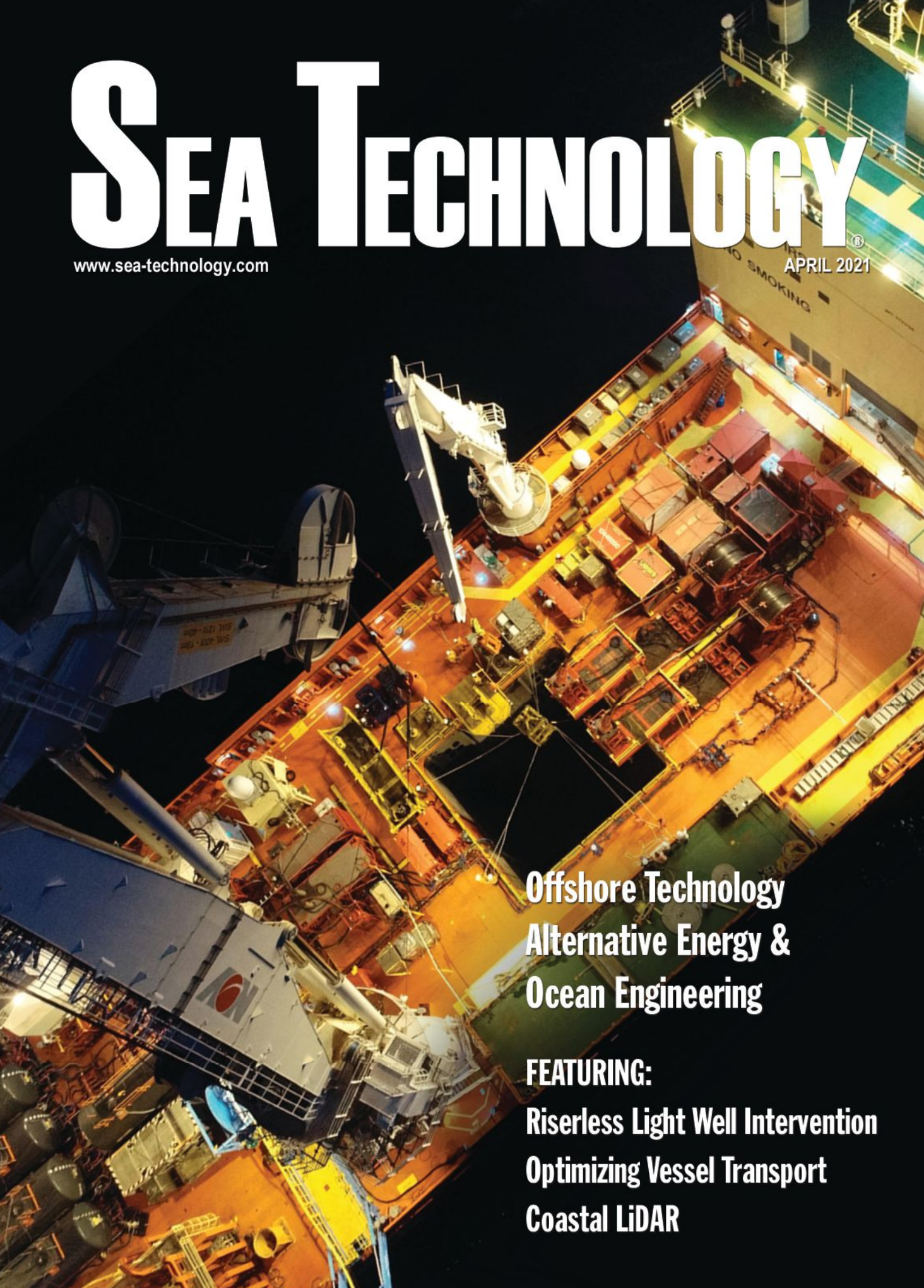


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2021

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AUGUST

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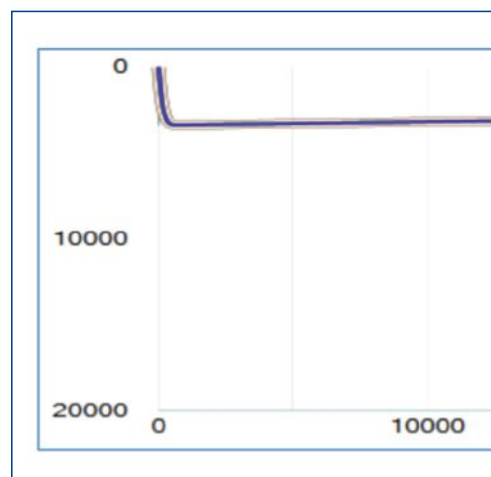


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C-I's flagship Gulf of Mexico assets include the offshore construction and light well intervention vessels *Island Venture* and *Island Performer*, the only RLWI vessels operating in the GOM.

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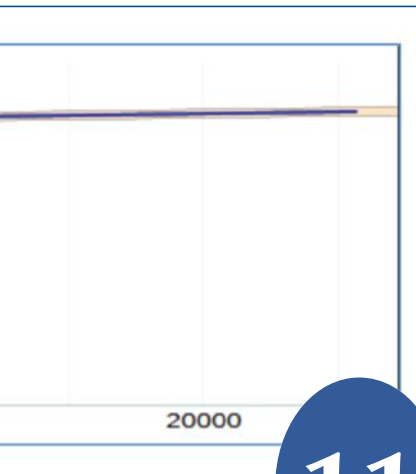




