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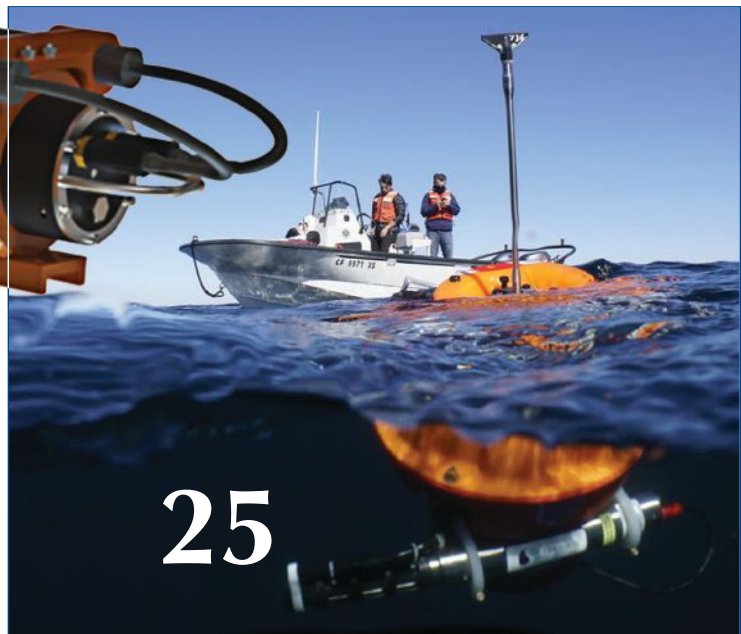
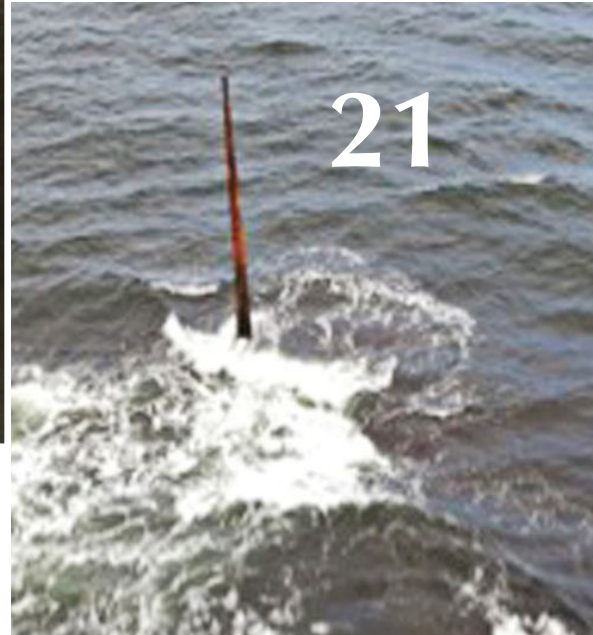
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COVER IMAGE

Linden Photonics supplied the critical fiber-optic link transmitting pictures and videos from the *Endurance22* expedition that discovered the wreck of legendary polar explorer Ernest Shackleton's ship, *Endurance*, in March 2022 after more than 100 years since its disappearance. The wreck was found more than 3,000 m underneath sea ice in the Antarctic's Weddell Sea. Linden Photonics' thin, strong, rugged and light 25-km continuous tether (seen in the background of the photo as the big orange spool) provided real-time data during the expedition and facilitated discovery of the lost wreck. (Credit: Esther Horvath, Falklands Maritime Heritage Trust)

NEXT MONTH

Discovering Shackleton's long-lost ship in Antarctica ... World's first ocean crossing by a solar-electric autonomous vessel ... Side scan sonar sheds light on New England maritime tragedy ... Drone-and-sensor integrations for geophysical and hydrographic purposes ... Q&A: Vickie Jensen, "Deep, Dark and Dangerous."

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)) New Commandant of US Coast Guard. Adm. Linda L. Fagan is the new head of the U.S. Coast Guard, replacing Adm. Karl L. Schultz as commandant. Fagan is the Coast Guard's first woman to hold the rank of four-star admiral. She again made history not only as the first woman to lead the Coast Guard but also as the first woman service chief of any U.S. military service. Schultz has retired from the Coast Guard after 39 years of service. He was awarded the Homeland Security Distinguished Service Medal from Department of Homeland Security Secretary Alejandro N. Mayorkas. A component of the Department of Homeland Security, the Coast Guard comprises more than 57,000 active-duty, reserve and civilian Coast Guardsmen and more than 25,000 volunteer Coast Guard Auxiliarists. During his four-year tenure, Schultz championed a compelling "Readiness Narrative" that raised the service's funding levels to enable renewed internal focus on the Coast Guard's Mission Ready Total Workforce, as well as prolific shipbuilding, aviation asset recapitalization and a signature Technical Revolution. Fagan assumed the duties as the 27th commandant following her service as the 32nd vice commandant. As vice commandant, Fagan served as the chief operating officer, responsible for executing the commandant's strategic intent, managing internal organizational governance and serving as the component acquisition executive.

)) Hydrogen Ship to Collect Plastic Waste. Plastic pollution in oceans and other bodies of water could more than double by 2030, according to the UN Environment Programme. Plastic debris is currently the most abundant type of litter in the ocean. H2-Industries and TECHNOLOG Services, a naval architecture company, have joined forces to develop 3D designs for an innovative concept ship that will collect plastic waste in the oceans and convert it into clean hydrogen, with surplus hydrogen to be shipped back to shore. The ship will be more than 150 m long, depending on optimal storage capacity, and travel at 4 kt. Waste plastic will be collected by two smaller vessels towing a 2-mi. net that funnels the waste from the surface and down to 10 m below. The most novel feature of the vessel will be the open bow design that allows the collected plastic waste to be fed onto conveyors and into the storage hold. This waste will be converted into hydrogen by the same thermolysis process that the H2-Industries' plants will use onshore. For every 600 kg of waste collected, approximately 100 kg of hydrogen can be produced and stored in liquid organic hydrogen carrier, a fluid referred to as "LOHC" that can carry hydrogen, in 20-ft. containers. These containers will be transferred to smaller vessels by onboard cranes for delivery to shore. The ship will run on electric motors using the LOHC produced on board as its fuel and creating electricity using H2-Industries' 19-in. eRelease racks. Each rack will hold 48 KW of installed power, and there will be multiple racks to deliver approximately 2 MW for this ship.

)) NOAA Report Shows US Fisheries Holding Steady. NOAA's 2021 Status of Stocks report highlights the efforts to rebuild and recover U.S. fisheries by providing a snapshot of the more than 460 stocks managed by NOAA Fisheries. In addition, NOAA issued an update to the Fisheries of the United States report, which provides details about the economic impacts of fisheries and tracks annual seafood consumption and the productivity of top fishing ports. In 2021, U.S. fisheries held steady with more than 90 percent of stocks not subject to overfishing, and 80 percent with population sizes sufficient to be considered not overfished. The number of stocks on the overfishing list held steady at 26, and the number of overfished stocks slightly increased to 51, up from 49. Data also reveal that in 2020, seafood landings in the U.S. were down 10 percent—likely due to the impacts of the COVID-19 pandemic—and overall seafood consumption had slightly decreased from the previous year, to 19 lb. per person. A stock is on the overfishing list when the annual catch rate is too high. A stock is on the overfished list when the population size of a stock is too low, whether because of fishing or other causes. This year's report also featured the first-ever assessment of the Atlantic blacktip shark. NOAA Fisheries determined the stock is not subject to overfishing, not overfished and is above the sustainable level. For the first time, Fisheries of the United States data are now available via a new interactive web portal (www.fisheries.noaa.gov/foss), which includes a detailed historic record of economic analysis of seafood consumption, landings totals and imports and exports of fishery products in the U.S. This portal will allow for more frequent updates throughout the year to improve data sharing and collaboration. By ending overfishing and rebuilding stocks, NOAA Fisheries strengthens the value of U.S. fisheries to the economy, communities and marine ecosystems.

)) Green Shipping Consortium. Digital Twin for Green Shipping (DT4GS) is a new project that will apply digital twin technology to improve maritime efficiency and cut carbon emissions. The 21 partners comprise maritime transport industry specialists and associations, shipping companies, shipping digital twin providers, universities and research centers from Italy, Belgium, France, Ireland, Cyprus, Spain, the Netherlands, Poland and Greece. DT4GS is European Commission funded, and the coalition is coordinated by Belgium-based R&D specialist Inlecom. Realistic digital representations of ships will be tested and validated in four Living Labs with different types of ships aiming at navigation/route, machinery and hull optimization, through to energy management. Improvements of transport system efficiency will be investigated via just-in-time arrival implementation. The goal is to contribute to achieving a 55 percent reduction in CO₂ emissions from waterborne transport by 2030, in line with the ultimate target of zero emissions by 2050. **ST**

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A Grand Challenge To Address Microplastics

Microplastics are found nearly everywhere—in the water we drink, the air we breathe and the food we eat. More than 83 percent of tap water worldwide is contaminated with microplastics, and humans could be ingesting a credit card's worth of microplastics each week. Scientists most recently discovered microplastics in human blood and in live human lungs.

The health impacts of this pollution are yet unknown, but what is known is that our clothes contribute considerably to the problem. Fifty percent of clothing is made from plastic-derived fibers, such as polyester and nylon, and this clothing sheds microfibers into the environment with every wash and wear.

Conservation X Labs (CXL) is a tech organization with a conservation mission, applying innovation and technology to prevent the sixth mass extinction on our planet, occurring as a result of human activities. By focusing on the underlying drivers of extinction—from the clothes we wear to the food we eat—and by supporting the most impactful solutions, CXL believes we can create better systems for the future.

CXL has published a comprehensive report called "Saving Water for Nature: Ten Grand Challenges for Water and Biodiversity Conservation," which outlines conservation problems that could benefit from innovative solutions. Here, CXL identified an opportunity to leverage global attention and funding for innovators creating solutions to prevent the shedding of plastic microfibers from textiles.

In 2020, The Flotilla Foundation and the Arthur Vining Davis Foundations provided funding for CXL to design and launch a global challenge to address marine microplastic pollution. In 2021, CXL launched the Microfiber Innovation Challenge, inviting scientists, engineers and entrepreneurs worldwide to submit innovations to solve microfiber pollution at the source, with prize money totaling \$650,000. The challenge attracted amazing companies from 24 countries dedicated to creating a better planet through innovation.

Panels of experts in ocean science, material and textile sciences, and entrepreneurship evaluated the innovations based on criteria including scalability, feasibility, and transformative and environmental impact. After each round of expert review, CXL recognized the achievements of 26 semifinalists, 12 finalists and five prize-winning teams.

Three of the prize winners have created fibers using innovative raw materials that are intended to replace the sources of plastic microfibers in textiles: Mango Materials, Werewool and Tandem Repeat Technologies. Two of the prize winners have created mechanisms to alter existing fibers to reduce shedding: Natural Fiber Welding and PANGAIA x MTIX.

The winning innovator teams are receiving support to continue to develop and test their products and expand key partnerships throughout the supply chain. They are also successfully connecting with investors to build their ventures and raise additional funding—Natural Fiber Welding recently closed an \$85 million Series B funding round.

If scaled, these solutions could fundamentally disrupt the environmental impact of clothing production. These innovations not only address microfiber pollution but also other aspects of sustainable clothing production, such as decreasing water use, reducing greenhouse gas emissions and designing products for a circular economy.

Scientists will continue to discover microplastics accumulating in humans and wildlife, and these companies are some of the best examples of how innovation can turn off the microfiber pollution tap.

To learn more, visit: microfiberinnovation.org. **ST**

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JANUARY

Annual Review & Forecast

**OCEANS 2022 Chennai, February 21-24, Chennai, India

FEBRUARY

Instrumentation: Measurement, Processing & Analysis

**Oceanology International, March 15-17, London, Excel, U.K.

MARCH

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

**AUVSI XPONENTIAL 2022, April 25-28, Orlando, FL

APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

**Offshore Technology Conference, May 2-5, Houston, TX

MAY

Communications, Telemetry, Data Processing

**Undersea Defence Technology (UDT), June 7-9, Rotterdam, The Netherlands

**EUROMARITIME, June 28-30, Marseille, France

JUNE

Seafloor Mapping/Sonar Systems/Vessels

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Editorial Calendar

UE DATE

JULY

Deck Gear, Cable, Connectors, Power Systems & Salvage

***CLEAN PACIFIC 2022*, August 23-24, Renton, Washington

AUGUST

Geophysical Exploration/Seafloor Engineering

***IMAGE '22*, August 28-September 2, Houston, TX

SEPTEMBER

Ocean Resources Development & Coastal Zone Management

***OCEANS 2022 Hampton Roads*, October 17-21, Virginia Beach, VA

***EURONAVAL*, October 18-22, Paris, France

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

***CLEAN GULF 2022*, November 8-10, New Orleans, Louisiana

***Offshore Energy 2022*, November 29-30, Amsterdam, The Netherlands

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Compact Marine Winch

Modern Design with Classic Structure to Improve Vessel Operations

By Joshua Eaton • James Haley

A winch is a device aboard a marine vessel that is used to hoist items to and from the deck, such as nets, vehicles and other scientific equipment. Nearly every research operation at sea requires a winch for hauling and retrieving equipment over the side of a ship.

In basic winches, the system's elements include a wide spool or winch drum mounted by a frame and rotated by a motor assembly or drive mechanism.

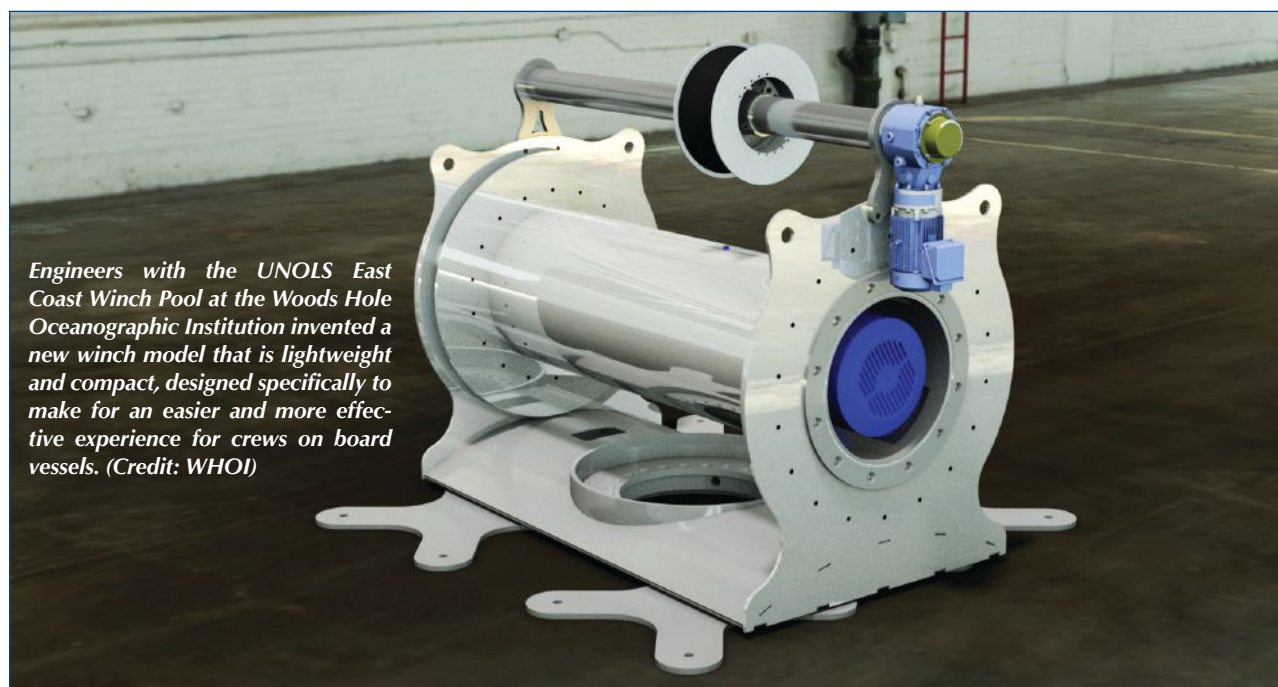
The motor assembly connects to the winch drum to drive rotation to

haul in or pay out cables with the winch drum.

