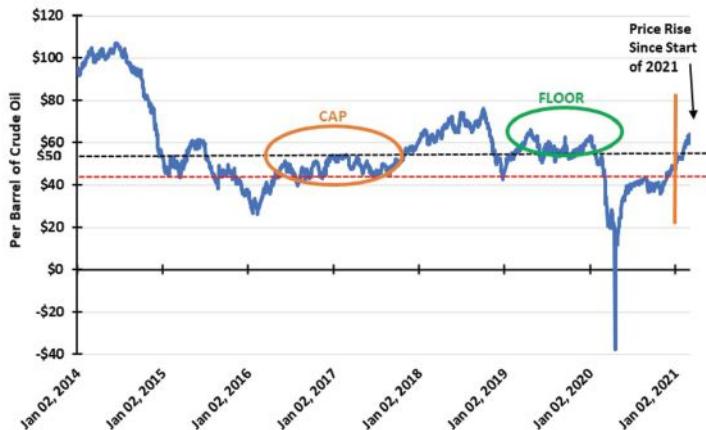
Valentine's Day, a polar vortex descended from the Arctic and delivered bitter cold temperatures all the way down to the Gulf Coast. It produced a major shock to the natural gas industry. With record low temperatures and unusual snow and ice conditions, utilities attempted to navigate a minefield of unstable fuel supplies for electricity generation, while struggling to keep the lights and heat on for Texas residents. Not all utilities were successful,

as the state's power grid manager forced them to shed upwards of 10 gigawatts of demand just as cold temperatures peaked. The result was blacking out power to eight million Texans. The bitter cold temperatures also disrupted power markets in adjacent states and Mexico, further disrupting the lives of millions of people.

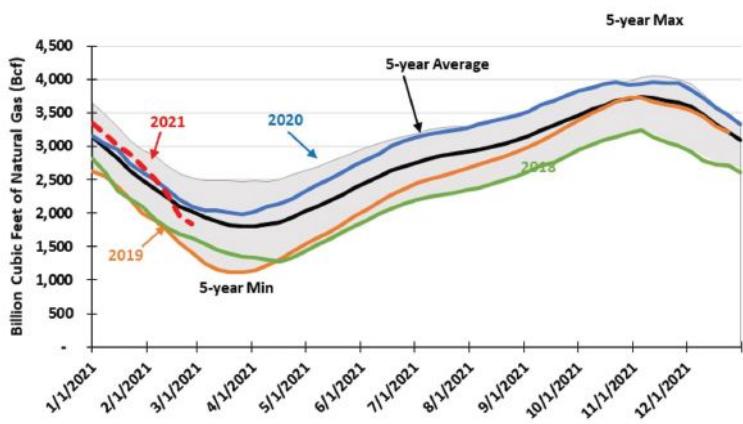
The havoc in the natural gas market created by the cold temperatures and fuel disruptions appeared in spot gas prices. While Henry Hub futures prices rose about ten percent between the day prior to the arrival of the cold spell and two days following its peak, spot prices jumped nearly eightfold. Gas buyers were frantic for supply! In Texas, Oklahoma and Kansas, wellhead gas prices exploded, jumping by as much as 100- to 200-fold. Several small gas producers were selling their supply on the spot market for \$500 per thousand cubic feet, at a time when Henry Hub futures prices were \$3.25.

Technical analysis tells us that despite continuing the string of recent large weekly gas storage withdrawals, the market is tightening. It may be two billion cubic feet per day too tight. That means gas prices will need to rise to shed demand by next winter if additional supply is not forthcoming. Financial discipline by gas producers seems destined to limit supply growth, which could offset the demand tightness. Higher gas prices will cut into gas use by power generators, as well as limit liquefied natural gas exports. Many people do not expect either condition to happen, but they might want to look at the latest Energy Information Administration Short-term Energy Outlook. It shows power generation use of gas next winter equal to 2017's use and below the consumption of intervening years. Likewise, the EIA sees LNG exports flat with last spring when global energy demand collapsed, and buyers were cancelling cargos. If the EIA's outlook is prescient, their expectation of sharply higher gas prices will happen.