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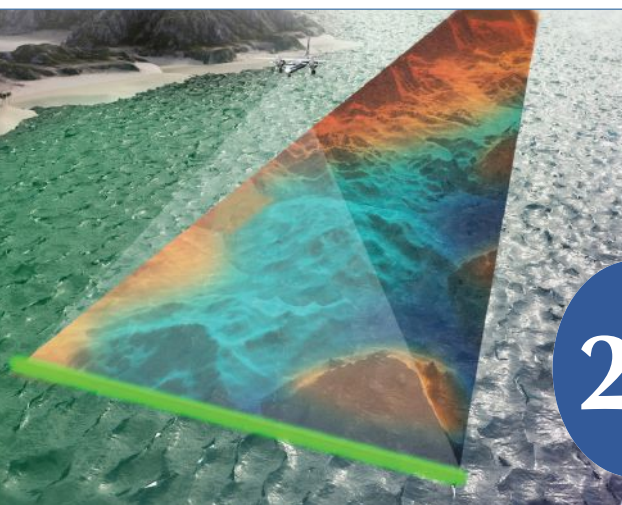
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)) NOAA Starts Sunsetting Paper Nautical Charts. NOAA has begun implementing its sunset plan for paper nautical charts, starting with the current paper chart 18665 of Lake Tahoe. After August, NOAA's electronic navigational chart will be the only NOAA nautical chart of the area. This is the first traditional paper chart to be fully supplanted by an electronic chart as part of NOAA's Office of Coast Survey Raster Sunset Plan, which includes a new process to notify mariners of the transition of individual paper charts to electronic charts. These charts are easier to update and maintain, keeping mariners safer with the latest information on marine hazards. NOAA will continue to announce the cancellation of additional paper charts as the sunset plan progresses, initially based on volume of sales or downloads, and in regions with improved NOAA electronic navigational chart coverage. Cancellation of all traditional paper and associated raster chart products will be completed by January 2025. While NOAA is sunsetting its traditional nautical chart products, it is undertaking a major effort to improve the data consistency and provide larger scale coverage within its electronic navigational chart product suite. Over the next four years, NOAA will work to ease the transition to electronic products by providing access to paper chart products based on electronic data. The online NOAA Custom Chart tool enables users to create their own paper and PDF charts from the latest NOAA ENC data.

)) Working Group for International Training Standards for Autonomous Ships. In partnership with SeaBot XR and the UK Maritime and Coastguard Agency, Fugro has launched MASSPeople, the Maritime Autonomous Surface Ships (MASS) International Training Standards Working Group. The group comprises representatives from European and international maritime authorities who will collaborate to develop world-class training and competency standards for remote and autonomous vessels. The introduction of remote and autonomous technology has brought new ways of working to the maritime sector, and the aim of MASSPeople is to explore the human dimension of remote and autonomously enabled marine surface vessels. Fugro and SeaBot XR have already been working together since 2019 to develop new standards and a training framework through which Fugro's employees can be upskilled in the operation of remote and autonomous vessels, and the new working group will continue these initiatives. MASSPeople will provide recommendations on new competency standards for inclusion into the International Convention of Standards on Training, Certification and Watchkeeping for Seafarers (STCW); the group will also propose specialisms, training structures and qualification requirements for remote and autonomous operators. By focusing on the mariners who operate this new technology, the group aims to ensure that their skills can evolve effectively and to high industry safety standards.

)) International 'Energy of the Future' Projects. The Coalition for the Energy of the Future, of which Wärtsilä was a founding member, has identified seven development projects for 2021. At the same time, the coalition welcomes three new corporate members, thereby expanding the original membership of 11 businesses to 14. The projects to be worked on in cross-industry working groups this year are: Green Hydrogen; New Biofuel for Maritime Needs; Carbon-Neutral LNG; Green Electricity; Zero Emissions; Digital Solutions; and Intermodal Green Hubs. The overall aim of the coalition is to define a clear pathway toward carbon neutrality.

)) Report on How to Integrate Renewable Energy into US Grid. The Energy Systems Integration Group (ESIG) has published a new report, "Transmission Planning for 100% Clean Electricity," focused on the critical need for national-level transmission planning and implementation in order to decarbonize the U.S. electricity system: www.esig.energy/wp-content/uploads/2021/02/Transmission-Planning-White-Paper.pdf. Over a two-month period, ESIG convened more than 50 power systems experts, who analyzed key research studies investigating energy sector decarbonization. The white paper is the culmination of the group's effort in developing a conceptual design for reaching U.S. clean energy goals using proactive transmission planning and development. ESIG's recommendations are: national transmission planning, including establishment of a national transmission planning authority and an ongoing national transmission planning process; renewable energy zones designated for the development of wind solar, and distributed energy resources to provide guidance on where transmission will be needed; and macro grid design for the development and implementation of a national transmission plan that includes a network of multiregional high-voltage transmission that unites the country's power systems.

)) Funding for American Lobster Research. The American Lobster Research Program will support research to address critical gaps in knowledge about how the American lobster and its fishery are being impacted by environmental change. Applications, due by April 20, 2021, are sought from research teams, and research partnerships are encouraged between state agencies, academia and/or industry stakeholders that address life-history parameters, including but not limited to impacts of ocean acidification; distribution and abundance, including but not limited to ecosystem shifts; species interactions; and/or bait alternatives in the Gulf of Maine, Georges Bank and/or southern New England. Pending appropriation of funds, Sea Grant anticipates awarding between five to 10 research projects, totaling between \$1 million and \$2 million in fiscal year 2021. Projects must have a maximum duration of two years. **ST**

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EASTERN U.S.A. & CANADA/G.O.M.

Ray Mahr, Jr.
KRK Consultants Ltd.
17476 Slipper Shell Way, Ste. 6
Lewes, DE 19958
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WESTERN U.S.A. & CANADA

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Tel: (310) 374-2301
bsabo@jsaboassoc.com

EUROPE

John Gold
John F. Gold & Associates
"Highview"
18a Aultone Way
Sutton, Surrey, SM1 3LE, England
Phone/FAX Nat'l: 020-8641-7717
Int'l: +44-20-8641-7717
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Offshore Technology Will Power Energy Transition

Without dispute, the global energy economy is transitioning to a lower carbon reality. Also without dispute is that the success of a low-carbon future depends on the success of all energy industry sectors. With its long history of innovation and ingenuity, the offshore energy industry is poised to drive the energy transformation the world needs.

The engineers, data statisticians, geologists, business executives, ship captains and more of the offshore industry are linked by a dedication to produce energy, better. Men and women of diverse backgrounds and perspectives fully expect their employer to be the best neighbor and the best investment of their talents.

Being a good neighbor and a good investment are not mutually exclusive. The offshore industry is in the process of managing both through technological innovation and progress.

Beyond the upper reaches of the Earth's atmosphere, satellites are providing real-time imaging and communications support for offshore oil and gas platforms. On the seafloor, subsea autonomous robots are monitoring production and equipment, providing real-time data to engineering experts on offshore platforms and in onshore facilities while reducing the need for more trips and more workers offshore.

Machine learning and artificial intelligence are revolutionizing the industry's decision-making abilities. Like a sci-fi Hollywood script, machine learning lets companies run complex simulations, using predictive data to discover hidden patterns. Paired with artificial intelligence, companies can test for any potential impacts or gauge the environmental risk of a new project before any plans are finalized. Automated sensing and inspection allow workers to have greater vision into everything that is happening at once, reducing the likelihood of accidents.