Among the challenges associated with typical marine winches are that they have large on-deck footprints, can be difficult to operate, are costly when made for a single purpose, and are used from a fixed location on the deck. Winches are often used in settings with limited real estate to place and mount the winch. For example, industrial marine winches are generally attached to the deck of a vessel and are limited to specific regions of the vessel due to size,

clearances and strength of the deck. Many conventional winches are not capable of residing in limited spaces on the deck of a vessel.

With these challenges in mind, engineers with the University-National Oceanographic Laboratory System (UNOLS) East Coast Winch Pool at the Woods Hole Oceanographic Institution (WHOI) in Massachusetts saw an opportunity to contribute to the winch market and design a radical new model—created and vetted by scientists for scientists. The group spent a decade



Engineers with the UNOLS East Coast Winch Pool at the Woods Hole Oceanographic Institution invented a new winch model that is lightweight and compact, designed specifically to make for an easier and more effective experience for crews on board vessels. (Credit: WHOI)



The winch has a small footprint and is frameless. It is adaptable for a variety of marine applications. The smaller footprint saves deck space, a valuable commodity on research vessels. (Credit: Joshua Eaton, WHOI)

working on a product that offers a lightweight, compact winch, designed specifically to make for an easier and more efficient experience for crews on board vessels.

Design

Winches are universal in the science and marine community. Crews are constantly putting some form of technology or equipment over the side of a ship and bringing it back using a winch. We saw an opportunity to make a smaller, stronger and faster system that would foster the work that crews are doing each day. The innovative, patented compact winch features modern design with an original, classic structure.

During World War II, designers moved away from focusing on form design and opted for function instead, rather than melding the two as engineers did in the mid-to-late 1800s. It was considered that form was more important than function during that era; for example, looking at bridge design in comparison, classic bridges have extra curves and rivets, embodying a Gothic style that emphasizes form over function. Similarly, winches em-

bodied that structure years ago, but seldom is a vintage approach taken in modern-day design. We prioritized a fusion of design that combines form and function for this new winch model.

The new winch was designed to have a throwback to the Victorian Age by showing all the bolt heads, nuts and welds. Drawing straight lines was purposely avoided in the design because we wanted to catch the eye of vessel crews interested in using this winch. In fact, the slip ring attachment was intended to resemble an old wooden airplane propeller.

This unique compact winch stemmed from a night of brainstorming on a whiteboard. We drew out and plotted our designs, erased and restarted over again multiple times, and analyzed the specs with each new redraw. This design started from the ground up and disregarded conventional design.

We came up with the original idea of using a ring bearing. A portable turntable using a large slewing ring bearing was designed. It opened up a whole new way of thinking about winch design and

the use of space in general. All of that was made possible by the new variable-frequency drive (VFD) that enabled putting a control station anywhere and using an all-electric motor and gearbox.

A few key elements of the compact winch design are: a smaller footprint that saves deck space, a valuable commodity on research vessels; a frameless, lighter winch adaptable for a variety of marine applications; a scalable design from 1/2 horsepower to hundreds of horsepower; and a strength-to-weight ratio of 2:1 compared to traditional winches' ratio of 1:2. This model can pull twice as much as it weighs.

To reduce deck space, the compact design features a minimal frame and, for the first time ever, utilizes the drum as a structural member. The capacity of the winch drum is capable of also housing various cables needed for research and winch components. The motor-in-the-drum design was also config-

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“We prioritized a fusion of design that combines form and function for this new winch model.”

ured to make maintenance quick and easy. The scalable design can be adapted for user-specific needs, negating the typical requirement for customized winch solutions for every application. The winch on a turntable allows for a 360° easy hand rotation that can lock the winch into place on the base, allowing for movement when needed.

This lightweight design also improves vessels’ fuel efficiency, lending itself to lower emissions and making it ideal for use aboard alternative-fuel-driven and ever-evolving green-design vessels. The compact design allows for additional equipment to be brought along, helping the ship’s mission to be more productive. As it is a scalable design, it can go from a footprint of less than 4x4 to more than 10x8 ft. and lift hundreds to tens of thousands of pounds.

Applications

The compact winch is geared toward a variety of land, offshore and aquatic applications—specifically in marine environments that include deploying and retrieving

mooring lines, floats, buoys and other scientific instruments. It was particularly designed with tech in mind: A key purpose is to support a heavy load on a cable such as AUVs, ROVs, human-occupied vehicles (HOVs), gliders and crates.

The compact winch is currently licensed for manufacture and sale to InterOcean Systems (IOS). Three WHOI winches manufactured under license by IOS are currently being integrated into a new University of Vermont research vessel.

To learn more about the compact winch, visit the WHOI Tech Transfer Office website at: <https://techtransfer.who.edu>. **ST**

Joshua Eaton is the UNOLS East Coast Winch Pool engineer and winch co-inventor at WHOI.

James Haley is the UNOLS East Coast Winch Pool coordinator and winch co-inventor at WHOI.

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Penetrators Versus Connectors

Why You Should Add Penetrators to Your Subsea Design Library

By Rustom Jehangir

Underwater connections are a fundamental part of just about every subsea system. Unless a device can be self-contained in one enclosure, it needs cables and connections.

Subsea engineers, scientists and operators have a lot of options available when it comes to underwater electrical connectors on the market. Everyone has their favorite go-to connector brand and model and usually has a lot of opinions about why. However, all available connector options have one thing in common: They're expensive.

When we started Blue Robotics, our primary focus was to drive down the cost of subsea components to enable more people to use them. We began with thrusters, then expanded to watertight enclosures, and later added more components, such as lights and cables. That path led us to building an ROV that required us to integrate all of these components together. Unfortunately, doing so with available connectors while maintaining an affordable price point seemed impossible. Each of our BlueROV2 vehicles has anywhere between 15 to 25 cable penetrations—you can imagine how expensive it would be if each of those were a subsea connector set!

We came up with a simple solution: a potted cable penetrator that uses epoxy adhesive to seal a cable passing through an aluminum bulkhead. This creates a low-cost, yet removable, cable connection. It was a risky decision that went against the common design patterns in the industry, but it was a critical element that enabled the success of our BlueROV2 vehicle.

The potted cable penetrators did a good job and helped our company to grow and develop many new



WetLink Penetrator assembly.

products, but as we increased production to higher volumes, we discovered weaknesses in reliability, performance and manufacturability. We struggled with the time needed to manufacture them and with their sensitivity to variations in potting material batches, environmental conditions and material surface preparation. In addition, our customers were pushing our products harder and exceeding the limits of the potted cable penetrators. These limitations and challenges with the potted cable penetrators led us to pursue a better, more robust solution, resulting in the WetLink Penetrator.

New Design

The WetLink Penetrator is a compression gland cable penetrator that's easy to assemble, free from any epoxy or adhesive, and extremely reliable to a tested depth of 950 m. There are sizes available for any cable with a jacket outer diameter between 3.7 to 9.8 mm.

Our Blue Robotics team rigorously tested and qualified the WetLink Penetrator design. New test equipment was designed and built that could run samples through



The WetLink Penetrator family.

extreme pressures, temperatures and electrical conditions to validate that the design would be unquestionably reliable. We tested thousands of units with a wide range of cables in harsh conditions with great success.

Today, I can confidently say that the WetLink Penetrator is the most enabling component in our product line of 260 components. It's what enables our products to be affordable for everyone from students to professionals, and, therefore, it's what enables the mission of Blue Robotics: to enable the future of ocean exploration via marine robotics.

Adding to Your Library of Components

Given improvements in reliability, and the confidence gained through the WetLink Penetrator testing, I believe penetrators are a critical subsea design element that can often replace traditional subsea connectors in many applications. As a designer or operator of subsea systems, I

encourage you to consider including penetrators in your subsea design library.

Wondering where penetrators might fit? The following are a few examples of design situations that can benefit from using a penetrator.

Device Side Connections. Device side connections, such as a cable that extends from a sensor or actuator's enclosure, can use a penetrator rather than a connector bulkhead. Cable whips installed on a device, like the one on Blue Robotics' Ping sonar altimeter and echosounder, are rarely removed and typically have another penetrator or connector installed at the other end, making a device side connector unnecessary; a penetrator would be more suitable. Many subsea devices, ranging from sonars to cameras to lights to sensors, can benefit from the use of a device side penetrator.

Intra-Vehicle Connections. Penetrators are also ideal for intra-vehicle connections between different subsys-

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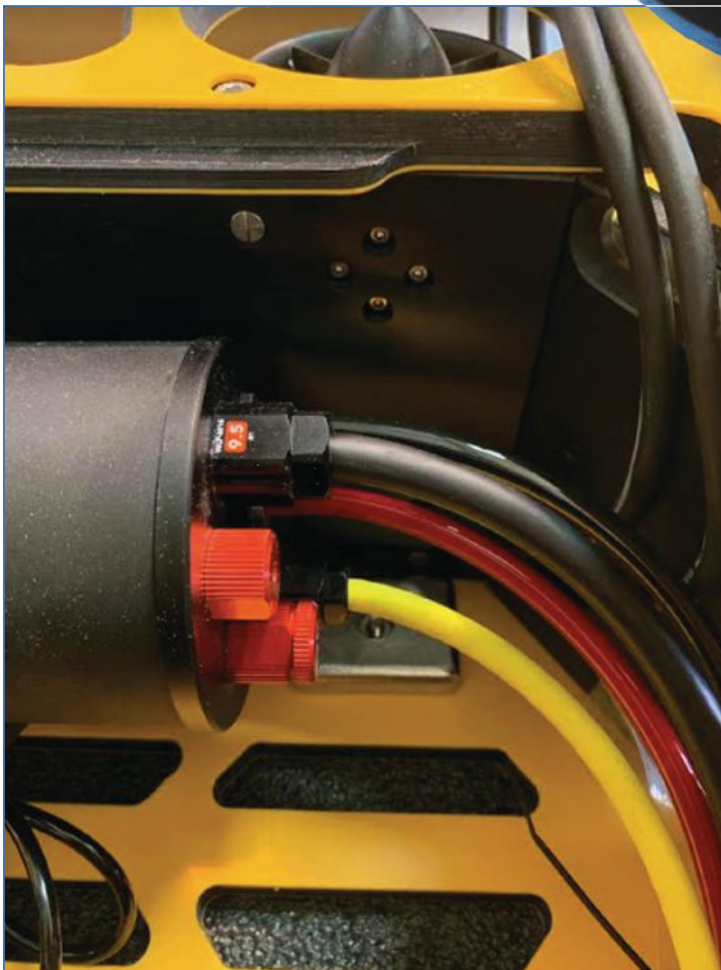
tems or enclosures. Most subsea vehicles are built with multiple enclosures to separate major systems in the vehicle. For example, many ROVs isolate the power system from the camera and control electronics. AUVs are often built from many smaller enclosures with buoyancy foam filler between enclosures, and many small surface vessels use a catamaran design that necessitates having electrical connections between separate hulls. In all of these cases, the electrical wiring is semipermanent and ideally suited to use a penetrator rather than a connector set.

Prototype Vehicle or System. One of the most useful times to use a penetrator is when first developing a prototype vehicle or system. It's usually time consuming and expensive to source purpose-built cable and connector assemblies.

With the flexibility to be quickly installed on many different cable sizes and constructions, penetrators can enable a prototype system to be constructed faster and more cost effectively.

Field Installation Applications. Potting-less penetrators such as the WetLink Penetrator are also particularly useful in field installation applications that are typically done with overmolded cable splices. In many parts of the world, it's challenging to get the potting compounds re-

(Above) Blue Robotics' Ping sonar with WetLink Penetrator.
(Below) An intra-vehicle connection in the JM HD1 ROV.
(Credit: JM Robotics)



quired for overmolded splices and field installations. Additionally, the cure time of those potting compounds can lead to costly project delays. A compression gland penetrator such as the WetLink Penetrator can be installed quickly and is ready to use immediately.

Cost-Sensitive Applications. Penetrators are ideal for applications that are cost sensitive and can benefit from an order of magnitude cost improvement relative to traditional subsea connectors. That benefits many potential users, including students competing in competitions such as RoboSub and MATE, young subsea companies trying to get a product to market affordably, and even those who have relied on subsea connectors for many years.

Regardless of what type of system you may be designing or operating, you're likely to find a place to benefit from the cost, ease of use and flexibility of cable penetrators. Consider adding them to your subsea design library, and the next time you're designing a subsea connector into your system, ask yourself: Could this be done with a penetrator instead?

Blue Robotics invites you to reach out for a free WetLink Penetrator sample by sending a message to: info@bluerobotics.com. **ST**

New Underwater Radio Technology

HydroFi Transmits Data Across Water-Air Boundary

By Stefan Videv • Molly Reyes

Reliable underwater radio communications has long been the goal for the many instances where cable, acoustic and optical solutions fail due to repeated wave motion stress, signal degradation in turbid or choppy waters, marine growth in tidal seawater, or where water quality severely limits range or there is no possibility of line of sight. Besides these tricky environmental conditions and the negative ecological impact of current communications installations, today's solutions are hard to deploy and manage because they often require frequent human intervention, with all the associated cost and carbon footprint implications.

For many years, even the most prestigious research labs have been stymied in their efforts to make radio communication practical underwater. They have measured progress in centimeters when it has worked at all. Optimal underwater signaling is affected by many seemingly insurmountable problems: the degree of salinity in the water, the difficulty of omnidirectional coverage, low data rates and channel quality issues in shallow and turbid waters, and minimal distance deployments.

But what if underwater radio modems had advanced to make underwater data collection viable, enabling you to create new monitoring opportunities for your business? What if you could wirelessly transmit data in harsh underwater environments using radio?

In this scenario, you could digitize ocean data to protect sensitive ecosystems, monitor pristine freshwater environments with real-time wireless sensors, optimize feeding schedules of a sustainable protein source, and remotely monitor subsea structural health to extend asset life.