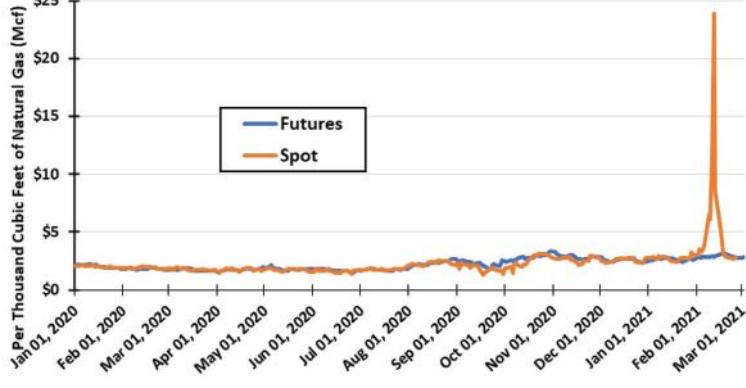
Will \$50 Become  
Cap or New Floor -  
The Answer Is In



Gas Storage Helped  
By Extreme Cold In  
Recent Weeks



What Happened  
To Spot Gas Prices  
During The Great  
Texas Blackout In  
February





## AMERICAS

### AUVSI XPONENTIAL Virtual

Virtual » May 4-6

[www.xponential.org/xponential2021](http://www.xponential.org/xponential2021)

### US Offshore Wind

Virtual » May 25-27

[www.reutersevents.com/events/offshore-wind](http://www.reutersevents.com/events/offshore-wind)

### SIPEX

Virtual » June 1-3

<https://surinameoilexpo.com>

### H2O Conference

Virtual » June 7-10

[www.h2oconference.ca](http://www.h2oconference.ca)

### International Telecoms Week

Washington D.C. » June 21-24

[www.internationaltelecomsweek.com](http://www.internationaltelecomsweek.com)

### Int'l Conference on Ocean, Offshore & Arctic Engineering (OMAE)

Virtual » June 21-30

<https://event.asme.org/OMAE>

### Floating Wind Solutions

Houston, TX » June 28-29

[www.floatingwindsolutions.com](http://www.floatingwindsolutions.com)

### AUVSI XPONENTIAL Atlanta

Atlanta, GA » August 16-19

[www.xponential.org/xponential2021](http://www.xponential.org/xponential2021)

### Offshore Technology Conference (OTC)

Houston, TX » August 16-19

<http://2021.otcnet.org/>

### International Partnering Forum (IPF)

Richmond, VA » August 24-26

[www.offshorewindus.org/2021ipf](http://www.offshorewindus.org/2021ipf)

### Offshore Well Intervention LATAM

Rio de Janeiro, Brazil » September 8-9

[www.offsnet.com/latam](http://www.offsnet.com/latam)

## EUROPE

### Deep Sea Mining Summit

London, UK » May 27-28

[www.deepsea-mining-summit.com/](http://www.deepsea-mining-summit.com/)

### Seanergy

Nantes, France » June 8-11

<https://www.seanergy-forum.com/en/seanergyforum>

### Seawork

Southampton, UK » June 15-17

[www.seawork.com](http://www.seawork.com)

### Underwater Technology Conference (UTC)

Virtual » June 16-17

[www.utc.no](http://www.utc.no)

### Electric & Hybrid World Marine Expo

Amsterdam, The Netherlands

» June 22-24

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

### Undersea Defence Technology (UDT)

Rostock, Germany » June 29-July 1

[www.udt-global.com](http://www.udt-global.com)

### All-Energy

Glasgow, UK » August 18-19

[www.all-energy.co.uk](http://www.all-energy.co.uk)

### Ocean Business

Southampton, UK » October 12-14

[www.oceanbusiness.com](http://www.oceanbusiness.com)

### Submarine Networks EMEA

London, UK » September 1-3

[www.terrapinn.com/conference/submarine-networks-world-europe/index.stm](https://www.terrapinn.com/conference/submarine-networks-world-europe/index.stm)

### SPE Offshore Europe

Aberdeen, UK » September 7-10

[www.offshore-europe.co.uk](http://www.offshore-europe.co.uk)

## OTHER REGIONS

### Offshore Well Intervention APAC

Kuala Lumpur, Malaysia » May 18-19  
[www.offsnet.com/owi-apac](http://www.offsnet.com/owi-apac)

### Telecoms World Middle East

Virtual » June 15-16

[www.terrapinn.com/conference/telecoms-world-middle-east/index.stm](http://www.terrapinn.com/conference/telecoms-world-middle-east/index.stm)

### PHILMARINE

Manila, Philippines » June 23-25  
[www.philmarine.com](http://www.philmarine.com)