Technology advances are shrinking an already small offshore footprint. The U.S. offshore industry is producing a growing amount of energy while preserving the U.S. Gulf of Mexico's performance as a low-emissions basin.

The Gulf of Mexico, where oil production is increasing after the COVID-19 energy collapse, should be viewed as the premier energy region. Oil production there has half the carbon intensity of other oil-producing regions. Furthermore, deepwater production, which accounts for 92 percent of production in the Gulf of Mexico, provides the lowest carbon intensity of any oil-producing region.

The Obama Administration looked at the climate impacts of canceling the same Gulf of Mexico oil and gas lease sales that are now paused and found that preventing these leases would lead to higher greenhouse gas emissions.

The world is already trying to play catchup with energy distribution and is only going to need more resources in the decades to come. Around 1 billion people still lack access to electricity, and global energy needs are expected to increase by 25 percent by 2040.

Every barrel of oil produced in the Gulf of Mexico is a barrel that our nation does not have to import from countries such as Russia or China. Abandoning the Gulf of Mexico does nothing to tackle demand-side emissions; it only reduces American energy security, locks away low-emissions energy and outsources American jobs and investment to "pollution havens."

Technology and innovation have empowered our industry to solve countless challenges. Now, this expertise can be leveraged for emissions and climate goals. The offshore industry should be a source of innovation to transition the energy economy to a lower carbon future. **ST**

Riserless Light Well Intervention

A More Efficient Approach to Existing Well Production

By George Wilson



Now, more than ever, in its drive for efficiency and profitability, the oil and gas industry values the benefits delivered by a skilled workforce. Additionally, operators are preferring to seek out a more turnkey approach to managing their business.

As a member of the Edison Chouest Offshore group of companies (ECO), C-Innovation (C-I) can partner with other ECO companies to harness the resources of a large vessel fleet, shipyards, port facilities, and logistics and communications services, offering a complete, economical single-source solution under one operating umbrella. Advanced ROV capabilities provide a range of support to subsea construction projects, as well as survey, drilling, intervention, maintenance and heavy-lift assignments. By combining project management, engineering, procurement, service and personnel into a single-source

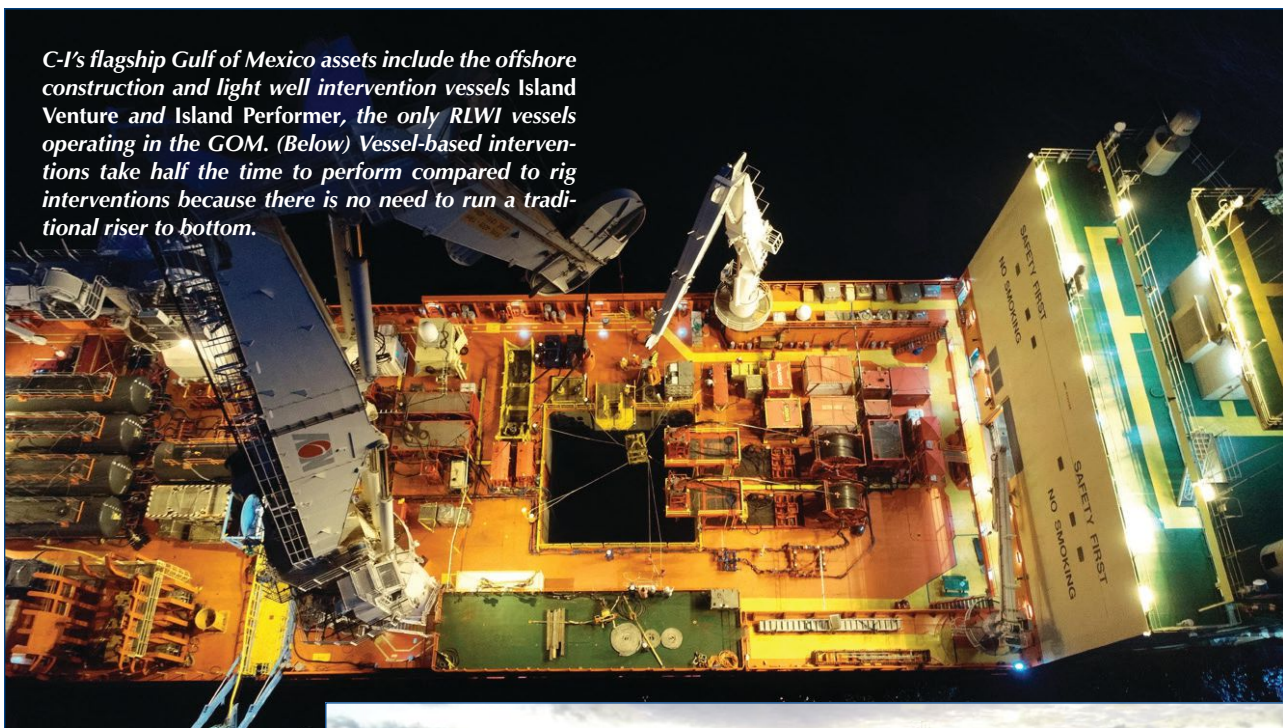
contract, operators can achieve more inclusive offerings at the same price structures.

The Rise of Riserless Light Well Interventions

In the current market environment, operators are seeking cost-effective ways of enhancing production from existing wells. Traditionally, methods to enhance well production were conducted from a rig. Now, riserless light well interventions (RLWIs) are becoming a more normalized approach to production enhancement throughout the industry and are proving to be far more cost-effective.

RLWIs are targeted to wells where skin build is suspected and production is impaired. RLWI eliminates the drilling riser connected to a blowout preventer (BOP), allowing interventions to be performed from smaller

C-I's flagship Gulf of Mexico assets include the offshore construction and light well intervention vessels *Island Venture* and *Island Performer*, the only RLWI vessels operating in the GOM. (Below) Vessel-based interventions take half the time to perform compared to rig interventions because there is no need to run a traditional riser to bottom.



dynamic-positioned vessels rather than larger, far more expensive drilling rigs. The intervention activities include bull heading chemicals and life-of-well operations, including wireline, logging, light perforating, zone isolation, plug setting and removal. RLWI enables the operators to perform intervention to increase the recovery rate at reduced time and cost. Currently, the candidate wells for RLWI are ones in which the tubing is known to be very clean and free of excessive asphaltenes and other contaminants. Wells that meet these criteria eliminate the need to perform complicated intrusive washout procedures to gain access.