The CSignum HydroFi v1.0 underwater radio modem.

That's the premise behind CSignum's new HydroFi modem, which will be commercially available in the second half of this year.

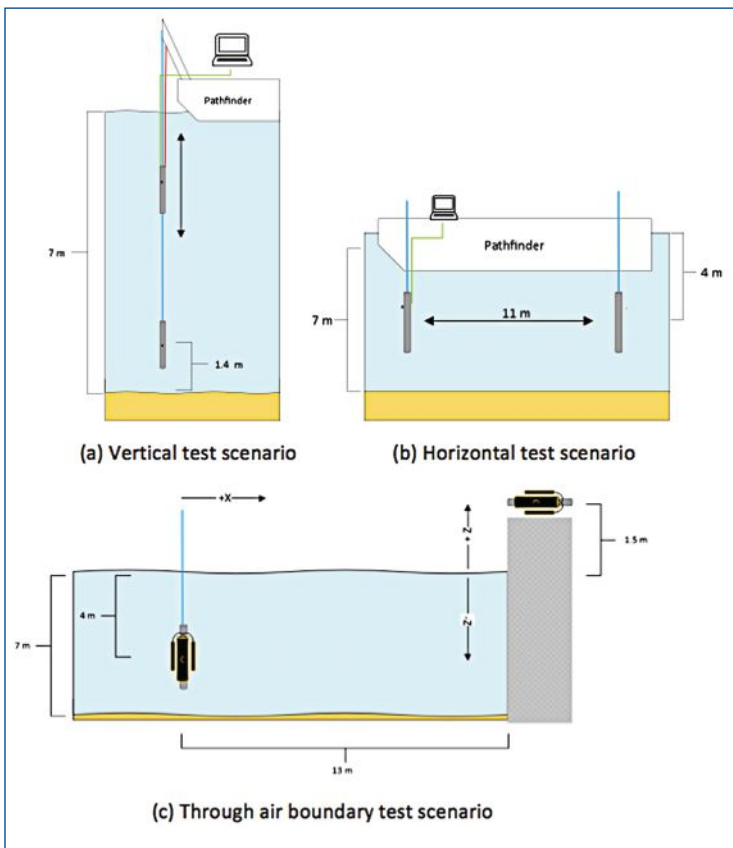
CSignum (www.csignum.com) was founded in 2020 to engineer a smarter planet by optimizing underwater health for the sustainable use by all. The company is headquartered in Bathgate, Scotland.

HydroFi modems support multiple use cases in shallow and turbid conditions, providing reliable communications and lower maintenance.

Recent saltwater field tests conducted in ports and in the open sea delivered an average of 18 m of consistent and clear data transmission between modems and receivers placed under and above the water, while freshwater testing delivered an average of 30 m.

HydroFi modems will be a crucial part of monitoring water quality in real time to protect marine life, enhance the blue economy and proactively manage fragile ecosystems as climate change and underwater warming become more prevalent.

CSignum is filling wireless communication gaps with HydroFi technology, which will unlock an explosion in subsea data transmission and transform underwater operations across environmental monitoring, ocean observing, aquaculture and offshore energy industries.



(Above) Test scenarios. (Below right) Radio attenuation in seawater. The range is estimated as being equal to a theoretical 100-dB loss.

Background

The primary motivating factor in the development of lower frequency radio technology for underwater communication was based on the impetus to detect and navigate submarines during the Cold War.

Natural sources of extremely low-frequency (ELF) and very-low-frequency (VLF) radio waves include lightning storms, volcanic eruptions and tornadoes due to charged particles in the atmosphere.

The CSignum HydroFi modems use low-frequency radio (RF) waves as the medium of communication (www.csignum.com/what-it-does). RF propagation is well understood in air, where certain frequency ranges come with benefits and advantages, depending on the application. These frequency ranges, benefits and drawbacks are not applicable underwater. RF propagation in water is completely different to that in air. RF energy suffers great attenuation in water, so any radio system's communication range is reduced.

The benefit of low-frequency radio waves is their ability to propagate through a medium with lower attenuation than their high-frequency counterparts.

Electromagnetic (EM) propagation through

water is different from air because of the high permittivity and conductivity of water. A propagating EM wave cycles energy between its electric and magnetic fields. In a high conductivity environment, this leads to attenuation.

Attenuation also varies depending on the salinity of the water and the frequency at which the data are sent. Attenuation in seawater is also frequency dependent, which presents a system design trade-off.

The signal attenuation constant can be modeled and calculated from first principles. For example, you can convert the attenuation constant to dB/m and plot it with the frequency dependent range, based on the assumption that a 100-dB channel propagation loss can be supported.

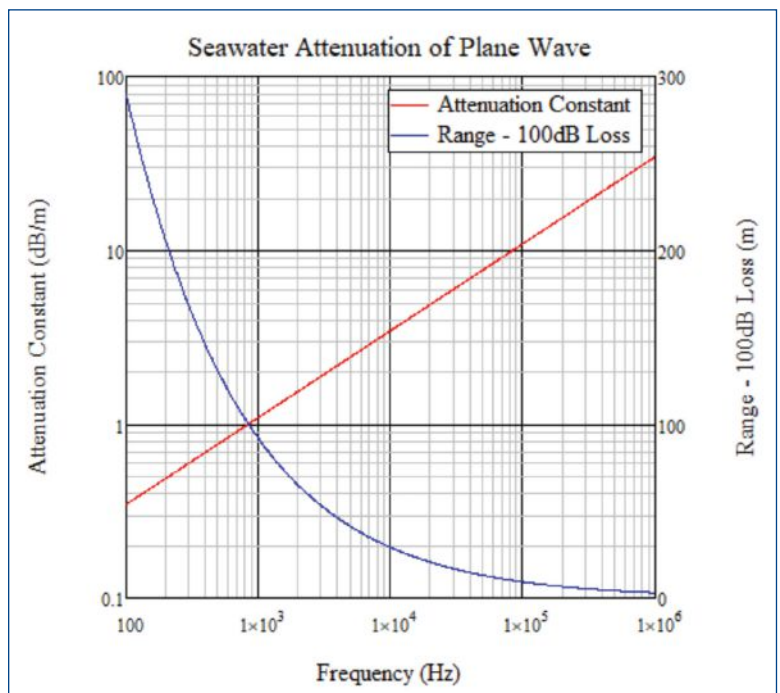
New Radio Technology

With HydroFi, CSignum has patented a way for low-frequency radio waves to reliably and automatically transmit data from underwater sensors through the water column and—for the first time—across the water-air boundary.

HydroFi technology delivers practical data rates at ranges in the tens of meters in an extremely energy efficient way. The technology can reliably communicate through the water-air boundary and is not affected by water quality, turbidity or biofouling.

This gives CSignum the unique ability to apply to many potential and existing shallow and turbid water use cases that are currently inaccessible for common wireless underwater communication technologies.

With a HydroFi modem, blue industries will now be able to digitally transform their operations, accelerate more affordable and sustainable deployments, and help engineer a smarter planet. Radio wireless connectivity through water enables multiple important new use cases,



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Frequency	Data Rate	Range
High (10-100 kHz)	High (~8 kb/s)	Low (<5 m)
Low (<10 kHz)	Low (~0.7 kb/s)	High (5-30 m)

Configuration trade-offs in low-frequency underwater radio applications. Note that data rates are highly dependent on bandwidth of system; values are indicative.

such as wireless sensor data uplink, asset condition monitoring and positioning applications in a cost-effective, simpler-to-deploy way compared to alternative cable, acoustic and optical solutions.

Field Testing

In the last six months, CSignum has been conducting real-world tests of the HydroFi modem in both the salt and fresh waters of Scotland. Hundreds of field tests were made over multiple days and under a variety of conditions in the static (no drift or current) saltwater of Burntisland Harbour, as well as the more demanding conditions of the open ocean and in the freshwater of Loch Lomond. Multiple deployments of HydroFi equipment were tested, including two modems communicating data vertically and horizontally underwater to each other and one modem underwater communicating to a receiver above the water.

Performance was measured by having the primary modem sending a packet of data to a secondary modem and requesting it to echo the data back. The secondary modem, upon successful receipt of the packet, successfully echoed it back to the primary modem. The number of successfully received packets by the primary modem was used in conjunction with the number of requests it had sent to the secondary modem to calculate the packet error rate. Up to 100 requests were made per measurement point. The HydroFi modem demonstrated it can support a bit rate of up to 200 bps at distances averaging 18 m in saltwater and 30 m in freshwater, where there is limited salinity to impact conductivity and signal attenuation or range. Results showed that the HydroFi modem lends itself well to communication through the water-air boundary without any significant signal attenuation.

Benefits to Marine Business

HydroFi modems will enable emerging and established underwater industries at every stage of technology adoption to digitally transform how they deploy, protect, operate, update, integrate and manage their remote communications systems. This will lead to greater sustainability, increased performance and preparedness for unforeseen events. Aquaculture, underwater observing, renewable energy and oil and gas operations will be able to scale their data infrastructures to meet evolving needs and changing market demands. Sector-specific use cases are available at: www.csignum.com/our-industries.

Users will also be able to deliver information to the right place at the right time to process for their applications, whether that involves structural integrity on a

wind farm or oil and gas platform, preventing harmful algal blooms, improving underwater observing, or optimizing the health and sustainability of fish farming.

The technology benefits of the innovative HydroFi modem are: reliability, reduced maintenance cost and risk, and greater access to dynamic data. Future plans include providing data to support digital twin modeling to enable operators to replicate a complete operational model offline to perform what-if scenarios, trial different parameter settings, and optimize performance.

The business benefits are numerous: increased efficiency and performance, reduced cost, extended asset life and access to real-time data. CSignum is currently piloting a variety of solutions with equipment manufacturers (sensors, floating and underwater structures, mobile devices and software solutions) to ensure HydroFi modems will be able to easily integrate with what's already installed so operators will be able to modernize systems and deliver increased ROI while protecting existing investments.

Conclusion

CSignum is proud to share these real-world results of our HydroFi modem field tests, which demonstrate that we have overcome key challenges long associated with underwater radio communication. The testing has enabled CSignum not only to demonstrate capability but also to pinpoint areas of improvement that will lead to significant performance improvements in the very near future.

By enabling “first-mile” data connections for underwater industries to join the advances of “last-mile” Wi-Fi signals on land, we are encouraging an end-to-end, agile digital infrastructure that enables operators to easily add sensors into the network so they can quickly respond to unforeseen economic and environmental global disruptions. Armed with dynamic readings, our customers will be able to make smart, data-driven decisions for any situation they may encounter. **ST**

Stefan Videv is the chief innovation officer at CSignum. He is at the cutting edge of wireless communication research, with over 60 peer-reviewed publications in premier IEEE journals. He has partnered with numerous industry leaders to develop communication prototypes and is excited by the unique possibilities that HydroFi technology creates.



Molly Reyes is the chief commercial officer at CSignum. She is an offshore expert with over 20 years of experience across the energy industry value chain. She has held a variety of commercial and technical roles focused on subsea infrastructure, asset economics, regulatory policy and corporate strategy, and she offers an interdisciplinary view of technology adoption.



USV for Shallow Water, Open Ocean

SP-48 Deftly Maneuvers for Challenging USCG ATON Survey

By Alessandra Bianchi

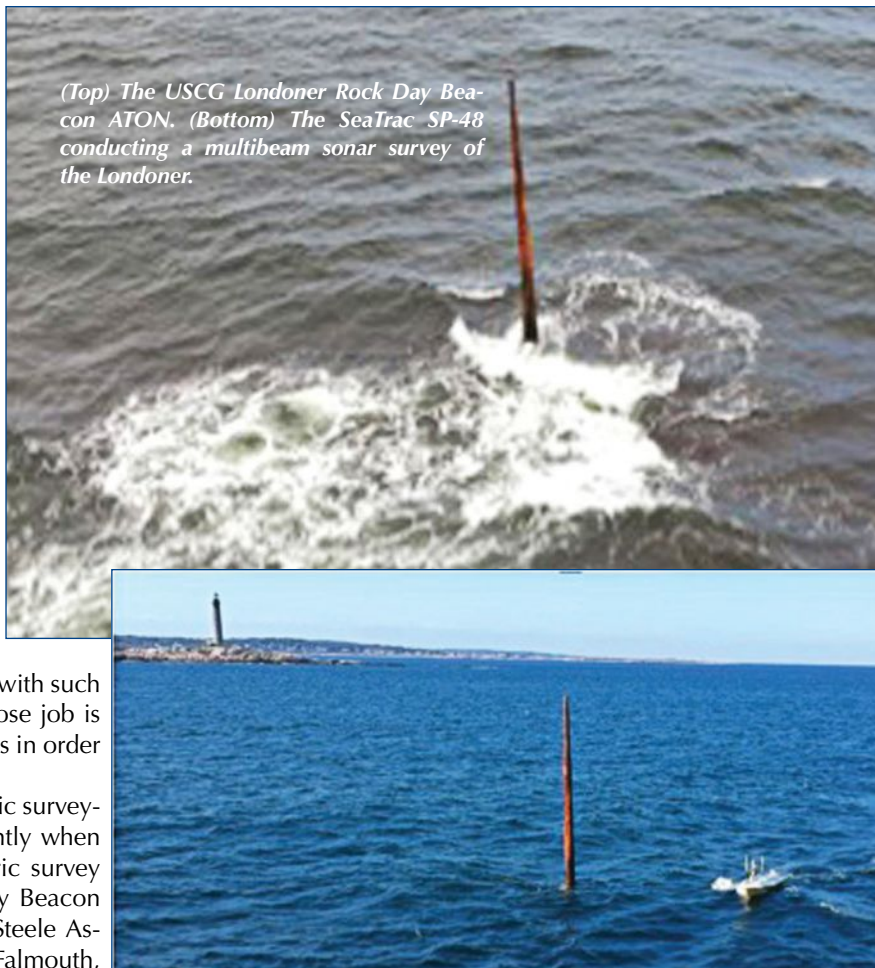
Aids to Navigation (ATON) come in many shapes, sizes, sounds and colors, featuring lights, sound signals, buoys, day beacons and/or other components. For instance, in the waters east of Rockport, Massachusetts, in notorious “Perfect Storm” territory, lies a rusty iron spindle protruding above the surface, like a pointy, angry nail from the seabed. Known as the Londoner Rock Day Beacon, the spiky structure is a U.S. Coast Guard (USCG) ATON, designed to be a mariner’s friend, despite looking like it might be a foe. The Londoner, perched atop an exposed rock pile in an otherwise open stretch of water, is like a double-edged sword: designed to aid mariners, yet hazardous in its own right if approached too closely.

The USCG is aware of such contradictions. Its 400-page compendium ATON “Light List” from the Atlantic Coast (www.navcen.uscg.gov/pdf/lightlists/LightList_V1_2019.pdf) cautions: “Vessels should not pass fixed aids to navigation close aboard due to the danger of collision with rip-rap or structure foundations, or with the obstruction or danger being marked.” Few mariners would argue with such terms. However, there are those whose job is to take a closer look at such structures in order to inspect them.