### Submarine Networks World

Singapore » September 29-30  
[www.terrapinn.com/conference/submarine-networks-world/](http://www.terrapinn.com/conference/submarine-networks-world/)

### ADIPEC

Abu Dhabi » November 15-18

[www.adippec.com](http://www.adippec.com)

### Telecoms World Asia

Bangkok » November 16-17

[www.terrapinn.com/conference/telecoms-world-asia/index.stm](http://www.terrapinn.com/conference/telecoms-world-asia/index.stm)

MONTH & DEADLINES	EDITORIAL FOCUS & SHOW DISTRIBUTION	TECHNOLOGY & INDUSTRY FOCUS	2021 EDITORIAL CALENDAR
JANUARY Editorial: Dec. 28 Ad: Jan. 14	» <b>The Essential 2021 Offshore Toolkit</b>	<b>Technologies:</b> ROV tooling & control, Subsea cables, Remote inspection, Supply vessels, turbines, tethers, and more. <b>Industry Focus:</b> Offshore Energy & Renewables, Marine Survey, Scientific, Defense	
FEBRUARY Editorial: Jan. 25 Ad: Feb. 11	» <b>Ocean Observation</b>	<b>Technologies:</b> Buoys, ADCP, Data Software, Sensors, Drifters, Gliders, and more. <b>Industry Focus:</b> Marine Survey, Scientific, Offshore Energy & Renewables	
MARCH Editorial: Feb. 22 Ad: Mar. 11	» <b>Unmanned Vehicles &amp; Marine Robotics</b> » <b>Distribution:</b> GIPEX ☎ / April 6-8 Oil Connect ☎ / May 11-14	<b>Technologies:</b> USVs, AUVs, ROVs, Aerial drones, Control systems, Seafloor residency, and more. <b>Industry Focus:</b> Offshore Energy, Marine Survey, Defense, Academic, Subsea Infrastructure	
APRIL Editorial: Mar. 22 Ad: Apr. 08	» <b>Defense &amp; Security</b>	<b>Technologies:</b> Autonomous Navigation, Comms & Telemetry, Magnetometers, GIS, Sonar, and more. <b>Industry Focus:</b> Subsea Defense, Government, Offshore Energy, Subsea Infrastructure	
MAY Editorial: Apr. 19 Ad: May 06	» <b>Marine Renewables</b> » <b>Distribution:</b> SIPEX ☎ / June 1-3 Floating Wind Solutions / June 28-29 Int'l Partnering Forum / Aug. 24-26	<b>Technologies:</b> Turbines, Subsea Cables, Inspection Drones, Subsea Batteries, Grid Integration, Connectors, and more. <b>Industry Focus:</b> Offshore Wind, Wave Energy, Tidal Energy, Alternative Offshore Energy	
JUNE Editorial: May 17 Ad: June 03	» <b>Bathymetric Mapping &amp; Hydrographic Survey</b>	<b>Technologies:</b> Oceanographic Equipment & Instrumentation, Sensor Suites, ADCP, Buoys, ROVs, and more. <b>Industry Focus:</b> Marine Survey, Academic, Geotechnical Services	
JULY Editorial: July 01 Ad: July 15	» <b>Unmanned Vehicles Buyers' Guide ☎</b>	<b>Technologies:</b> ROVs, AUVs, USVs, Towed & Bottom Crawling Vehicles, and Gliders. <b>Company Focus:</b> Exclusive company/product spotlights and editorial features available	
AUGUST Editorial: July. 26 Ad: Aug. 12	» <b>Deep-Sea Exploration</b>	<b>Technologies:</b> Seabed samplers, Mining machines, Geotechnical tooling, Seafloor imaging equipment, and more. <b>Industry Focus:</b> Offshore Energy, Marine Mining, Scientific	
SEPTEMBER Editorial: Aug. 23 Ad: Sep. 09	» <b>Offshore Build, Inspection &amp; Maintenance</b> » <b>Distribution:</b> Ocean Business / Oct. 12-14 Offshore Energy / Oct. 26-27	<b>Technologies:</b> Inspection drones, Turbines, Subsea cables, Power substations, Battery technology, Grid integration, Connectors, and more. <b>Industry Focus:</b> Offshore Operations & Maintenance, Offshore Energy & Renewables	
OCTOBER Editorial: Sep. 20 Ad: Oct. 07	» <b>Submersibles</b> » <b>Distribution:</b> Ocean Energy Europe / Dec. 6-7	<b>Technologies:</b> Manned submersibles, Navigation systems, ROVs, Submarines, Resident Subsea Vehicles, and more. <b>Industry Focus:</b> Offshore Energy, Defense, Academic, Marine Mining	
NOV./DEC. Editorial: Oct. 18 Ad: Nov. 11	» <b>Subsea Engineering &amp; Infrastructure</b>	<b>Technologies:</b> Subsea drills, Prospecting tools, Deck handling equipment, and more. <b>Industry Focus:</b> Offshore Energy, Defense, Marine Mining, Government	
SPECIAL ISSUE Editorial: Nov. 18 Ad: Dec. 1	» <b>The Future of Ocean Technology</b>	<b>Tech and Industry Focus:</b> Our Special Edition unites an exclusive roll call of industry thought leaders to discuss the innovative breakthroughs set to redefine how we work in marine environments over the coming decade.	