Vessel-based interventions, compared with rigs, take half the time to perform, partly due to not having to run a traditional riser to bottom, which is a very time consuming and costly effort. Time spent on site is, therefore, significantly reduced. Additionally, vessel schedules can be very flexible, whereas rig schedules tend to be much more constrictive and drilling usually takes precedence. The RLWI approach, therefore, offers tremendous increases in efficiency for well interventions at nearly half the cost of performing rig-based interventions. This allows for a much broader portfolio of wells to be logged and stimulated for increased production. Currently, C-I is extending its offering of RLWI to numerous clients in the Gulf of Mexico (GOM) and worldwide, providing a complete offering, which includes all services under a single-solution provider to best utilize personnel and resources.



***Island Venture* Multiple Well Campaign**

In 2019, C-I was awarded a significant contract to perform RLWI activities for BP in the Gulf of Mexico. The initial contract called for both mechanical as well as hydraulic acid stimulations, which were executed from C-I's flagship Gulf of Mexico assets, the offshore construction and light well intervention vessels *Island Venture* and *Island Performer*, the only RLWI vessels operating in the GOM. The work was performed in water depths of up to 6,500 ft. on different assets. This well intervention award from BP was a continuation of other subsea intervention work C-I is performing as the main contract holder. This contract complimented the multi-year IMR (inspection, maintenance and repair) agreement currently in place with BP and other operators in the Gulf of Mexico. C-I performed on seven wells at Na Kika and Thunder Horse oilfields and averaged 25 days well-to-well, including transit.

The project exhibited a significant reduction in greenhouse gas emissions when compared to traditional methods. By being on site for half the time required by a rig, C-I was able to halve emissions in comparison, and by utiliz-

ing a smaller vessel in comparison to a rig, the emissions output was reduced even further. Additionally, BP confirmed that the interventions increased production. Subsequently, C-I was given a one-year extension for 2021. The *Island Venture* mobilized in late December and is currently completing the first well DC124 at Atlantis. C-I will continue to supply all project management and engineering to provide a complete RLWI system utilizing Baker Hughes' 7Series subsea well intervention system, a hydraulic stimulation kit from Caltex Oil Tools, and the full suite of Halliburton's numerous wireline, e-line, coil tubing and pumping units on 18 wells at Atlantis, Na Kita and Thunder Horse oilfields.

Caltex Oil Tools Acquisition

With the 2020 acquisition of Caltex Oil Tools, a provider of equipment rentals, services and customized engineering capabilities to the offshore industry, C-I advanced its position as the single-source solution for the subsea and offshore industries. Caltex's highly experienced team was a perfect fit to support C-I's continued growth as a leader in the subsea market. The deal enables C-I to jointly develop more efficient technology and processes to increase returns in RLWI projects.

The Caltex Rigless Stimulation Tool (RST) is a next-generation, compact, well-access package designed using field-proven components. The Caltex RST system is fully 15K operational and suitable in subambient hydrostatic pressure conditions while achieving 15-BBL/min. flow performance. It is operated by a state-of-the-art control and monitoring system with the most safety features and redundant controls in the industry. The Caltex RST has proven to be a game-changer in enhancing the efficiency and safety of fluid interventions, enabling C-I to complete multiple hydraulic stimulation interventions, including three in ultradeepwater (8,000 ft.+) in 2020. These ultradeepwater interventions were completed in the time that would have traditionally been used to do just one, thus significantly beating the customer's expenditure projections.

Events of 2020

Needless to say, 2020 was an exceptionally challenging year. However, everyone who has worked in the oil and gas industry for a number of years understands the cyclical nature of the industry and has learned how to be flexible and overcome challenges both day-to-day and in the long run. In 2020, the C-I led RLWI team was forming and normalizing the "One Team" along with establishing norms with BP. This phase of a project is critical and challenging in a "normal" year. C-I manages 15 different subcontractors to perform RLWI operations, while also interfacing with the operator and its subcontractors.

RLWI is a complex operation requiring special expertise and control in all phases of its preparation and implementation. The operations include: vessel operator, ROV operator, well control operator, wireline operator for both e-line and slickline, pumping operator, and safety systems operator. These multiple expert contractors make up the One Team that works together to offer

unique and cost-effective turnkey solutions. With C-I acting as a one-stop shop, the client benefits by eliminating the need to approve multiple vendors. C-I's RLWI One Team approach carries with it the motto: "One down, all down." This means if any one component goes down and the team cannot progress the work, then the client pays nothing to the contract holder. As C-I owns the largest share of risk, it makes sense that C-I owns the contract. This approach holds everyone accountable and encourages everyone to find the solution to return to a productive posture. By managing all aspects, including HSE and quality management plans from all partners, C-I is better able to align values and ensure project success.

Of course, the arrival of the COVID-19 pandemic made the demands of 2020 even more challenging. The local city and county lockdowns changed normal modes of communication between contractors and eliminated the collaboration around a conference table, making interaction virtual. But the biggest challenge, which will continue into 2021, is the new COVID-19 procedures and mitigations put in place to prevent spread within a close-quarters living environment on board vessels. C-I has worked with its suppliers to develop a robust and complete COVID-19 mitigation plan to safeguard the health and safety of all clients and contractors on board its vessels. This includes protocols for COVID-19 testing, social distancing and all the associated logistics of isolating personnel that are symptomatic, whether it be prior to embarkation or while 100 mi. offshore. A subdued oil price, as a result of decreased use of fossil fuels in the pandemic, is steering oil and gas producers into RLWI in an effort to achieve more production with the wells they already have online.

Future Outlook

By uniting services and offering complete packages to the end-user, a single contractor can maintain a higher utilization rate, enabling projects to be completed more efficiently than ever before.

Since C-I owns its own vessels, which represent the largest piece of an RLWI equipment spread, customers are afforded advantages in costs, time and efficiency. Headquartered in Houston and led by a core management team with more than 65 years of experience in deepwater, remote technologies and intervention solutions, the Caltex team will enable C-I to further expand its engineering and subsea service capabilities in order to deliver a more complete offering.

C-I aims to continue growing its relationship with BP on RLWI projects and is committed to supporting clients in reducing greenhouse gas emissions during operations. This is an example of how C-I aids clients in providing innovative, cost-saving solutions while reducing carbon footprint without compromising the end result. The knowledge gained and continuing innovations will contribute to the net-zero targets being set by C-Innovation and many other operators in the oil and gas industry. **ST**

George Wilson is the RLWI project manager at C-Innovation LLC (C-I), an affiliate of Edison Chouest Offshore (ECO) and its family of companies.