Such was the position hydrographic surveyor Eric Steele found himself in recently when tasked with performing a bathymetric survey of the damaged Londoner Rock Day Beacon for the Coast Guard. Steele’s firm, Steele Associates Marine Consultants LLC, in Falmouth,

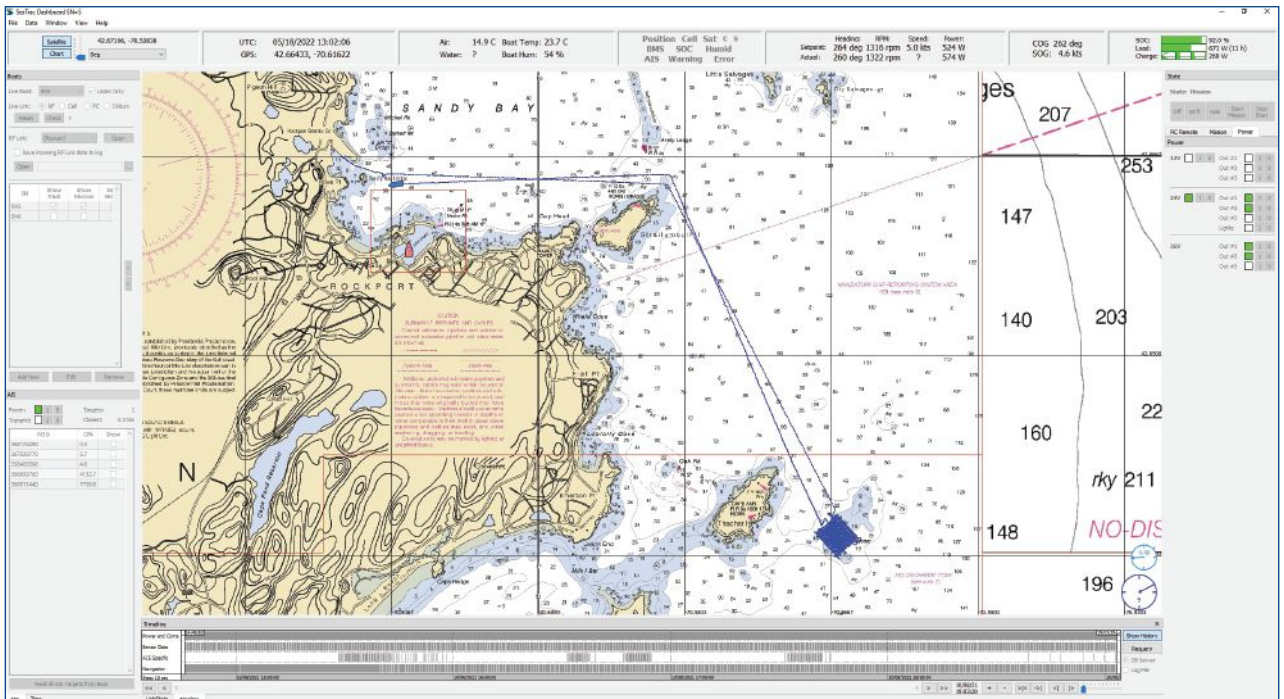
Massachusetts, regularly provides highly accurate hydrographic survey data and interpretation for U.S. Army Corps of Engineers, Navy and Coast Guard projects, so Steele, a certified hydrographer, knew what he was getting into.

(Top) The USCG Londoner Rock Day Beacon ATON. (Bottom) The SeaTrac SP-48 conducting a multibeam sonar survey of the Londoner.





(Left) The SeaTrac SP-48 USV can perform shallow-water surveys in open ocean. (Below) Survey route.



“Many of our surveys involve complex site conditions, requiring a nuanced survey approach while minimizing risk to field crews and survey assets,” Steele said. “The scope of the Londoner ATON job required high-resolution multibeam bathymetry of an exposed rock feature in otherwise open water. A hazard analysis determined this shallow-water, dynamic site posed a significant risk to the safety of the survey crew using a conventional survey vessel.”

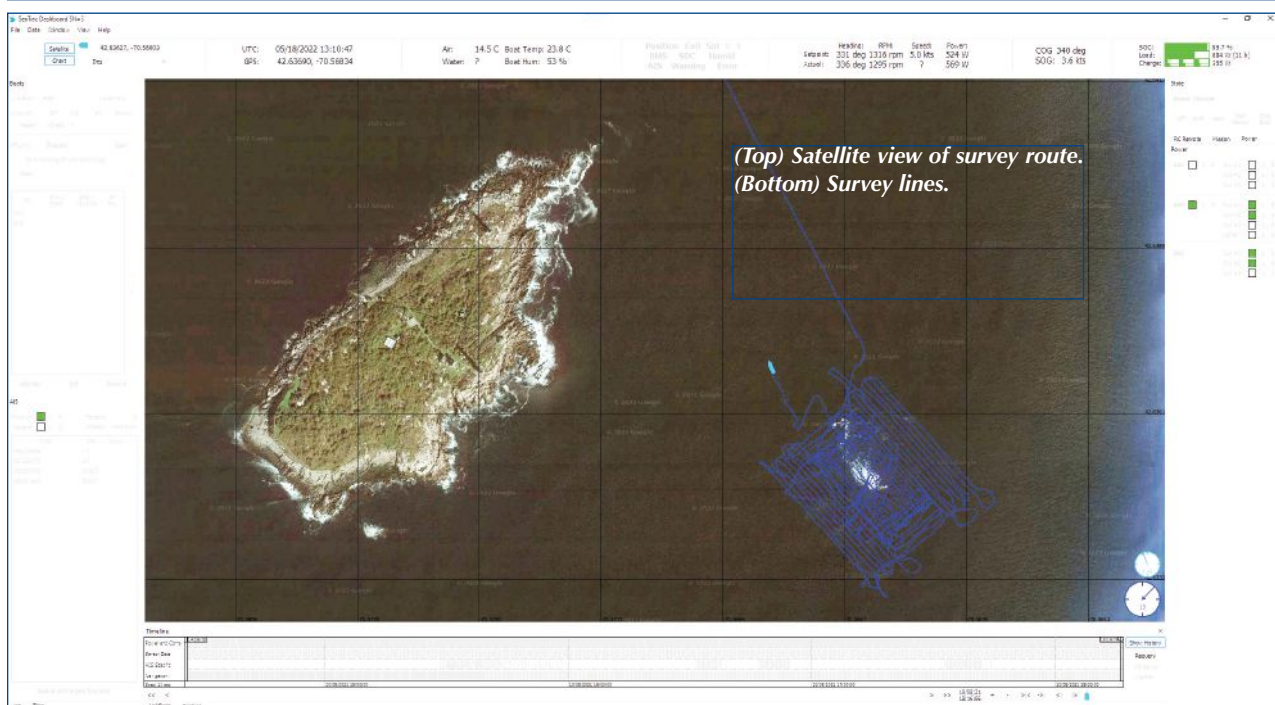
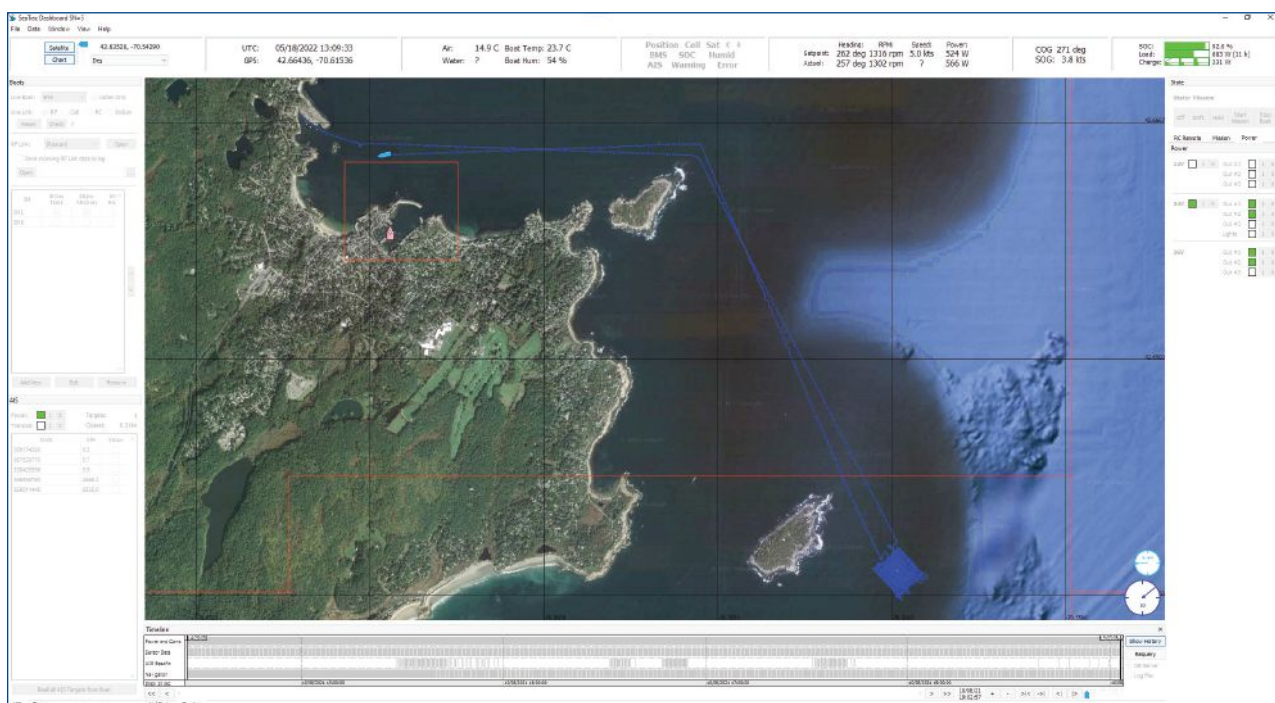
Steele Associates had already added a small autonomous surface vessel (ASV) to its collection of in-house vessels for tricky shallow-survey jobs, but the ATON assignment was a bit of a hybrid: a shallow survey in the middle of open ocean.

In contrast, Steele Associates’ six-footer was better suited for protected waters. The Londoner Rock ATON survey job would require a persistent surface vehicle that performed well in both shallow waters and open ocean—a perfect fit for SeaTrac Systems Inc.’s SP-48, a solar-powered, 4.8-m unmanned surface vessel (USV) featuring versatility.

USV for Shallow Water and Open Ocean

SeaTrac’s SP-48s are among the newer entrants in the USV space, designed to be the utility player of the field. They are versatile, with the ability to operate in both open ocean and shallow areas, such as mudflats, rivers and near shore. They are persistent, thanks to 750 W of solar panels and large battery storage that can be tapped for reliable propulsion even when no solar energy is present. They are powerful, with 500 W of available payload power, thanks to onboard lithium-iron batteries and custom battery management software.

The SP-48 is sensor agnostic, with a moonpool, mast and hull for mounting best-in-class multibeam and side scan sonars, ADCPs, water quality sondes, hydrophone arrays, aquatic-habitat echosounders and various other oceanographic sensors. The platform is also flexible, with several modes of operation, i.e., manual, supervised and full over-the-horizon autonomy; communications options, i.e., line-of-sight radio frequency, cellular, high-bandwidth satellite or custom networks; and easy launch/recovery options, i.e., ramp, pier or ship.



(Top) Satellite view of survey route.
(Bottom) Survey lines.

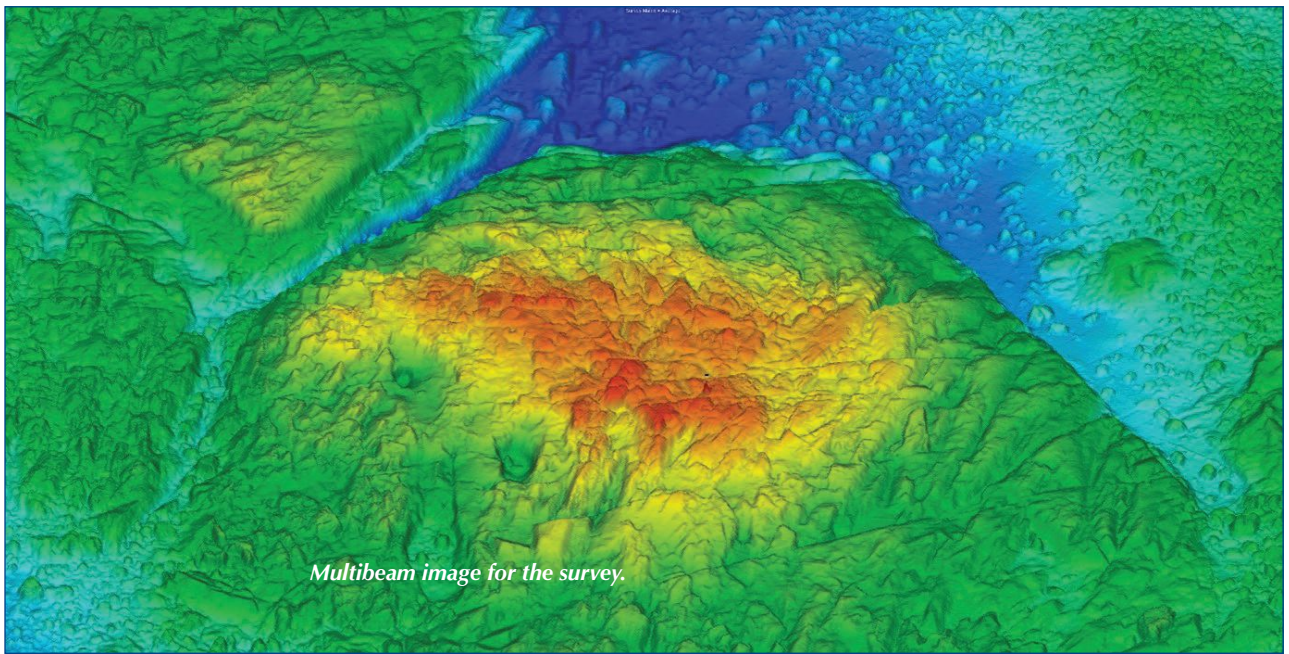
This inherent versatility is no accident. “Increasingly, customers’ missions have grown in complexity, requiring a range of sensors, and they’re looking for less costly, less resource-intensive and more flexible solutions to carry out a variety of tasks simultaneously in the challenging ocean environment,” said Buddy Duncan, co-founder of SeaTrac Systems. “SeaTrac’s customizable USVs offer a simple, cost-effective and open platform to perform the dangerous, dull and dirty work with greater efficiency over current methods.”

Duncan, who spent his early career working as an engineer on ExxonMobil tankers, met fellow SeaTrac co-founder Jigger Herman in the hallways of MIT’s naval

architecture department 30 years ago, where they both worked on Bill Koch’s successful America’s Cup campaign, and the duo have been collaborating successfully and delivering products to demanding customers ever since. SeaTrac Systems Inc. is their third company, and it is informed by the same ethos as the first two: to deliver hardware/software products that are simple, reliable and cost effective.