## BW GROUP AND MIROS LAUNCH FUEL-SAVING, EMISSIONS-REDUCING JOINT VENTURE

BW Group and Miros are launching Miros Mocean, a joint venture to provide the shipping industry with a new standard in vessel performance optimization. BW Group and Miros are combining maritime expertise and leading radar technology to overcome the performance inefficiencies of the shipping industry by providing unprecedented data accuracy into the operating conditions of a vessel, a missing piece in vessel performance until now.

The lack of reliable information on performance in actual operating conditions leads to highly variable performance data and built-in tolerances in the legal contracts between owners and charterers. This lack of precision in vessel speed control and lack of accurate weather data are the largest known factors contributing to suboptimal vessel performance, leading to excess fuel oil consumption and CO<sub>2</sub> emissions.

Says Remi Eriksen, DNV Group President and CEO, said: "Decarbonizing the shipping industry is the grand challenge of our time. International regulators and other key stakeholders have set clear and ambitious goals for emissions reductions, and for the industry to progress, accurate measurement and reporting of emissions data will be important. As custodians of the sea, we as an industry have a duty of care to ensure that decisions are made based on the best possible data."

Michael Parker, Chair of the Poseidon Principles Association, commented: "Now that we have established what we need to measure under the Poseidon Principles, it is important for the industry to keep improving accuracy and reliability by accounting for factors such as weather conditions and other operating parameters."

### **Miros Mocean - The Missing Piece in Vessel Performance Optimization**

BW Group's own experience with Miros' technology underpins the joint venture, with more than a year of cooperative development behind the offering.

"To be able to understand if an investment is truly optimizing the performance of your vessel, you need to account for weather," says Christian Bonfils, Managing Director, BW Dry Cargo. "The technology Miros Mocean introduces is what we at BW Group had been looking for. It gives access to accurate speed through water and weather data at the precise ship location and combined with fuel flow and main engine power meters we can quantify fuel savings of up to 10% on a single voyage. It has also helped to change the legal contracts to actual performance instead of warranties, setting the standard for the future of this industry."

Miros Mocean combines fuel oil consumption and main engine power measurements with real-time accurate environmental conditions at the vessel's actual location. This allows vessel owners and operators to:

- Make real-time decisions about the operation of vessels with the objective of saving fuel and reducing greenhouse gas emissions.
- Integrate highly accurate weather data into their existing vessel performance systems for further performance enhancements.
- Optimize charter party contracts by using the measured performance of a vessel rather than warranties.

In this way, Miros Mocean provides real-time decision support for the enablement of performance optimization, fuel savings, reduced carbon emissions and documentation of true weather conditions to remove uncertainty from claims. Miros Mocean's vision is to give the shipping industry accurate and relevant performance data to optimize costs and create a transparent, collaborative, and greener shipping industry for the future.