Record Pipeline Cleanout

Snubbing/Hydraulic Workover Unit Facilitates Pipe Decommissioning

By Bobby Bray • Charles Overstreet

As field assets in the deepwater Gulf of Mexico (GOM) mature, there will be continuing decommissioning needs, including pipeline decommissioning, which is part of a larger decommissioning program.

Two typical types of pipeline decommissioning are: retrieving, cutting, cleaning and disposing of the pipeline on land; and flushing, cleaning, capping, burying, covering, surveying and leaving pipeline in situ on the seafloor.

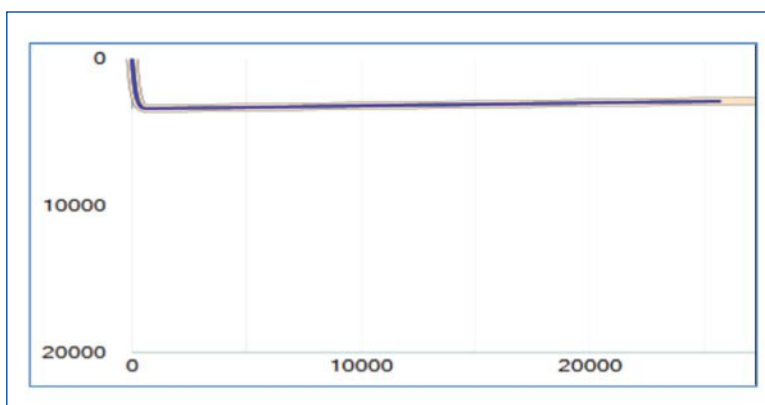
In the case of leaving the pipeline on the seafloor, a pigging program may be used if it is possible to circulate the pipeline from one end to the other.

If circulation is not possible, then other means of meeting the regulatory requirements must be used. One proven technique is using a snubbing/hydraulic workover (HWO) unit and a DP3 semisubmersible well intervention and construction vessel.

In the fourth quarter of 2020, SBS Energy Services (SBS) successfully completed a multi-phase project to decommission approximately 29,000 ft. of 10-by-6-in. concentric insulated pipeline in the deepwater Gulf of Mexico (3,281-ft. water depth) in partnership with Helix Energy Solutions Group, setting a new offshore snubbing/HWO unit world record. The project was completed successfully in 22 days, ahead of schedule and under budget.

Project Overview

The operator had a four-part objective to meet the federal regulations for decommissioning the pipeline section and ancillary components. This article will expound on phase two operations, which involved using a 340K snubbing/HWO unit to rig up and intervene inside the pipeline with an optimized drill pipe string to perform washing/flushing operations until reaching the second



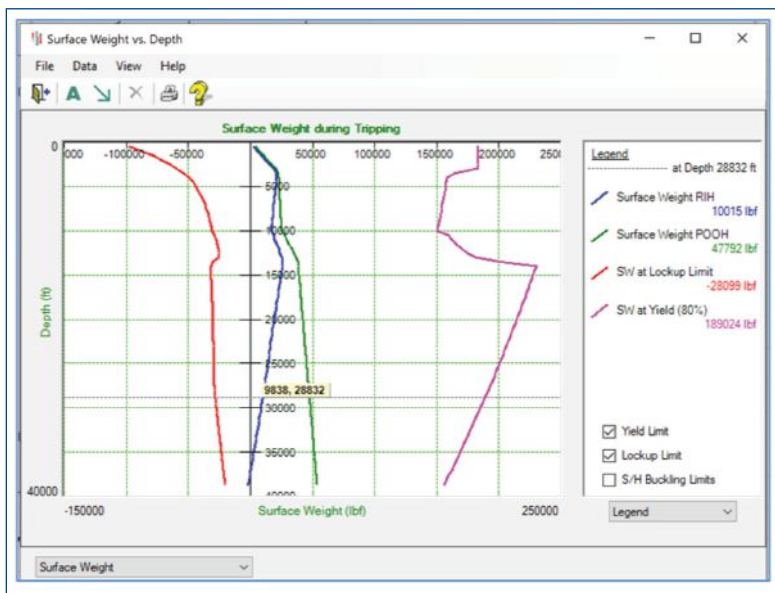
Pipeline trajectory, side view. The trajectory illustrates the short vertical depth (3,281 ft.) compared to the horizontal lateral (25,069 ft.) for a 7.8:1 ratio and the lateral up-dip. Total work string depth was 28,789 ft.

pipeline end termination. Phase two entailed: building a bridge between operational aspects using previous successes/and lessons learned; using a multi-faceted approach combining offshore, snubbing and coiled tubing experience; performing multiple torque and drag iterations to balance practicality, supply chain availability and optimal work string design; keeping the bottom hole assembly (BHA) as simple as possible; provide enough hydraulic horsepower to circulate at high enough flow rates to effectively clean the pipeline of debris; determine the best pre-plan trip schedule of the optimum depth to trip/snub/rotate/snub rotate; and convey the information to operations prior to deployment.

SBS realized that the most efficient operation was to adopt a one-trip-in/one-trip-out philosophy.

Pre-Job Planning

Pre-job planning started six months prior to commencing the work. The operator employed project man-



Force modeling: rotate, pipe heavy, pipe on pipe, est. 0.2 friction factor. Successful prediction of tripping to 28,789 ft. at 10,015 lb. pipe heavy. The execution required snubbing while rotating in tight areas.

agement techniques such as completing the overall task matrix and HAZID. The customer group also used the combined experience and institutional knowledge, along with pre-job modeling, collaboration and process design.

This project required the use of a semisubmersible well intervention and construction vessel. The combination of the vessel platform along with the snubbing/HWO equipment and ancillary equipment allowed for maintaining control while cleaning out the pipeline.

The pipeline's analog data needed to be evaluated and converted to survey data. This was achieved by coordinating with the vessel's pipe lay survey coupled with the pipeline layout on the seafloor.

Then, the force calculations were run. Using the institutional knowledge, coupled with the available work-string supply, numerous iterations were performed to determine the best overall fit and design of the 2.875-in. OD work string to be successfully tripped in the inner 6-in. nominal pipeline with adequate margin. After completing the force modeling, the best pre-plan trip schedule was produced using the optimum depth to trip/snub/rotate/snub and rotate for the most time-efficient trip.

An endurance fatigue graph (S-N curve) was developed in collaboration with the operator's drilling engineer. The calculations determined that with the inputs the work string could rotate with infinite cycle life due to stresses and not exceed the endurance limit.