Londoner Rock ATON Survey

Conveniently for Eric Steele and the ATON survey, SeaTrac happens to be headquartered in Marblehead, Massachusetts, just 24 mi. (16 nautical mi.) down the coast



from Rockport and the Londoner ATON spindle. Even better, in addition to manufacturing, selling and renting their boats to customers, SeaTrac performs missions for them, for an hourly, daily or monthly rate.

Steele hired an SP-48 for the day. And so, on an overcast morning in October 2021, a SeaTrac crewmember launched an SP-48 outfitted with a NORBIT iWBMS multibeam sonar, Applanix POS MV WaveMaster II IMU and Hypack Hysweep software from a Rockport boat ramp at 11 a.m. The SP-48 followed a programmed mission to the survey area, where it commenced survey operations at 11:45 a.m. (high tide was at 1:09 p.m.). The initial lines were run to determine the location of the spindle and its relation to the charted position, and the team then modified the mission plan to ensure full coverage in the area near the spindle.

For the next 2 hr., the SP-48 executed the mission plan under the supervision of two SeaTrac team members, one in the office monitoring the remote command station and another in a support boat that was on site to conduct sound velocity profile (SVP) casts. All the while, from his desk back in Falmouth, a hydrographic surveyor

at Steele Associates monitored the data collection in real time over a remote connection.

Working with SeaTrac's technology and team offered considerable time savings for the Londoner survey by turning what would have been a 10-hr. roundtrip effort into 2 hr. of work at a desk, having eliminated a 3-hr. drive each way between Falmouth and Rockport and 2 hr. of launching/disembarking/transiting time to and from the site. Using the SP-48 enabled the hydrographers to deliver the Coast Guard results that they otherwise would not have been able to obtain from their manned boat.

"The vessel and sonar head's shallow draft allowed for access and survey coverage in areas beyond possibility with a traditional vessel," noted Steele. "Accurate predetermined sensor offsets and short lever arms resulted in a precise bathymetric data set, which exceeded our expectations.

"The SeaTrac SP-48 has proven to perform well and will be our choice for uncrewed vessel open-water survey missions." **ST**

Alessandra Bianchi is the communications director at SeaTrac Systems Inc.



Blue Tech Accelerator

startBlue Fosters Innovation, Entrepreneurship

By Vanessa Scott

The blue tech sector and the blue economy are growing rapidly, along with the need for innovation that addresses climate change and supports the United Nations' Sustainable Development Goals (SDGs). UC San Diego and its partners are leading innovative research and innovation programs to tackle ocean challenges with advanced science and engineering solutions. One key example is the startBlue Accelerator, which launched its inaugural cohort in 2021. The startBlue program is a joint project of Scripps Institution of Oceanography and Rady School of Management at UC San Diego.

startBlue is an eight-month ocean technology-focused accelerator program that is part of UC San Diego's StartR accelerator program, supporting the formation of advanced science and engineering startups tackling ocean-focused challenges and solutions integrated into science, industry, investment and government networks. Since 2012, StartR has graduated 239 companies, and Scripps and Rady have worked together to support more than 80 new environmental startups from UC San Diego through entrepreneurship education and pitch competitions.

The Blue Economy

Per the World Bank's definition, the blue economy encompasses "sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem health."

In the United States, the ocean economy has a \$373 billion impact, with 2.3 million jobs (based on 2018 numbers) in sectors such as tourism, transportation and national security.

Globally, the blue economy is worth \$1.5 trillion, sustaining 31 million jobs (in agriculture, energy, fishing, shipbuilding and more), and it is expected to double its impact by 2030.

One reason for the increased focus on blue tech and the blue economy is the urgency of meeting the UN



Technology innovation is a key component of the blue economy. Here, researchers at UC San Diego's Scripps Institution of Oceanography deploy and test a Deep Argo robotic float, which profiles the ocean at depths of up to 6,000 m. (Credit: Rich Walsh)

SDGs, which include the intention to "conserve and sustain marine resources for sustainable development" (SDG 14). With the challenges and opportunities presented by climate change, blue tech innovation is at a premium.

startBlue Accelerator

The startBlue Accelerator is the latest in UC San Diego's StartR series of programs fostering innovation and entrepreneurship. It provides training, hands-on experience, technical support, industry mentorship and fundraising opportunities for blue tech startups ready to grow.

Active participation of program partners integrates startBlue into the pipeline of regional blue economy resources, from formation to scale, including: the Port of San Diego and its Blue Economy Incubator, TMA Blue-Tech, U.S. Coast Guard Blue Technology Center of Expertise, National Defense Industrial Association, the San Diego Military Advisory Council, AiiM Partners, AltaSea at the Port of Los Angeles, California Sea Grant, the Brink Small Business Development Center, and Ocean Visions.

Along with mentorship and material aid, participation

in startBlue also offers social opportunities that could spawn business relationships. Mixers are generally held in the late winter or early spring quarters, primarily in preparation for the Triton Innovation challenge, a business competition focused on fostering creativity and highlighting commercially promising, environmentally focused technologies from UC San Diego. Many teams have formed from these mixers.

First Cohort

startBlue's inaugural cohort is remarkably diverse and includes startups seizing opportunities in biologics, robotics, food, energy, 3D printing, stormwater filtration, measuring underwater biomass and monitoring fish populations, and even improving a centuries-old invention: the anchor.

In May 2022, seven teams from the first cohort showcased their

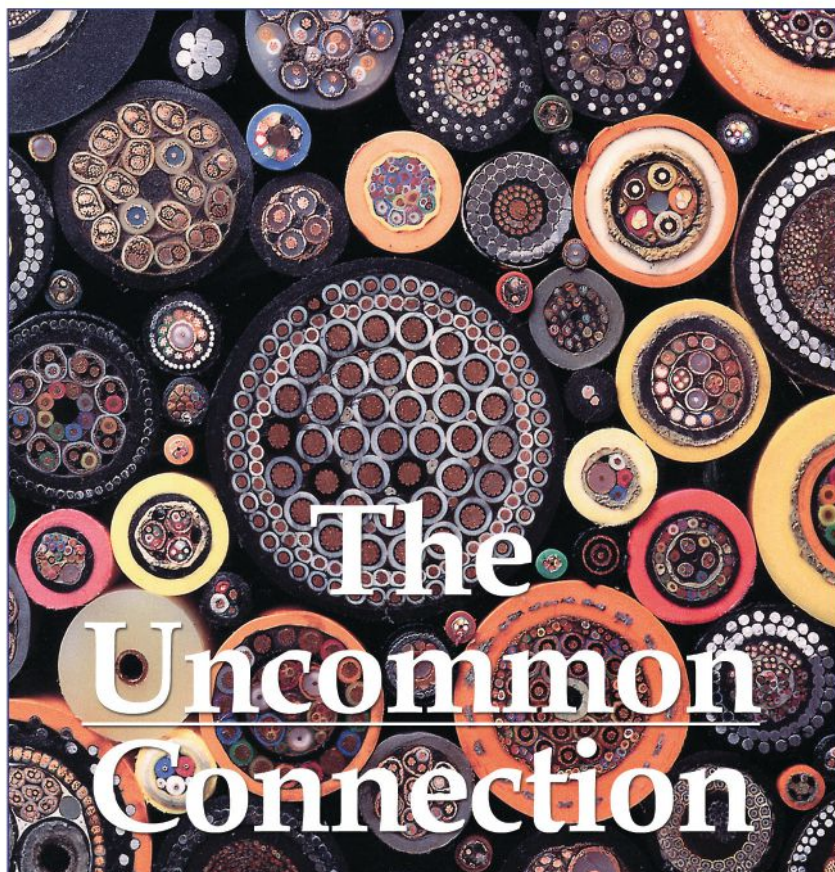
ocean-focused startup solutions as part of startBlue Demo Day. Teams presented their pitches, demonstrated the progress they have made and announced their plans for the months ahead.

Members of the first cohort are already making their presence known in the wider world of business. Algeon Materials, which leverages ocean-derived materials to create bio-innovative plastic alternatives, won first place in the April 2022 Triton Innovation Challenge. Kai Pono Solutions, creators of stormwater filtration technology, won second place in the environmental-focused business competition. CalWave Power Technologies, Inc., which unlocks the carbon-free power of ocean waves, was recently awarded funding from the U.S. Department of Energy to advance its xWave technology.

"We aim to help decarbonize the grid and reach the U.S. goal of net-zero carbon emissions by 2050," said Marcus Lehmann, CEO and co-founder of CalWave. "After years of engineering, our team was able to install our wave energy pilot unit off the coast of San Diego in September 2021 in close collaboration with Scripps Institution of Oceanography. StartBlue was a great opportunity to advance our collaboration with local researchers and industry experts, especially in the blue economy. UC San Diego and the startBlue Accelerator program have truly shown support for blue technology innovators who are willing to think big. Thanks to our colleagues and mentors in startBlue, we are prepared to meet these challenges. I'm excited to see others take advantage of this critical opportunity that can shape the future of ocean-based startups."

Next Cohort

Applications are open for startBlue's second cohort and will be accepted through July 8, 2022. Chosen startups will have access to training, hands-on experience, industry mentorship, technical support, fundraising opportunities and more. No affiliation with UC San Diego is required. Teams of at least



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two people must commit to participating in core events (weekly classes, biweekly site visits and workshops, showcase events, etc.) and meet a minimum of 8 hr. of mentoring time. Since startBlue is offered in person, a San Diego presence is required.

Applications are available via the startBlue website: <https://startblue.ucsd.edu>. Mentorship opportunities for business leaders and community members are also available.

San Diego: A Leader In Blue Tech Innovation

The defense sector and U.S. Navy presence in the San Diego area has long positioned it to be a leader in the blue economy. According to a new report published in 2022 by TMA BlueTech, San Diego's blue economy includes more than 4,320 maritime, water and blue technology establishments that generate \$16.2 billion in direct revenues and provide more than 114,000 direct jobs, accounting for 5 percent of the business establishments in San Diego County and 9 percent of its total employment. In the national context, America's marine economy was worth about \$373 billion as of 2018, per figures from the U.S. Department of Commerce.

San Diego is unique in terms of the resources it offers to startups, more specifically to later-stage startups who are looking for equity-based investment and to deploy a pilot. Critically, there is a lack of support for the newest startups that need to develop their go-to-market strategies, and that's where startBlue comes in. The accelerator supports those teams as they're spinning up, looking to compete for nondilutive funding and then transition into later-stage programs, such as the Port of San Diego's Blue Economy Incubator.

How to Get Involved

The startBlue program presents many generous opportunities for local business leaders and subject-matter experts to play a part in developing the future of the blue economy. Mentorship is available at different levels, including lead

and secondary mentors. Lead mentors are generalists with expertise in startups. Lead mentors do not need to be experts in the blue economy or blue tech, but they need to be self-starters who are well connected and willing to share their network to help teams toward their milestones for the program. Secondary mentors are domain experts in a particular sector. Those interested in becoming mentors are encouraged to get

involved in startBlue. For more information on the startBlue program, or to sign up as a mentor, visit: <http://startblue.ucsd.edu> or email: startblue@ucsd.edu. **ST**

Vanessa Scott is the director of startBlue, corporate affiliates, business development, industry outreach and innovation at Scripps Institution of Oceanography, UC San Diego.



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international

New Member of WATERBORNE Tech Platform

HEMEXPO – Hellenic Marine Equipment Manufacturers and Exports has become a member of the WATERBORNE Technology Platform (TP), the largest technological cooperation platform in Europe for issues related to the maritime economy.

WATERBORNE TP aims to engage all relevant parties in the European maritime industry and ensure that, while national policies vary according to particular challenges, effective mechanisms are developed to enable collaboration between EU and EEA (European Economic Area) stakeholders.

Research and development is a key focus for HEMEXPO, particularly in the area of sustainable technologies, and membership in WATERBORNE TP will enable HEMEXPO to develop products in line with specific industry needs and participate in European programs that will finance such projects.

KR Opens Integrated Survey Center

Korean Register (KR) held an inauguration ceremony for its new Integrated Survey Center (ISC) at the company's headquarters in Busan, South Korea. KR-ISC is an in-house developed digital platform that interactively exchanges data directly between shipping companies and KR to monitor its registered ships around the world at a glance and to provide more systematic and integrated survey service.

During an emergency, KR-ISC can provide immediate technical support to customers for making key decisions by identifying the ship's condition in real time using images and data sent from the vessel.

For shipowners, KR-ISC platform provides the survey and audit information of all KR-registered vessels, simultaneously facilitating compliance with environmental regulations, such as the Carbon Intensity Index (CII), while maximizing the efficiency of their ship operations.

Clean Hull Initiative

The Clean Hull Initiative (CHI) is a new international effort initiated by the environmental NGO Bellona Foundation and supported by Jotun and other leading companies in the maritime industry to develop an industry standard for proactive hull cleaning to tackle the global issue of biofouling.

Severe underwater biofouling slows the affected ship and can increase its fuel consumption by as much as 40 percent, boosting already high CO₂ emissions. Biofouling may also cause the spread of invasive aquatic species, affecting biodiversity, ecosystem health and the livelihoods of coastal communities.

STR Invests in Sonardyne Tech

Subsea Technology and Rentals (STR), specializing in marine survey equipment, has committed to a multimillion pound investment in seafloor, vehicle and vessel-based positioning hardware from Sonardyne. STR's

purchase includes Sonardyne's long-baseline (LBL), ultrashort baseline (USBL) and inertial navigation systems to support survey and construction projects across the offshore energy markets.

Navico Joins Responsible Business Alliance

Navico, a division of Brunswick Corp.'s Advanced Systems Group, has joined the Responsible Business Alliance as a supporter member. It is the first company focused on marine electronics to join the world's largest industry coalition dedicated to corporate social responsibility in global supply chains.

XOCEAN Acquisition

XOCEAN has completed the acquisition of Geomara, a specialist hydrographic survey company. XOCEAN aims to displace the emission of 1 million tons of carbon over the next five years. The company uses USVs to collect ocean data for services such as seabed mapping, inspection of subsea assets and environmental monitoring.

Greenland Bathymetric Expedition

The Nippon Foundation-GEBCO Seabed 2030 Project has entered into a memorandum of understanding with the Ocean Research Project (ORP) to support the global effort in pursuit of mapping the world's ocean floor, especially in polar regions through ORP's upcoming expedition, GO-MARIE.

The GO-MARIE (Glacier-Oceans Mapping & Research Interdisciplinary Effort) program is a 2022 expedition that is also the motivation for the maiden voyage of the organization's flagship, the RV *Marie Tharp*, a 22-m steel schooner built to navigate uncharted polar territory. There will be a base crew of 10, including rotating ocean science experts joining legs of the voyage, setting sail this summer for an extensive two-month mission in southern Greenland.

Seabed 2030 aims to map the entirety of the world's seafloor. Just under 80 percent of the Earth's seabed is yet to be mapped, including much of the coastline of the Greenland Ice Sheet. As the sea ice retreats, these coastal areas become accessible for bathymetric survey, and the data help to improve global climate models.

New Training Platform Competence Standard

DNV has awarded the Swedish maritime training platform Seably a new competence certification for its digital services. The DNV SeaSkill standard ST-0595 is the first of its kind and addresses the emergence of maritime training platform providers.