# SeaState

THE ON&T PODCAST

SEASON 2 / EPISODE 3

## COASTAL OCEAN OBSERVING SYSTEMS



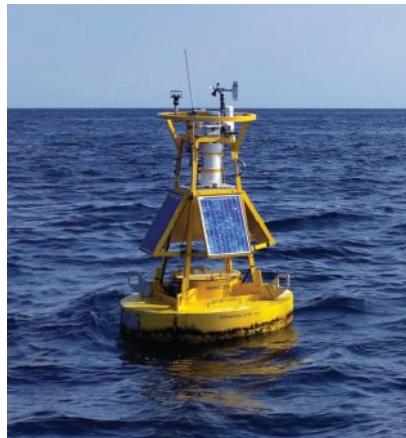
» David Walsh

In the next episode of SeaState we talk with David Walsh from Woods Hole Group. Mr. Walsh uses field and laboratory data to resolve and evaluate oceanographic and geologic processes within coastal, estuarine, and oceanic environments. He has extensive experience in the design, implementation, and management of marine data collection programs for site characterization—whether through instrumentation moorings or sample collection. Other areas of specialization are sediment characterization and the spatial and temporal quantification of shoreline and bathymetric change using Geographical Information Systems (GIS) and other geospatial software packages to map and define geomorphological processes. In addition, Mr. Walsh has extensive field experience in the acquisition, processing, groundtruthing, and interpretation of bathymetric, side-scan sonar, and sub-bottom sonar surveys in order to investigate subaqueous sedimentary environments on a regional scale. Mr. Walsh received his M.S. in Oceanography in 2004, and a B.S. in Geology in 1999.

In his present position, Mr. Walsh works in concert with coastal engineers to collect and analyze the oceanographic and geophysical data necessary for the development of hydrodynamic models, shoreline change analysis, and restoration design various coastal environments. Woods Hole Group is an international environmental services and products organization headquartered in Massachusetts, and with USA offices in Delaware, Maryland, and Texas. Woods Hole Group offers a range of coastal, ecological, and oceanographic consulting services, along with products for collecting ocean measurements, ocean forecasting, tracking wildlife with satellite communications, and vessel monitoring systems (VMS) for fisheries management.

Woods Hole Group is committed to safeguarding the environmental health of our planet, a mission that requires a fundamental understanding of the laws of nature and a willingness—and ability—to challenge long-accepted notions of what can and cannot be done. Protect the legacy of humankind, in a changing climate, means accepting that economic growth and responsible environmental policy go hand-in-hand.

Plotting such a course, in partnership with public and private concerns, requires teams of collaborating specialists. The company strives to partner with other companies, agencies, leading academic research institutions, and nations on collaborative projects in a commitment to unite leading experts and technologies to solve practical problems. This was—and always will be—the founding premise of the Woods Hole Group.



NORTHEASTERN REGIONAL ASSOCIATION  
OF COASTAL OCEAN OBSERVING SYSTEMS

## OCEAN DATA FOR DECISIONS

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social media: @neracoos  
+1 (603) 319-1785

## DECOM AWARDS' ROLE IN REFLECTING SECTOR EXPORT CAPABILITIES

Decom North Sea (DNS) has announced the launch of the fourth annual Decom Awards; the only industry accolades dedicated to decommissioning excellence across the global energy industry.



» Decom Awards 2019. (Photo caption: DNS)

With four categories available to enter this year, the Awards have been designed to showcase the expertise, collaboration and on-going innovation which are providing tangible benefits to the decommissioning sector. The winners will be announced at a virtual ceremony on 21 May as the culmination of DNS' Decom Week, which replaces the traditional Decom Offshore conference. As the largest, global decommissioning event, it comprises five days of live streamed events, tech talks, technical demonstrations and more, from around the world.

Discussing the Awards, Decom North Sea's interim Managing Director, Will Rowley, said: "In common with our energy industry colleagues, decommissioning has felt the effects wrought by the circumstances of the past year. However, whilst we have experienced both industry and external challenges, our sector has continued to operate and innovate.