A rotary torque schedule was used to prevent over-torquing the work string, depending where the depth was relative to the pipeline. The hydraulic circuit was reset at periodic intervals.

Fluid circulation calculations were performed to determine the proper flow rate and horsepower range to adequately remove the pipeline debris. The fluid circula-

tion calculations estimated 3.5 bpm and less than 5,000 psi, 428 hhp.

Nozzle-sizing sensitivity was performed by balancing the number of nozzles and diameters with adequate pressure drop, jet velocity, impact force and hydraulic horsepower.

Since the snubbing/HWO unit and drill pipe work-string option provided more than enough probability of success to reach the target depth, there was no need to add extra BHA components. However, extra BHA components can be used as needed in future applications.

The project group chose to use a custom junk mill/jet nozzle assembly. This heavy-duty BHA approach reduced the probability of BHA failure, maximized fluid circulation horsepower availability, and reduced the need to trip out of the pipeline to repair or

replace the BHA.

Operational Execution

The highlight of the operation was to successfully trip in one time and trip out the work string to the 28,789-ft. actual pipe measurement (3,281-ft. water depth; 25,069 ft. lateral) and flush the pipeline.

The high-level procedure follows: the pipeline was hung off at the drill floor of the semisubmersible; a 340K snubbing/HWO unit system and purpose-configured blowout preventer stack was rigged up directly on the end of the exposed 10-by-6-in. pipeline prepared with a welded flange; a custom 2.875-in. drill pipe and 2.875-in. tubing work string was tripped in the pipeline; the BHA consisted of a nipple and a custom-built junk mill/jet nozzle; and treated calcium chloride fluid and pipe-on-pipe additive were heated and circulated to clean out the debris and mitigate hydrate formation.

Managing the fluid circulation system was one of the challenging parts of the operation. The pipeline was filled with seawater and capped. The snubbing/HWO unit was tripped in as far as possible, then snubbed/pushed until the predetermined maximum allowable snub force was reached. During this time, the pipe-on-pipe additive was introduced into the circulation system as needed. When the snubbing limit was reached, the rotary torque was engaged, and the work string continued to be tripped in. When the work string would not trip with its own weight, the snubbing/HWO unit rotated while pushing to the objective depth. The pipeline was circulated as per the customer's procedure, and the work string was tripped out of the pipeline.

The work string tripped in over 1 mi. (5,280 ft.) farther than the best multi-trip attempt by coiled tubing in a side-by-side comparison. The snubbing/HWO system is capable of even greater distances than those on this project.

Unique Project Features

This project relied on the snubbing/HWO unit's abili-

ty to snub/push/rotate and allows for the ability to reach nearly 5 mi. of extended lateral or a 7.8:1 lateral/vertical ratio.

Another characteristic that makes this unique is that the pipeline lay on the seafloor has a short vertical section (3,281-ft. water depth) compared to a conventional well profile (10,000 ft. vertical). In a simplified case, the weight of the tubular in the vertical is slacked off, and the weight is transferred to the horizontal path and pushes the tubing in front of it along said horizontal to the objective depth.

This concept works until the horizontal buckling and subsequent lockup occur due to frictional forces between the tubing and the casing, or until the vertical section helically buckles and locks up. The operational hurdle is that the vertical depth is short in comparison to the above example. Thus, other techniques need to be employed. Typical techniques considered were using a coiled tubing unit/advanced BHA, a drilling rig or a snubbing/HWO unit. A coiled tubing unit can push and pull, but not rotate; a drilling rig can rotate and pull, but not push. The snubbing/HWO unit can push, pull, rotate, and simultaneously push and rotate; advanced BHAs can be attached to each if needed.

A thermal reactive water heater system was used on this project. Even though thermal reactive water heater systems are established in the industry, consideration was taken to ensure that enough capacity with redundancy was available on the semisubmersible vessel deck so as not to impede the circulation rates pumped. This technique was employed to further assist in softening the hydrocarbon deposits in the pipeline and assist in cleaning out the pipeline.

The pipe-on-pipe friction reducer additive was used to increase the trip depth and lower the trip forces. This technique is typically used in coiled tubing operation. Pumping the chemical intermittently, or as a batch treatment, was effective.

The new torque lock system was designed, engineered and manufactured to store, transfer and maintain residual torque energy while washing and rotating. The system consists of a compact hydraulic traveling torque lock clamp device and a lower stationary torque lock clamp device working in conjunction. The torque lock system

has both safety and operational efficiency in design. It saved measurable time, controlled project costs and created a safer work environment.

When drilling long laterals, drilling rigs use a back-up tong on the drill string prior to breaking out joints to prevent backlash and maintain torque. However, since a drilling rig uses a power swivel or top drive instead of a traveling head, there is no torque transfer as when using a snubbing/HWO unit.

The system maintains internal residual downhole torque through each stroke and while making up or breaking out joints. The system also mitigates torsional and axial shock loads to increase trip speed and operational efficiency without having to release the system torsion on each stroke. So, over a 28,789-ft. trip in operation, the torque lock device will be used over 2,300 times, resulting in a time savings of up to three days.

Another technology was to incorporate a heavy-duty hydraulic bypass swivel. The bypass swivel increases the efficiency during tripping by eliminating the need to manually attach and detach hoses for the traveling torque lock device. This piece of equipment is designed to hold the design push/pull axial loads while providing a pressurized flow path from a stationary spool to an upper rotational spool. The swivel increased project safety by not requiring personnel to climb and attach hydraulic hoses.

This project demonstrated that the snubbing/HWO unit and vessel configuration approach is an environmentally safe and cost-efficient option for pipeline cleanouts.

Acknowledgments

SBS Energy Services and OPC would like to give thanks to the GOM operator; Helix Energy Solutions Group and the Q4000 vessel and crew; and SBS's support staff and crew for their dedication, professionalism, teamwork culture and safety practices. **ST**

Bobby Bray is the president of SBS Energy Services LLC.

Charles Overstreet, P.E., is the owner of Omicron Project Consulting LLC.