The standard's certification framework aims to ensure the quality of the training platforms, as well as their learning products and operation. It was developed in cooperation with Seably as a pilot customer.

New Jersey Certifies Clean Marinas

MarineMax locations Lake Hopatcong, Somers Point and Ship Bottom have been recognized by the New Jersey Department of Environment Protection as certified Clean Marinas. The New Jersey Clean Marina Program

program helps participants comply with state and federal regulations, avoiding costly citations and violations while helping the environment and wildlife.

Summit Fire & Security Acquisition

Fire Ranger, a South Florida distributor for Sea-Fire Marine fire detection and suppression systems, has been acquired by Summit Fire & Security. This positions Fire Ranger as a division of Summit, with new resources and infrastructure to expand marine business nationally, including applications for Sea-Fire products in currently unrepresented market segments.

ABS Awards First Autonomous Notation

A 32-m tug developed by Keppel Offshore & Marine (Keppel O&M) is the first to receive the ABS Autonomous Notation, following its ABS Remote-Control Navigation Notation. In the second phase of the project, the vessel performed autonomous collision detection and collision avoidance tasks while supervised by an onboard tug master. The project was one of a series of industry-leading initiatives to support the development of the ABS Guide for Autonomous and Remote-Control Functions.

Elastec Acquisition

Elastec has acquired Kepner Plastics. Kepner was founded in 1961 and broke into the oil spill response industry in 1968 after the invention of the SeaCurtain Boom. The international success of the SeaCurtain Boom enabled the creation of a large product portfolio.

Jaia Robotics Moves to Blue Tech Center

Jaia Robotics has opened a new facility at the Herreshoff Blue Tech Innovation Center in Rhode Island.

Jaia Robotics develops and manufactures micro-sized, high-speed, aquatic data collection robots called JaiaBots. JaiaBots can be operated individually or in multi-vehicle pods in depths of up to 100 m, in a wide variety of environments, including offshore, surf zones, estuaries, rivers and lakes.

JaiaBots represent a significant advancement in affordable robots supporting the big data needs of academia, commercial industry and government agencies, including the U.S. Department of Defense.

Veson Acquisition

Veson Nautical, a provider of maritime freight software worldwide, has acquired Q88, an information management and software platform for the maritime transportation industry. The acquisition will provide Veson's existing clients with a complementary software suite, the opportunity to benefit from a standardized approach to managing vessel specifications, and the capability to utilize Q88's products to provide compelling connectivity while powering decision making within the maritime shipping ecosystem.

Meanwhile, Q88 customers will see iterative and rapid development in existing product lines, as these solutions become more integrated with Veson's platform and current product offering. **ST**

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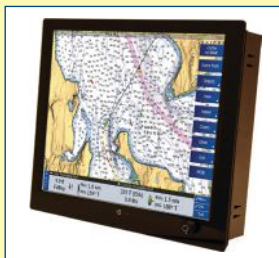
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Vessel Touchscreens



The Sunlight Readable Touchscreen (SRT) for bright outdoor and fly-bridge applications and the Pilot House Touchscreen (PHT) displays for interior installations have received ABS type approval. The two displays have the same size range and features but use different bonded displays with different levels of backlighting. Seatronx LLC.

Marine CO₂ Content Testing

Portalevel MAX PLUS MARINE is easy to use by simply displaying "LIQUID" or "GAS" on the screen when testing. It is light and portable and enables you to ensure the contents of your CO₂ systems while complying with IMO SOLAS FSS codes. It has three independent calibration modes and four power settings. Coltraco Ltd.

Sonar, Acoustic Solutions

Underwater defense solutions include: a sonar-based protection suite for ports, harbors and other offshore and inshore-based strategic assets; anti-submarine warfare (ASW), coastal domain awareness sonar (CDAS) systems that detect submarines and other submersible threats at a very long range; and wide- and medium-area coverage diver detection sonar (DDS) systems that autonomously and automatically inspect, detect, classify and alert on potential underwater threats, such as divers and vehicles. DSIT Solutions Ltd.

Cyberattack Protection

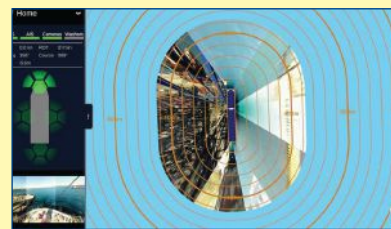
Designed for the demands of satellite connectivity, GTDeploy har-

nesses the power of the FastNet data transfer platform to optimize data streams between ship and shore. GTDeploy helps minimize your risk by enabling you to simply deploy software update patches to remote locations. GTMaritime.

Hull Design Support System

PrimeShip-HULL 2022 complies with the recent comprehensive revision of the Rules for the Survey and Construction of Steel Ships Part C, which stipulates requirements for hull structures. It provides extensive support for shipbuilding design, including enhanced automation and person-hour reduction capabilities. ClassNK.

360° Situational Awareness



Designed to significantly enhance marine safety, the Smart Panoramic Edge Camera System (S.P.E.C.S.) streams directly to the bridge in real time. The cameras provide a calibrated range grid around a vessel for precise measurement of distances. The system offers an augmented reality view by connecting to the navigation system to assist in identifying targets and potential hazards. Wärtsilä Voyage.

GNSS Antennas

eXtended Filtering (XF) has been added to the housed and embedded lightweight HC977XF (triple-band + L-Band); HC882XF (dual band + L-Band); and HC872XF (dual-band GPS and GLONASS + L-Band) precision helical GNSS antennas. XF mitigates interference from all near-band signals and ensures that the antenna provides the purest GNSS signals. Tallysman Wireless Inc.

SEA TECH e-NEWS

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Oyster Aquaculture Could Improve Potomac River Estuary

Oyster aquaculture in the Potomac River estuary could result in significant improvements to water quality, according to a new NOAA and U.S. Geological Survey study published in *Aquatic Geochemistry*. All of the nitrogen currently polluting the Potomac River estuary could be removed if 40 percent of its riverbed were used for shellfish cultivation, according to the joint study. [Read More](#)

Navy's Laser Weapon Ready For Summer Deployment

Navy engineers are making final adjustments to a laser weapon prototype that will be the first of its kind to deploy aboard a ship late this summer. The prototype, an improved version of the laser weapon system, will be installed on the USS Zumwalt (DDG 1000) in the Persian Gulf. Navy leaders have made direct attacks on weapons a top priority to counter what they call asymmetric threats, including unmanned and light aircraft and small attack boats that could be used to deny U.S. forces access to certain areas. [Read More](#)

Ferry Sinks Off Coast of South Korea

With 422 passengers onboard, a ferry sailing from Incheon, South Korea, to the island Jiu sank near the southern tip of South Korea Wednesday. Most of the more than 100 people on the ship were high school students headed for a school trip to the island. In the rescue effort, more than 90 vessels and at least 10 aircraft sought to pull passengers from the water to safety. [Read More](#)

Pay Increase for Sailors Soon to Come

Sailors working for the U.S. Navy could see a faster paycheck in the coming weeks, reported the Virginia Pilot. On May 1, sailors serving the Virginia class will receive a pay raise. The increase in pay comes as an effort by the Navy to recruit and retain sailors. The Navy has increased the pay of sailors in the past, but the latest is a part of a pay raise to those who work in jobs involving long deployments. Currently, the spend is between \$40 and \$700 dollars. [Read More](#)

US Senate Reviews DOE Budget Request

For fiscal year 2015, the Department of Energy (DOE) requested \$27.5 billion. The U.S. Senate Appropriations Committee, Subcommittee on Energy and Water Development, held a hearing last week to review the funding request and discuss financial priorities. According to Lamar Alexander (R-Tenn.), research should be a focus of spending. [Read More](#)

US Technology Helps in Search for Flight 370

More than a month after Malaysia Airlines Flight 370 went missing, crews are hard at work trying to uncover what happened to the Boeing 777. Acoustic signals emitted from the plane's black box, which houses records from the flight, provide a lead to the location of the plane, and eight countries are participating in the effort to scan the waters off the coast of Northwest Australia. Crews believe from Hawaii the U.S. Navy is helping in the search. [Read More](#)

2014 Sea Technology Buyers Guide Now Available

Published annually by Compas Publications, the 2014 edition of the *Sea Technology Buyers Guide* is now available. The *Buyers Guide* features a market analysis and seven sub-directories, including industrial firms, services, federal government organizations, educational institutions, oceanographic research vessels and geophysical survey vessels.

Featuring the government and industry news you need to know, *Sea Tech e-News* delivers timely information straight to your inbox, with details on recent product releases, updates on new hires and promotion, and workshops. We send out the newsletter every other week, so you'll get a steady stream of news edited down to what matters most.

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GNSS Receivers



AsteRx-U3 Marine and AsteRx-m3 Fg offer accurate positioning near and offshore via centimeter-level RTK or the built-in Fugro PPP subdecimeter subscription service, delivered over NTRIP internet or L-band satellite. Corrections delivered over L-band allow dredging, bathymetry or marine construction projects even where there is no internet service. The AsteRx-U3 Marine receiver offers a dedicated L-Band demodulator with a separate L-Band RF input for high latitudes. Septentrio N.V.

Vessel CO₂ Measurement

CARBON LENS continuously analyzes and records the flow of emitted CO₂ from each stack of a vessel, taking into account its temperature and exhaust pressure. The data are then livestreamed from the vessel to designated recipients ashore. The system has been awarded type approval by the Korean Register. Marine Technology Solution Pte Ltd.

Navigation, Piloting Aid

SafePilot CAT PRO is a completely independent portable pilot unit (PPU) designed to overcome the

limitations of AIS and Wi-Fi range. The solution comprises SafePilot software and the SafePilot CAT PRO PPU. Applications include piloting in narrow channels and confined waters. Trelleborg AB.

Electric Inboard

H-100 is an innovative 100-kW inboard motor that is engineered for larger sailing boats and motor vessels 60 to 100 ft. It has a full displacement up to 200 tons. The motor delivers high performance with less noise, fewer vibrations and zero exhaust fumes. The drive system can go straight to the propeller, stern drive, sail drive or azimuth thruster. ePropulsion.

Electro-Hydrogen Power

A turnkey power generator for the supply of low-carbon electricity on board ships, the BV-approved REXH2 has a hydrogen PEM fuel cell at its heart that makes it possible to meet energy needs ranging from 70 kW to about 1 MW when several REXH2s are installed in parallel. EODev (Energy Observer Developments).

Hull Service Robot

HSR is man-portable, weighing under 66 lb. (30 kg), with a length of 34 in. (86 cm). It enables proactive in-water cleaning to be a viable solution for fuel saving and optimized ship performance. Armach Robotics Inc.

Bycatch Prevention

Ropeless Fishing Gear is an add-on that adapts to existing fishing traps and pots while honoring traditional methods. Tautline Fishing Gear is an industry-first tautline buoy system built to keep fishing lines tight in the water. Symphony of Science/SOS Foundation.

Local Navigation Warnings

The following data have been added to the CIO+ Navigational Warnings Database: Greek warnings, Turkish warnings, MENAS (Middle East Navigation Aids Service), Northern Sea Route West and East, and Chinese warnings from 33 coastal administrations of China MSA. Chart-World GmbH.

Fuel Monitoring

3130 NMEA2000 Fuel Sender to Resistive Output Adaptor connects to Volvo and other engine ECU tank level inputs. It simply connects from the NMEA2000 network to the resistive input connection on the engine ECU and removes the need for multiple senders in a fuel tank. Oceanic Systems (UK) Ltd.

Digital Tug Line Management

ICARIA for Workboat has an inspection app to ease usage and condition data collection; online portal CONNECT for trend and data analysis; and online CLASSROOM to build crew competencies. Samson Rope Technologies. **ST**

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New Director of BSEE Gulf of Mexico Region

The U.S. Bureau of Safety and Environmental Enforcement (BSEE) has selected Bryan Domangue as the new director of BSEE's Gulf of Mexico Region.

Domangue has oversight responsibilities for about 1,709 production platforms, as well as drilling rig activity that occurs in federal waters in the Gulf of Mexico. He leads a staff of 415, which includes petroleum engineers, structural engineers, geologists, geophysicists, environmental scientists and administrative staff.

He began his career with BSEE in 1997 and has more than 30 years of experience in the oil and gas industry. He has served as the deputy regional director for Districts, Investigations, Environmental and Enforcement; as senior technical adviser for the BSEE Gulf of Mexico Region; and as the acting chief of the National Offshore Training Center. Domangue also previously served as office supervisor for Regional Operations and as district manager for the Houma District Office of the BSEE Gulf of Mexico Outer Continental Shelf Region. He holds a B.S. degree in petroleum engineering from Louisiana State University.

Possible Offshore Wind Leasing In Oregon and Central Atlantic

The U.S. Department of the Interior has published in the Federal Register two separate calls for information and nominations for possible offshore wind leasing areas in Oregon and the Central Atlantic.

The National Ocean Industries Association (NOIA) has welcomed the news: "The more offshore wind leases and the greater the geographical diversity of new American offshore wind projects, the greater the benefits will be to the national supply chain," said NOIA President Erik Milito. "Offshore wind is a national endeavor that benefits communities, through new jobs and investments, far beyond the states immediately onshore from lease areas."

A 10-year moratorium has begun on offshore wind leasing from North Carolina through the Eastern Gulf of Mexico. NOIA advocates legislation to revoke the ban.

Milito said the announcement is much needed for industry: "The calls for information and nominations for the Central Atlantic, which potentially includes areas offshore North Carolina, underscores the need for an immediate legislative fix that rescinds the upcoming prohibition on new offshore wind lease sales."

\$6.2 Million in Funding for Species Recovery

NOAA Fisheries is proposing 12 new projects and the continuation of 13 multi-year projects under the Species Recovery Grants Program, with up to \$6.2 million in new funding. The program supports management, research, monitoring and outreach activities that have direct conservation benefits for endangered species.

Up to \$3.6 million in funding for new awards are proposed for projects in Alaska, California, Delaware, Geor-

gia, Hawaii, Florida, Maryland, Oregon, Puerto Rico and to the Makah Tribe. Additionally, up to \$2.6 million in funding will continue to support 13 existing projects approved through prior grant cycles.

This year's recommended projects support state and tribal partners in a range of activities, such as: assessing and monitoring endangered and threatened species, including evaluating abundance, spawning and foraging behaviors; collecting demographic and genetic information to improve understanding of population distribution, habitat use and impacts from human threats; assessing the impacts of climate change on species' predator-prey interactions and population distribution, abundance, and recovery; improving captive reproduction, health and survival of endangered species; assisting with animal stranding responses; assessing threats of specific prey populations to the diet of endangered species; and engaging the public in conservation of Endangered Species Act-listed species.

BOEM Finds No Significant Impact from Offshore Wind Energy Leasing in Humboldt WEA

The U.S. Bureau of Ocean Energy Management (BOEM) has completed its environmental review of potential impacts from offshore wind energy leasing activities in the Humboldt Wind Energy Area (WEA), located 20 mi. offshore northern California and has issued a finding of no significant impact.