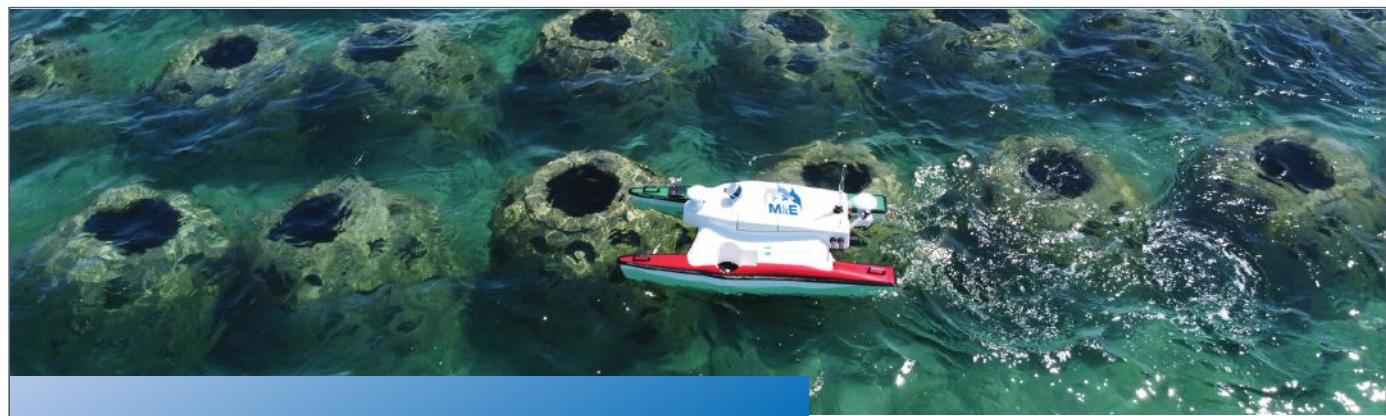
"Throughout the past year, DNS has worked hard to represent and promote our decommissioning supply chain as the global leader in its field, with the ability to export

capability and expertise. The Decom North Sea Awards play an important role in this objective, whilst we celebrate some of the outstanding work undertaken across the sector during 2020."

Categories for the Decom Awards 2021 are:

- Excellence in Collaboration Award
- Technical Innovation in Decommissioning Award
- Rising Star in Decommissioning Award
- Decom North Sea Member Award

Entries are open from now until Friday 19 March, 2021. Category submissions can be made either in traditional written format or—new for 2021—via video recording. Submissions are welcome from all companies operating in the offshore decommissioning sector, with categories, criteria and application forms available at <https://decomnorthsea.com/events/the-decom-north-sea-awards-2021>



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## MAJOR CONTRACT WINS FOR NUCORE AT THE START OF 2021

Nucore Group, a specialist engineering company providing integrated climate control and fire safety solutions in hazardous environments, has won two major contracts worth seven figures which will see them deliver their combined services, including heating, ventilation, air conditioning (HVAC) and refrigeration maintenance, as well as fire safety services, to operators in the North Sea.

The first contract, which kicked-off in January, will see Nucore provide preventative and ongoing climate control maintenance programs for four platforms and FPSO's in the UK's North Sea. The second contract, which started in February, sees Nucore support a client operating several platforms in the southern North Sea. In addition, Nucore has retained a significant part of an existing firefighting equipment (FFE) contract for the same client.

Phil Davie, COO of Nucore, said: "We are delighted to have won two three-year contracts so close to home. As we move forward, the North Sea will continue to be a key growth market for our integrated service offering, building on the years of knowledge and best practice our teams possess and we have adapted to a more efficient operating model. As a specialist engineering company, we pride ourselves on our expertise and legislative understanding, that is so important when dealing with climate control equipment, especially in high-hazard environments.



» Nucore has scooped up 1.2m of contracts so far this year. (Photo credit: Nucore Group)

"It's a fantastic way to start the year, after the challenges we all faced in 2020, and it's encouraging to see the industry pushing forward through difficult times."

Nucore specializes in providing high-quality, expert-led climate control, fire safety and security solutions and equipment for the oil and gas, marine, petrochemical and renewable industries.

**From shallow to deep-water**

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+1 207 502 1400  
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Cathx Ocean design and manufacture advanced subsea imaging and precision measurement systems for subsea operations.

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The range includes the Hunter system (AUV Imaging and Laser), the Scout system (Observation Class ROV Imaging and Laser Profiling), the Pathfinder system (Work Class ROV Imaging and Laser Profiling) and the Prowler I & II systems (Towed Vehicle Imaging Range and Scale Measurement).



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401 884 8801  
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+47 73 51 50 20  
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www.km.kongsberg.com/seatex  
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+47 73 54 55 00  
+47 73 51 50 20  
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www.km.kongsberg.com/seatex  
Finn Otto Sanne at finn.otto.sanne@kongsberg.com

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**STAR:ODDI**  
Skeidaras 12, 210  
Gardabær, Iceland  
+354 533 6060  
+354 533 6069  
baldur@star-oddi.com  
www.star-oddi.com  
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10633 West Airport Blvd Ste 300  
Stafford TX 77477  
+1 832 833 8000  
cortland@cortlandcompany.com  
www.cortlandcompany.com  
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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.