SAAB SEA EYE



SAAB

Ship Advisory System

OCTOPUS Monitors, Forecasts Vessel Motions to Optimize Transport

By Jukka Maattanen

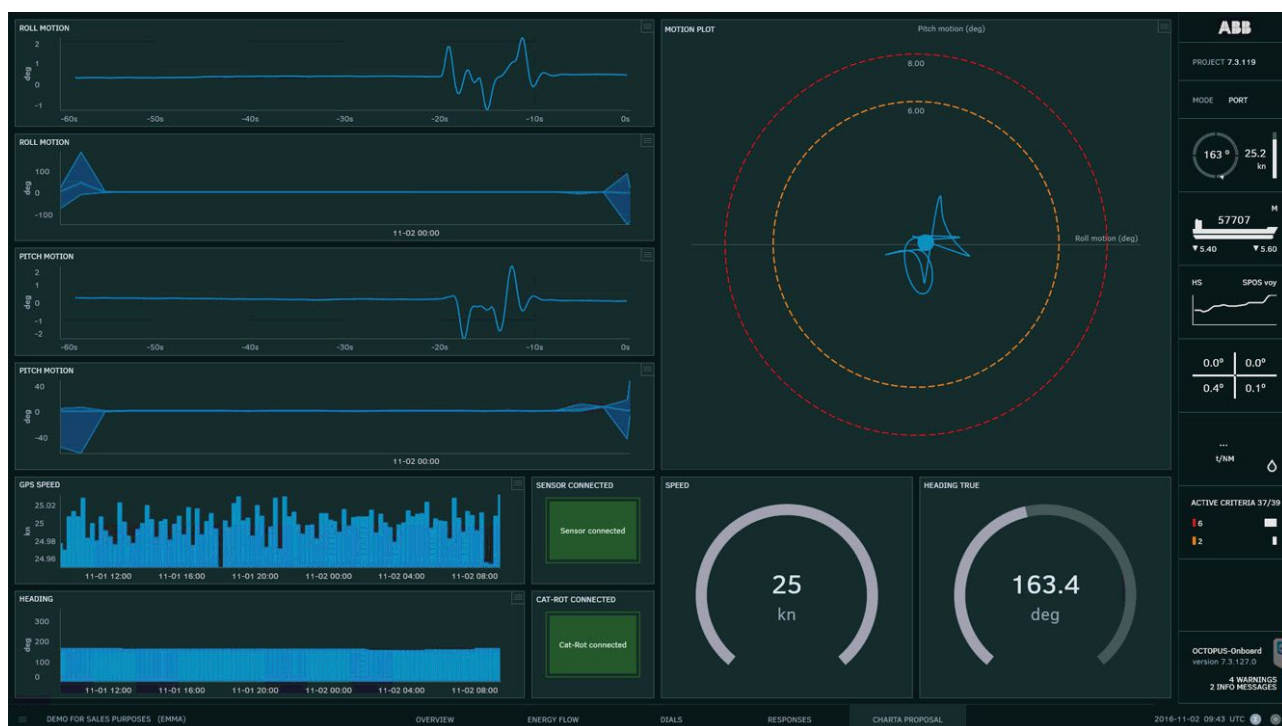
World container port throughput grew from 36 million TEU in 1980 to exceed 800 million TEU by 2019, according to the new “Port Economics, Management and Policy” report by renowned industry analysts Theo Notteboom, Athanasios Pallis and Jean-Paul Rodrigue. These figures demonstrate how the container and its economies of scale have continued to drive globalization.

Safety specialists also know that, while the number of containers that are lost over the side of ships each year is

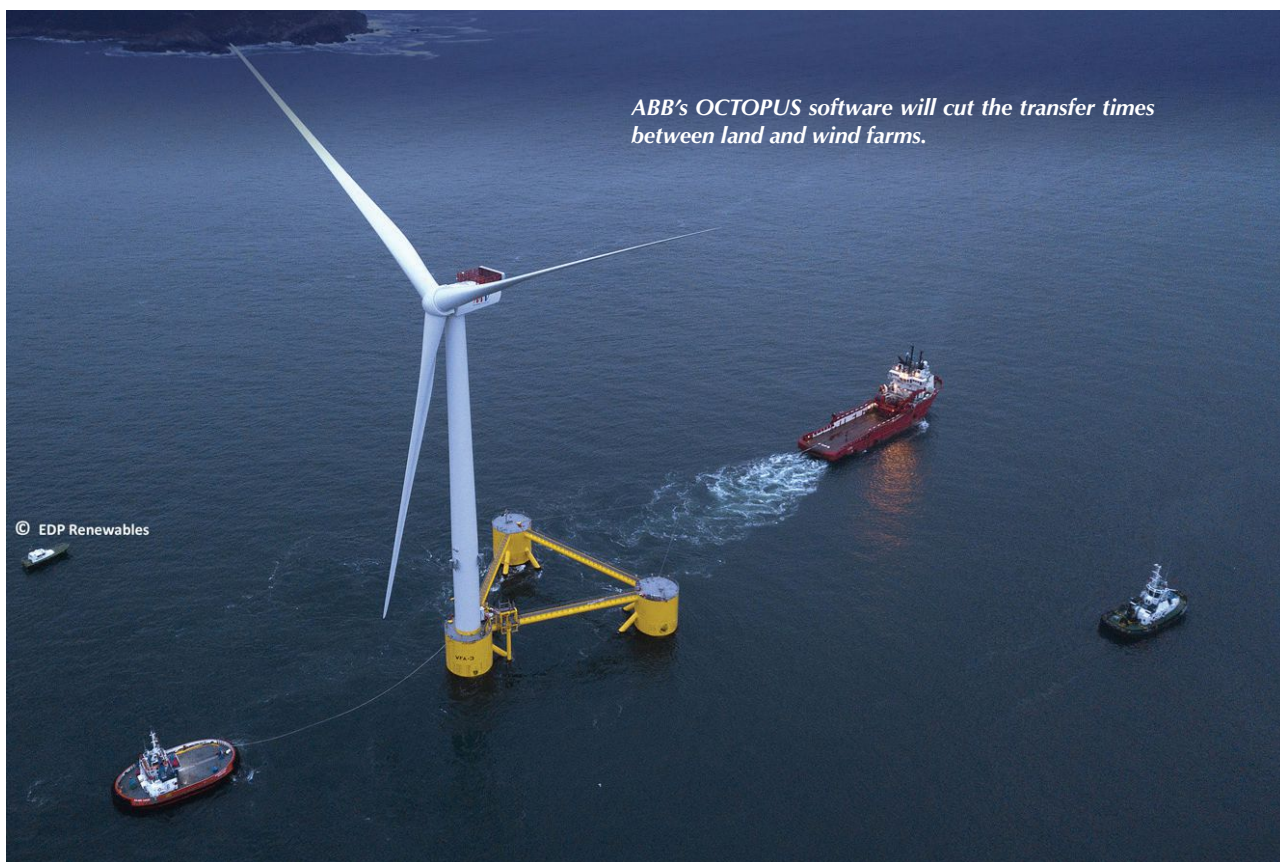
relatively small, in absolute terms, it is a number that has also been on the rise.