BOEM's environmental assessment (EA) considers potential impacts from the issuance of leases within the WEA that comprises nearly 132,369 acres (206.8 sq. mi.) off the coast of Humboldt County, California. The Humboldt WEA, if developed, could bring up to 1.6 GW of clean energy to the grid, enough to power approximately 560,000 homes.

The EA considers potential environmental consequences of site characterization activities (i.e., biological, archeological, geological and geophysical surveys and core samples) and site assessment activities (i.e., installation of meteorological buoys). The EA also considers project easements associated with each potential lease and related right-of-way grants for subsea cable corridors in the Humboldt WEA.

Should a lease sale occur, and before approving the construction of any offshore wind energy facility in the Humboldt WEA, BOEM will develop an environmental impact statement to analyze the project-specific environmental and socioeconomic consequences.

Producer Responsibility Bill for Plastics

Colorado's state legislature has passed a bill that would establish extended producer responsibility (EPR) for plastic and packaging materials. The legislation would hold producers of packaging financially responsible for their recycling; incentivize a reduction in the amount of materials used; ensure that the recycling system receives the funding and investment it needs; and prevent plastic pollution. The bill is now at the governor's office.

Colorado is third state in the U.S. to pass a packaging EPR bill, after Oregon and Maine. **ST**

NRL, BSEE Demonstrate New Oil Spill Tech

To inform oil spill responders about new technologies available to address oil spills, the U.S. Bureau of Safety and Environmental Enforcement (BSEE) and the U.S. Naval Research Laboratory (NRL) hosted an outdoor demonstration of the Low-Emission Spray Crude Oil Combustor technology, also known as the "BSEE Burner," at NRL's testing facility in Chesapeake Beach, Maryland, earlier this year.

Developed in partnership with NRL over seven years, the BSEE Burner technology cleanly burns large volumes of emulsified oil from spills that occur in remote areas where storage facilities may not be available, or where transporting the recovered oil is cost prohibitive.

Environmental Protection Agency emission tests revealed that the burner performs well, with a combustion efficiency of 99.9 percent. Carbon monoxide concentrations were at almost undetectable levels, and low-soot emissions yielded no visible smoke plume.

JFD to Assess Ship Suitability for Sub Rescue

JFD, part of James Fisher and Sons plc, was awarded a contract by Navantia to conduct a ship survey and suitability assessment of the Spanish Navy's new Submarine Rescue Mothership (BAM-IS).

Navantia, the Spanish state-owned military shipbuilding company, is in the process of completing the preliminary design for the BAM-IS. The new Mothership (MO-SHIP) will replace the Spanish Navy's existing vessel, which is not adapted to host submarine rescue systems.

Slovenian Navy Chooses RTsys AUVs for MCM

RTsys has secured a contract with the Slovenian Navy for the supply of one COMET-MCM AUV and two NEMOSENS micro-AUVs to be added to the existing range using RTsys SONADIVE hand-held sonar units, enabling Slovenia's Explosive Ordnance Disposal Diving Department to have full capabilities for mine countermeasures (MCM) from very shallow water to 300-m depth.

The COMET-MCM is designed to quickly and efficiently cover large underwater areas with both high-definition sonar imaging and TV camera capabilities with real-time tracking and positioning. The NEMOSENS man-portable and modular vehicle also offers live tracking and high-accuracy positioning, for operation in very shallow water (less than 5 m).

Preliminary Design for Submarine Tender

L3Harris Technologies is one of three companies selected to provide preliminary designs for the next-generation submarine tender, a support vessel that will provide expeditionary maintenance and repairs for U.S. Navy submarines. L3Harris will support the development of the AS(X) ship specifications, interface specifications, ship cost estimates and construction schedules under the base AS(X) concept refinement and preliminary design contract. The nine-month study includes options for

an additional nine-month update and an overarching 36-month period for special studies.

More LAUVs for Danish Navy

The Danish Navy has taken a second delivery of OCEANSCAN-MST lightweight AUVs (LAUVs) as part of a framework agreement. These LAUVs will be part of a larger fleet for mine-hunting applications.

Previously delivered LAUV units are now performing regular operations for the Danish Navy MCM team. The second delivery of LAUVs has similar payload configuration, comprising a dual-frequency, high-resolution side scan sonar from KLEIN; an inertial navigation system from iXblue; a Doppler velocity log from Nortek; and multiple communication capabilities at surface and underwater. An upcoming delivery will include an LAUV unit equipped with a Voyis imaging system for mine identification and bottom photogrammetry.

GA-EMS to Assess Submarine Propulsor Bearings

General Atomics Electromagnetic Systems (GA-EMS) has been awarded a task order from U.S. Naval Surface Warfare Center, Carderock Division to conduct a manufacturing assessment of new propulsor bearing concept designs.

A comparative analysis of the selected designs will be conducted for submarine propulsors. **ST**

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Production Begins at PowerNap in US GOM

Shell Offshore Inc., a subsidiary of Shell plc, has started production at PowerNap, a subsea development in the U.S. Gulf of Mexico (GOM) with an estimated peak production of 20,000 barrels of oil equivalent per day (boe/d). PowerNap is a tie-back to the Shell-operated Olympus production hub in the prolific Mars Corridor. Shell has been producing in the Mars Corridor for more than 25 years. PowerNap strengthens a core upstream position.

Shell is the leading deepwater operator in the U.S. Gulf of Mexico, where its production is among the lowest greenhouse gas (GHG) intensity in the world for producing oil, the company said. Shell's global deepwater portfolio represents two core positions in the upstream business, with prolific basins in the U.S.

and Brazil, along with a frontier exploration portfolio in Mexico, Suriname, Argentina and West Africa.

Workboat Simulation For North Sea Operator

Workboat pilots from offshore-access specialist Tidal Transit have become the first expert end-users to experience Artemis Technologies' marine workboat simulator as part of a joint project to develop the world's first 24-passenger, high-speed, zero-emission crew transfer vessel (CTV).

The North Sea operator has linked with Artemis Technologies, based in Belfast, for the venture that is backed by the U.K. government's Clean Maritime Demonstration Competition, funded by the Department for Transport. The initiative seeks to demonstrate the transformative power of the revolutionary Artemis eFoil electric propulsion

system to eliminate carbon emissions in global CTV operations.

The Tidal Transit visit to Artemis Technologies' new research, design and manufacturing facility in Belfast came as the Artemis team prepares to bring to market the world's first commercially viable, zero-emissions 11-m workboat. The simulator allows multiple scenarios to be tested, such as wind and sea state, and enables the pilots to virtually experience an e-foiling workboat.

The Artemis eFoiler integrates a high-power-density electric drivetrain into an autonomously controlled hydrofoil, combining proven technologies from yacht racing, motorsport and the aerospace industry.

The Clean Maritime Demonstration Competition is part of a plan for a green industrial revolution that builds on the vision set out in the Department for Transport's Clean Maritime Plan 2019. It has allocated up to £23,259,000 match-funding to U.K. innovators to support the design and development of

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zero-emission vessel technologies and greener ports through a series of technology trials and feasibility studies.

Expanded Joint Venture to Develop Bayou Bend CCS

Chevron U.S.A. Inc., through its Chevron New Energies division, Talos Energy Inc., through its Talos Low Carbon Solutions division, and Carbonvert Inc. have closed on an expanded joint venture to develop the Bayou Bend CCS offshore carbon capture and sequestration hub that had been held by Talos and Carbonvert.

In 2021, a joint venture between Talos and Carbonvert, now known as Bayou Bend CCS, was the winning bidder for the Texas General Land Office's Jefferson County, Texas, carbon storage lease, located in state waters offshore Beaumont and Port Arthur, Texas.

The Bayou Bend CCS project site encompasses over 40,000 gross acres and, based on Talos and Carbonvert's preliminary estimates, could potentially sequester 225 to 275 million metric tons of carbon dioxide from industrial sources in the area. The Bayou Bend CCS lease is the first and only offshore lease in the United States dedicated to CO₂ sequestration.

Upon closing, equity interests in the joint venture now comprise 25 percent Talos, 25 percent Carbonvert and 50 percent Chevron, and Talos remains the operator.

Floating Wind Pilot Farm in French Mediterranean Sea

BOURBON will contribute to the construction of the Eolmed project, a key pilot farm of three floaters each fitted with 10-MW turbines to be installed by mid-2024. BOURBON's scope of work will comprise the complete farm offshore installation, including the detailed design, procurement and fabrication of the floating electrical hub, interarray cables, and anchoring and mooring systems.

Since 2011, BOURBON has installed most of the floating wind turbine prototypes around the world (in Portugal, France, Scotland, Nor-

way, etc.), including the first European pre-industrial floating wind farm, Windfloat Atlantic, completed in 2020 offshore Portugal.

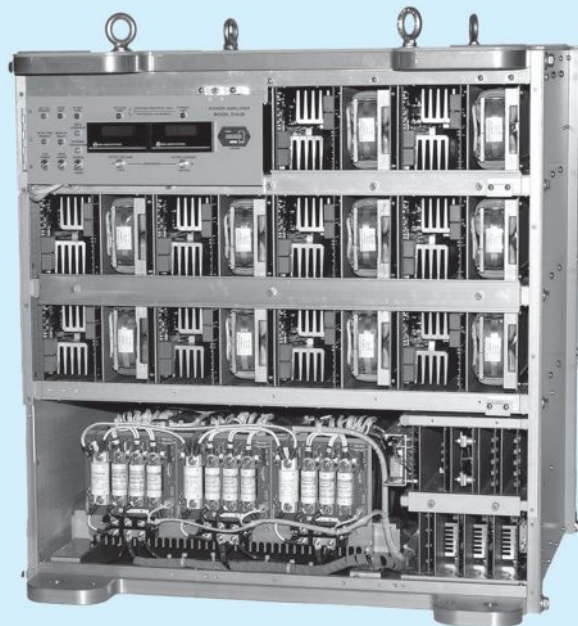
DLM Upgrades Offshore Cable-Laying Hire Fleet

Dynamic Load Monitoring (UK) Ltd. (DLM), of Southampton, U.K., has expanded its hire fleet for pre-lay grapnel run and route clearance operations as the renewable energy

and telecommunications sectors prepare for their busiest period of the year offshore. The additions include two acoustic release hooks and a detrenching grapnel with a 1.8-m fluke, a prong-shaped tool for seabed penetration. The entire product range will transition to TW-3.0 (third-generation) technology over the next several months to coincide with improved Northern Hemisphere weather conditions. **ST**

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environmental monitoring

AZFP6-ice for Ice, Biology, Risk Management Research

A prototype of ASL Environmental Sciences' AZFP6-ice was deployed in the coastal waters approximately 40 km east of the town of Nain, Labrador, an area used for indigenous traditional hunting and fishing. This deployment was carried out by ASL in collaboration with the Inuit Nunatsiavut government in October 2021 and will be recovered in the fall of 2022.

The AZFP6-ice combines the technology of the Ice Profiling Sonar (IPS) with its ability to detect ice draft along with the calibrated Acoustic Zooplankton Fish Profiler (AZFP) echosounder to examine zooplankton, fish, bubbles and suspended sediments in the water column.

The upgraded IPS component used in this unit includes a logarithmic detector to prevent signal saturation of strong targets while providing information on weak targets. This revised version of the IPS is referred to as the Log IPS.

The AZFP6-ice at this site will be used to better understand the impact of climate change on the ice and biology of the region. A notable ocean-ice feature in this region is year-round ice-free areas, locally referred to as rattles or polynya. These year-round ice-free areas are considered biologically rich. Placement of the mooring this year was downstream from a known rattle location in order to provide insights into the biological activity and ice dynamics there.

The results from a Log IPS deployed approximately 500 m away, as well as two previous years of IPS data collected in this location, will provide a useful comparison with the new AZFP6-ice data, along with the now added benefits of the bio-acoustics echosounders.

Log IPS data from a previous deployment from 2020/2021 revealed a dynamic environment, with some days exhibiting a full range of open water, waves, flat level ice and moderately sized keels measuring up to

13-m drafts. With this year's deployment of the AZFP6-ice, further insight will shed light on this dynamic region and provide useful information to help manage the risks associated for those that traverse this area.

Oceaneering's First Climate Change Report

Oceaneering International Inc. has released its first climate change report, aligning with the framework developed by the Task Force on Climate-related Financial Disclosures (TCFD). It includes analysis and progress updates across each of the four TCFD pillars: governance, strategy, risk management, and metrics and targets.

The TCFD framework provides a widely accepted methodology that increases transparency in connection with Oceaneering's climate risk reporting and plan to limit the environmental impacts of its businesses and customers in the offshore energy, defense, aerospace, manufacturing and entertainment industries.

Seafloor Spreading Has Slowed

A new global analysis of the last 19 million years of seafloor spreading rates found they have been slowing down by as much as 40 percent.

New oceanic crust forms continuously along rifts thousands of miles long on the seafloor, driven by plate tectonics. As subduction pulls old crust down, rifts open up like fissures in an effusive volcano, drawing hot crust toward the surface. Once at the surface, the crust begins to cool and gets pushed away from the rift, replaced by hotter, younger crust.

This cycle is called seafloor spreading, and its rate shapes many global processes, including sea level and the carbon cycle. Faster rates tend to cause more volcanic activity, which releases greenhouse gases, so deciphering spreading rates helps contextualize long-term changes in the atmosphere.

Today, spreading rates top out around 140 mm per year, but peaked around 200 mm per year just 15

million years ago in some places, according to the new study, published in the AGU journal *Geophysical Research Letters*. The study examined 18 ridges, but took a particularly close look at the eastern Pacific, home to some of the world's fastest spreading ridges. Because these slowed greatly, some by nearly 100 mm per year slower compared to 19 million years ago, they dragged down the world's average spreading rates.

It's a complex problem to solve, made more difficult by the seafloor's slow and steady self-destruction in subduction zones. The cycle of seafloor creation and destruction takes about every 180 million years, the age of the oldest seafloor.

The driver of slowing growth might be located at subduction zones rather than spreading ridges. For example, as the Andes grow along the western edge of the South American continent, the mountains push down on the crust.

But this added friction can't be the only driver of the slowdown, because slowing rates were found globally and mountain growth is regional. Larger-scale processes, such as changes in mantle convection, could also be playing a role. Absolute plate speeds, rather than the relative speeds used in this study, can help determine the cause of the slowdown.

OSIL Buoys Monitor Dredging For Baltic Pipe Project

OSIL has provided a number of lightweight repositionable environmental monitoring buoys to DHI A/S for the Baltic Pipe Project.

Dredging activities are vital to the successful outcome of the project, and OSIL has produced a total of 17 0.6-m buoys for DHI A/S, a number of which have been in continual use monitoring the turbidity levels and other environmental conditions around the active dredging sites. The buoys on this project have been repositioned to follow the dredger movements and debris plume on an almost daily basis.

More than 500 OSIL data buoy systems are installed worldwide in dredge monitoring networks. **ST**

Kongsberg Digital Acquisition

Kongsberg Digital (KDI) has acquired Interconsult Bulgaria Ltd. (ICB), a software developer and supplier of process modeling, software architecture design, quality assurance, and 3D modeling and design.