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209 - 1875 Broadway Street

Port Coquitlam, BC

V3C 4Z1 Canada

+1 604 944 8248

info@imenex.com

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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.



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Salem, NH 03079  
+1 603 893 6131  
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Environmental Sensors &amp; Systems

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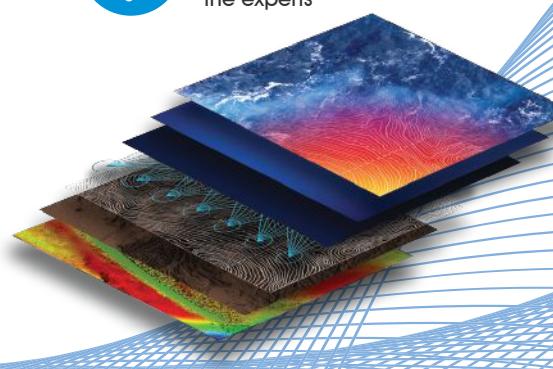
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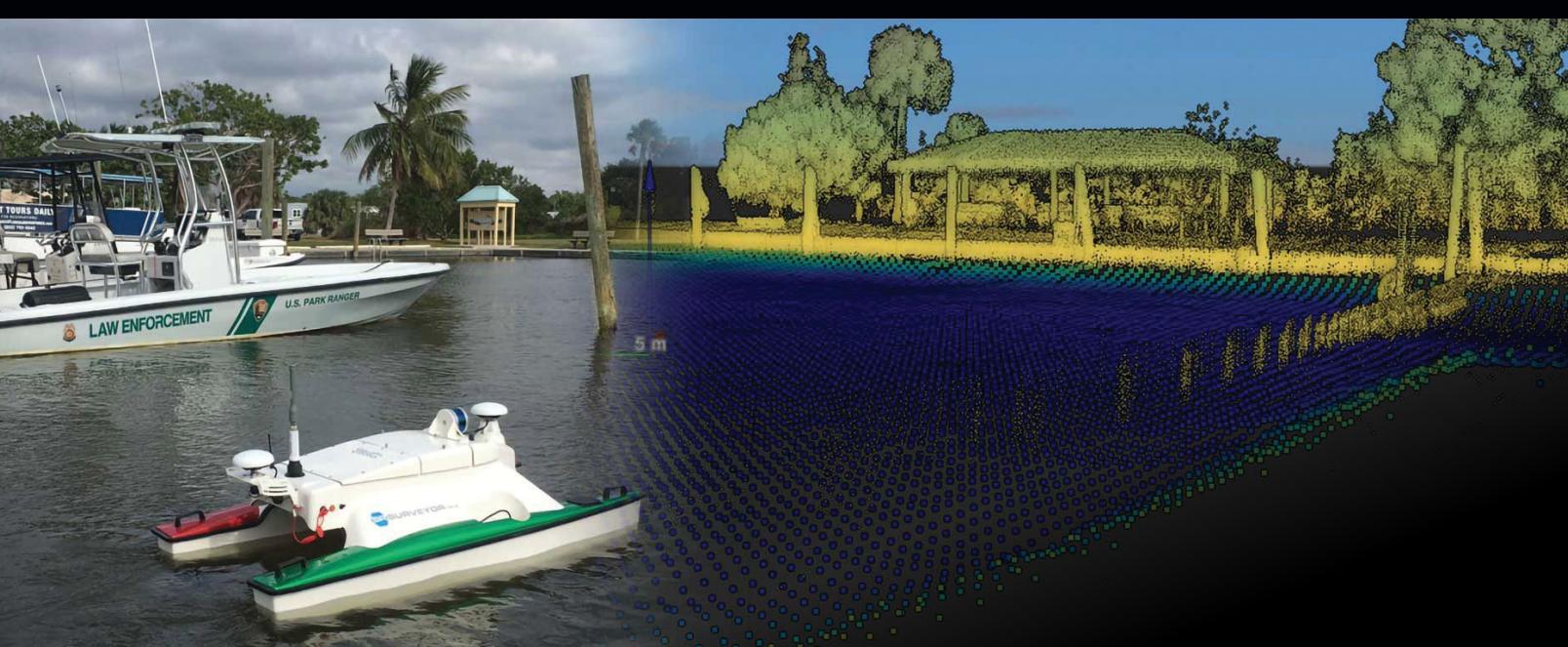
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