Kongsberg Digital is experiencing significant commercial traction across its three digital divisions: Digital Energy, Digital Wells and Digital Ocean. To support the roll-out of digital positions in energy and maritime and to support the growth into renewables, KDI is ramping up development capacity.

ICB will serve as KDI's European development hub for software development to attract and develop key talent to deliver into existing projects and support KDI's vision to accelerate the green shift by digitalizing the world's industries. ICB has proven solid delivery and highly skilled developers through its relationship with Kongsberg Group since 2004, supporting a range of products.

Connectivity for Digitalization Of Shipping Industry

Inmarsat's Fleet Xpress Enhanced solution provides access to a wider portfolio of Inmarsat's connectivity products through the Fleet Edge platform and is futureproof for seamless integration to Inmarsat's ORCHESTRA network. ORCHESTRA is a "network of networks" to help meet future maritime connectivity needs, drawing on Global Xpress (Ka-band), ELERA (L-band), terrestrial 5G and low Earth orbit (LEO) network capacity.

The modular offering enables flexibility to consolidate and scale IT requirements with a combination of satellite connectivity solutions and takes place over a trusted endpoint security network. This connectivity supports everything from email and basic office applications to the latest IoT-powered solutions.

The Fleet Edge platform allows Inmarsat partners to integrate their value-added services and host applications. By seamlessly con-

necting onboard IoT sensors to the cloud, shipping companies can select the right combination of global connectivity solutions from Inmarsat or Inmarsat partners to enable crew welfare and safety while ensuring efficient operations in any weather conditions.

Customers need guaranteed seamless global coverage for fast and secure data transfer, especially at the busy ports, straits and shipping canals where reliable connectivity matters most. The Fleet Xpress solution operates as a fully managed service, powered by Inmarsat's Ka-band network, enabling customers to increase their bandwidth as their digital ecosystem evolves.

Natural Fiber Composite Wind Turbine Blade

Collier Aerospace Corp. has launched its new HyperX structural analysis and design software, which has been demonstrated in a real-world application in sizing a 7.4-m natural fiber composite wind turbine blade.

The blade's development was a collaboration between the Department of Naval Architecture and Ocean Engineering at Hongik University in South Korea and Samwon Millennia Inc., a software reseller. The aim was to evaluate the viability of replacing E-glass fiber with natural plant-based flax fiber reinforcement to reduce the environmental impact of end-of-life blades.

Collier Aerospace used HyperX software to define materials, ply layouts and determine dimensions to help ensure the blade met all performance requirements. The new software was used throughout the blade's structural design stages, including laminate stacking sequences, ply boundaries and layup stacking order.

As a result of wind turbine blades being difficult to recycle commercially, various groups are studying methods to dispose of end-of-life blades in a more environmentally benign manner than landfilling, or to recapture material for reuse in

subsequent applications. Another approach, and the one taken in the Korean study, is to reduce the environmental impact at the start of the design process by opting to use natural fiber reinforcements rather than carbon or glass fibers. Natural fibers are far less energy intensive to grow, harvest and clean than the production of carbon or glass fibers. Since they are derived from living plants, natural fibers sequester carbon dioxide and nitrogen during their growing cycle and then keep those gases locked up in plant tissue during their use as a composite reinforcement.

The final blade design uses a hybrid of natural fiber and E-glass reinforcement. It is slightly heavier (7.4 percent) than the original glass-fiber-reinforced blade, but that additional weight was deemed technically tolerable to gain the environmental benefits of using natural fibers. Currently, the wind blades are being produced using vacuum-assisted resin infusion molding.

Corvus Opens US Factory To Meet Battery Demand

Corvus Energy, a supplier of battery energy storage systems (BESS) for marine applications, is expanding its U.S. operations by opening a new factory in the state of Washington, just north of Seattle.

The manufacturing facility, with 200 MWh of annual stored energy capacity, will support demand for marine BESS in the Americas as the marine industry accelerates its adoption of decarbonization technology to meet global greenhouse gas emissions reduction targets. The new factory will be located in the Port of Bellingham.

Forecasts predict an \$800 million market for maritime energy storage systems in 2030.

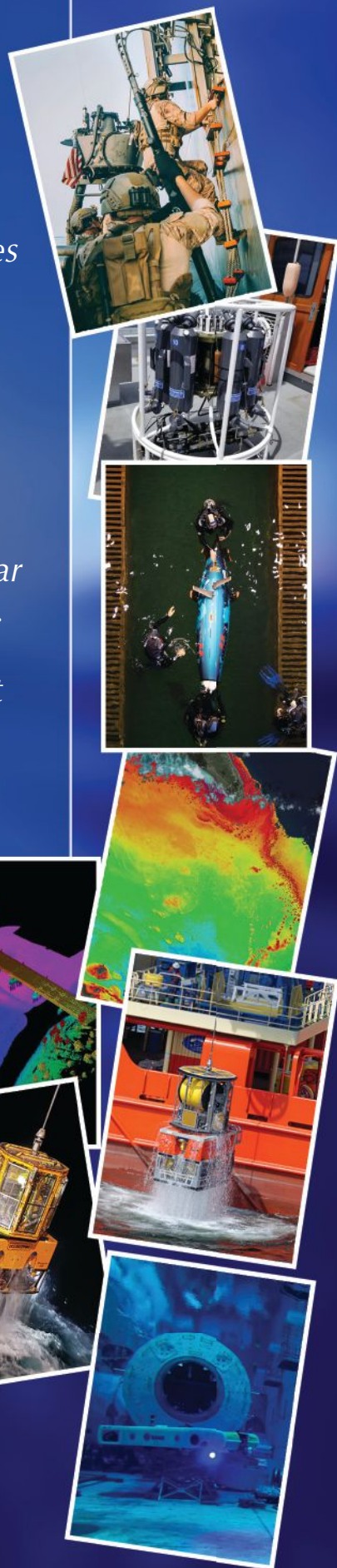
Corvus expects continued strong growth in offshore wind and oil and gas support vessels, tugs and workboats, Ro-Pax and Ro-Ro ferries, tour boats and passenger ferries, and coastal and inland cargo vessels. Its new battery factory in the U.S. will meet demand for hybrid and zero-emission vessels in these sectors. **ST**

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contracts

Kongsberg Digital (KDI), Kongsberg, Norway, will provide its vessel-to-cloud infrastructure, Vessel Insight, to over 100 vessels for a large industrial shipowner in the tanker segment. Undisclosed.

DEME Offshore US, Boston, Massachusetts, has entered into a long-term agreement to jointly develop motion compensation technology for a pioneering feeder concept on the Vineyard Wind 1 project, the first commercial-scale offshore wind farm in the U.S. Barge Master.

Speedcast, Aberdeen, U.K., has been selected to continue providing services for its global fleet via a three-year contract. Speedcast will deliver the latest connectivity solutions to best serve a deepwater drilling fleet in operation across the Gulf of Mexico, Brazil, North Sea and African coast regions. Seadrill.

DNV, London, U.K., has been selected to support the decarbonization initiatives of the producers of 40 percent of the world's oil and gas. International Association of Oil & Gas Producers.

Strohm, IJmuiden, Netherlands, the world's first manufacturer of fully bonded, thermoplastic composite pipe, has signed a memorandum of understanding with a French renewable hydrogen supplier to develop solutions for hydrogen transport onshore and offshore. Initial plans entail launch of the first floating wind turbine to be integrated with a hydrogen production system. Lhyfe.

NAVTOR, Egersund, Norway, will integrate the Automated Mutual Assistance Vessel Rescue (AMVER) System into the digital chart table software NavStation to simplify the life-saving initiative. AMVER is a constantly evolving safety net for ships in distress. U.S. Coast Guard.

Woolpert, Wasilla, Alaska, will process and delineate elevation-derived hydrography (EDH) from Li-

DAR data collected in Oregon and IfSAR data collected in Alaska. The high-resolution EDH data developed under these two task orders will be used to update the National Hydrography Dataset, which represents the U.S. surface water network. U.S. Geological Survey. **ST**

meetings

Note: The coronavirus (COVID-19) pandemic could affect event dates. Check event websites for the latest updates.

AUGUST

August 4-5—Oil Spill India, New Delhi, India. www.oilspillindia.org.

August 23-24—CLEAN PACIFIC, Renton, Washington. www.cleanpacific.org.

SEPTEMBER

September 6-9—SMM, Hamburg, Germany. www.smm-hamburg.com/en.

September 13-14—Antifouling Conference, Gothenburg, Sweden. <https://innovatum.confetti.events/antifouling-conference-2022>.

September 18-23—International Marine Debris Conference, Busan, South Korea. www.7imdc.org.

September 19-22—Moored Systems for the Future Buoy Workshop, Wilmington, North Carolina. <https://mtsociety.memberclicks.net/buoy-workshop>.

September 20-22—Fleet Maintenance & Modernization Symposium, Virginia Beach, Virginia. 703-836-6727 or www.navalengineers.org/Symposia/FMMS2022.

September 26-29—SNAME Maritime Convention, Houston, Texas. www.sname.org/smc-2022-general-information.

September 27-28—Teledyne Marine Workshop – Tech on the Lakes, Traverse City, Michigan. [\[dynamarine.com/events/TeledyneMarineWorkshop-Tech-on-Lakes\]\(http://dynamarine.com/events/TeledyneMarineWorkshop-Tech-on-Lakes\).](http://www.tele-</p></div><div data-bbox=)

OCTOBER

October 3-7—National Marine Electronics Association (NMEA) Conference, Anaheim, California. 410-975-9425 or www.nmea.org.

October 9-12—Maritime Cyprus, Limassol, Cyprus. <https://maritimecyprus.dms.gov.cy>.

October 16-19—AAPA Annual Convention & Expo, Orlando, Florida. <https://my.aapa-ports.org/AC2022/Home/AC2022/Home.aspx>.

October 17-18—Sustainable Ocean Summit, Barcelona, Spain. www.sustainableoceansummit.org.

October 17-21—OCEANS 2022 Hampton Roads, Hampton Roads, Virginia. hamptonroads22.oceansconference.org.

October 18-20—International Ocean Conference on Ocean Energy and Ocean Energy Europe, Donostia/San Sebastián, Spain. <https://icoeoe2022donostia.org>.

October 18-21—EURONAVAL, Paris-Le Bourget, France. euronaval.fr.

NOVEMBER

November 2-4—MAST Med 2022, Athens, Greece. <https://mastconfex.com>.

November 8-10—CLEAN GULF, New Orleans, Louisiana. www.cleangulf.org.

November 17-19—Pacific Marine Expo, Seattle, Washington. www.PacificMarineExpo.com.

November 22-24—Marine Renewables Canada Conference, Halifax, Canada. <https://marinerenewables.ca/event/marine-renewables-canada-2022-annual-conference>.

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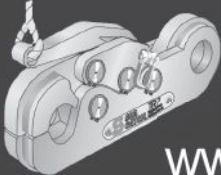
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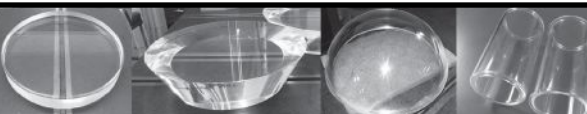
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We Need to Encourage More Women in STEM Careers—Dr. Lorraine Gray

With 20 years of experience in marine management, Dr. Lorraine Gray is an expert in marine planning and licensing. In her current role at Pioneer Consulting, she leads permitting in the U.S. and Europe. Gray has previously worked on pioneering marine spatial planning projects, including incorporating local fishing knowledge in Scotland and the development of the Marine (Scotland) Act.



A career in the science, technology, engineering and mathematics (STEM) fields unlocks a fascinating and exciting world of possibilities. But for many women, entering a STEM profession can be fraught with obstacles.

I first began my journey as a woman in STEM by earning my Ph.D. in fish ecology. I was a home-carer at the time. Twenty years ago, this was seen as a woman's role, and to some extent it still is, as uncompensated labor and maternity/paternity inequality continue to be issues. I did not speak about my struggles to balance my home responsibilities with my duties at work to my superiors; I was concerned it would be seen as weakness, and I would be treated differently.

Now that I have over 20 years of marine management experience, I know how crucial female representation is in traditionally male-dominated industries. If I'd been open about my needs at work, I hope I could have received support.

By supporting and advocating for more women to become involved in STEM careers, the resulting greater diversity will benefit industry and society. I'd like to address some of the obstacles I've observed that we in STEM industries will need to tackle in order to welcome more women to our ranks.

Job security is one of the greatest obstacles facing women in STEM

careers, due to domestic responsibilities. After earning my Ph.D., I worked for 10 years in academia and for government. Only when I entered industry afterward did I observe a higher proportion of women were employed in academia and government because there is better safeguarding of your position, especially regarding maternity leave (in the U.K., it is common to take one year off). Unfortunately, in industry, I've met women who had their jobs downgraded when they returned from leave. It's a real problem that affects women's career choices.

Another challenge is lack of affordable childcare (speaking from a U.K. perspective). About a decade ago, I faced a choice while caring for two small children. I questioned whether to continue working in government, where most of my salary would go to childcare, or start my own contracting company to enable flexible work hours so I could take care of my children. I went for the latter, arguably riskier option and found myself working a schedule outside of the normal 9 to 5. But there was freedom in the nontraditional route. For the past several years, I've worked in the subsea cables industry—first in the government sector, issuing licenses for survey and installation, then with Pioneer Consulting, where I lead the transatlantic and Europe permitting team. Career independence has enabled me to pursue my passion while still spending time with my family, but it does require out-of-the-box thinking.

Lack of confidence and mentorship remain challenges for women in STEM, which is why it's important for female role models to be visible in their positions. Without proper representation, it is much harder for young women to envision themselves in certain jobs, or even be aware that certain careers exist.

Seeing a woman's achievements, especially on social media, could

inspire young people to get involved in STEM. Companies should publicize the achievements of their female employees and get the word out about what's possible for women in the field.

When faced with an obstacle, it is crucial to be confident and honest in expressing your concerns. It is not a weakness to speak up, as I once may have thought. You may find that you receive support and encouragement from your colleagues. You'll also forge a path for other women at your company and make others feel less alone.

And I cannot say this enough: Finding a mentor, whether a family member, colleague or friend, will go a long way. Look for someone you admire, and don't be shy about initiating the mentorship.

My time as a lecturer intensified my passion for getting young, hard-done-by kids and mature students to return to education in order to move into STEM careers. I wanted to share my passion for the natural world with them.

Empowerment is a critical element of gender equity, and I always told my post-graduate students after completing their thesis: "You are the expert now." This was said to me, and it resonated. However, I still had hang-ups about being a lecturer. I sometimes worried I didn't know enough; imposter syndrome is common, especially among women. But I had confidence anyway, a tactic I learned from my mentors.

In all settings, diverse teams bring different points of view. This improves collaboration and sparks innovation. I hope, with time, gender inequalities in the workplace will diminish. Any industry that lacks the input of half of the population is missing out.

It's important for the advancement of science and technology that women are encouraged and supported to bring their unique talents to the table. **ST**

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