With 6 to 7 million boxes in transit on the water at any given moment, the estimated 1,500 containers that are thought to be lost each year is certainly of moderate proportions. That said, some of these losses can cause major incidents grabbing the headlines.

The consequences of any loss can be significant. Aside from the short-term financial costs, reputations are at risk. Environmental impacts can also be a major



The OCTOPUS motion monitoring function helps onboard staff to take immediate action when maximum allowable motions and accelerations are exceeded.



ABB's OCTOPUS software will cut the transfer times between land and wind farms.

© EDP Renewables

concern—particularly when the cargo in question is hazardous. Meanwhile, stray containers—whether afloat or on the seabed in shallow waters—represent a threat to navigational safety.

Today, closer attention is paid to the way cargo is secured than ever before, and rules to establish the weight of the cargoes being loaded into containers have also been put in place. However, while containers withstand compressive and shear forces, heavy weather can still bring extreme vertical loads that can cause structural failure at the bottom of the stack. High lateral loads can break lashings and corner fittings, causing containers at the edges of the stack to topple over.

Reading the Waves

Given that the forces acting on containers in the stack are a result of the ship's responses to prevailing conditions, the ability to monitor and predict vessel motions offers a self-evident safety benefit for containerships. In reality, vessels are not rigid, and the vessel's structure does bend due to the varying loads on the hull. In addition, accuracy can be limited in some calculations. However, when accelerations are measured at a minimum of three locations that are widely distributed over the vessel, these limitations can be overcome. Motion monitoring of this kind may be used as a basis to quantify the risk of losing containers due to excessive accelerations in the wave conditions at the time of measurement. This is a key and well-established component of the ship operations performance management package ABB Ability Marine Advisory System – OCTOPUS.

If the ability to retrieve historical time-series data on the accelerations at any container location on board is clearly useful when investigating an incident, and to ensuring current conditions are safe, the true value of monitoring becomes clear when motions and accelerations can be predicted—and data used to achieve safer operations.

Weather forecasts, which include information on sea states, are fundamental to predicting the motions of a vessel and the subsequent forces exerted on its cargo. With accurate in-sights into conditions at sea, shipmasters can avoid areas where vessel motions are likely to be most severe.

Simply considering the height of waves may not be sufficient, however, as the distribution of wave periods and wave direction relative to the ship's heading can have a greater impact on acceleration levels than wave height alone.

Interpreting a wave forecast with the aim of minimizing accelerations at container locations is clearly a task that is too complex to execute manually.

Instead, protecting cargo against excessive loads is best achieved using an automated process that is known as "vessel response forecasting," in which forecast wave conditions are translated into predicted vessel motions. The knowledge of how a ship responds in different sea states is essential to this process; accordingly, a ship's motions in a range of wave directions, periods and heights are recorded over time—with vessel speed and loading condition also taken into account and stored in a database.

“ABB’s vision is to develop the module to serve multiple sectors”

Protective Reach of OCTOPUS

It is the capability to support real-time decision making in voyage planning and execution that has led heavy-lift vessel owners increasingly to turn to OCTOPUS. In fact, ABB estimates that the system is currently utilized by around 90 percent of the semisubmersible heavy-lift ships in operation worldwide.

In addition to providing users with detailed information about current conditions, OCTOPUS helps to identify the risks related to vessel motions when changing heading or speed. Motions such as roll and pitch are calculated for the full range of headings and ship speeds and compared with an upper limit. On the onboard display, red areas indicate conditions where at least one of the given limits is exceeded, while amber areas correspond to conditions where motions are acceptable but close to the limit; green areas signify favorable sailing conditions.

Vessel motion risk management of this type is already a powerful safety tool in the project cargo market, where heavy-lift ships transport huge, unwieldy cargoes such as wind turbine parts and jack-up rigs. The sheer scale of these structures means that they are subject to far more extreme accelerations and stresses than are exerted on container stacks, no matter how “mega” the container vessel.

References include all five existing project cargo carriers for Norwegian heavy-lift specialist OHT, which describes ship motion calculation and control as essential to its operations.

Even though project cargo voyages are meticulously planned in advance, rapidly developing weather systems at sea may require quick changes of plan. The sheer size of tripods, jackets and wind turbines themselves is only one issue. OHT’s clients often ask for the log of accelerations after a transportation in order to assess the fatigue on the cargo. Furthermore, where in the past cargo transporters and installers were different parties, one company can increasingly fulfill both functions.

Dutch company Roll Group, meanwhile, has been using OCTOPUS for 10 years, with its latest ship *BigRoll Biscay* deploying the solution to protect its high-value payloads. The 146-m-long, 12,285-dwt module carrier, which allows project cargoes to be rolled or lifted on board, joined the Roll Group fleet in early 2020. The *BigRoll Biscay* order extends a relationship between ABB and Roll Group that has been developing since 2009, when the first contract for OCTOPUS was signed.

Knowing Which Way the Wind Blows

Alongside improved safety, vessel response forecasting based on the OCTOPUS platform also brings efficiency gains. According to Roll Group’s senior project

manager Joep Janssens, the solution not only “minimizes the environmental forces” to which *Biscay* and its cargo are exposed but “decreases fuel consumption and helps cut emissions as a result.”

Furthermore, ABB’s ship-type-specific expertise in hydrodynamics ensures that the attractions of OCTOPUS are “transferable” across a growing range of vessels. They include wind turbine installation vessels, where there is a direct relationship between minimizing vessel motions and maximizing the operational window. A forthcoming vessel for Louis Dreyfus Armateurs will leverage OCTOPUS as it serves the world’s largest offshore wind farm, for example.

OCTOPUS is also making a key contribution to the far-reaching European Union-backed Project ATLANTIS research initiative to develop new wind energy fields in the Atlantic Ocean, one off the coast of Viana do Castelo, Portugal, and another further out to sea. A newly developed OCTOPUS module will provide actionable insights to help onshore operators optimize the planning of missions from port to wind farm, cut transfer times between land and wind farms, and reduce vessel waiting time and working times on site.

The new module will also take into consideration the operational limitations of the ship and personnel and assess deployment opportunities for ROVs, USVs and unmanned aerial vehicles. This is an industry first that allows the user ashore to plan offshore operations according to the performance of the vessel, crew and equipment in the conditions they face. This is a significant step forward for remote decision making: In adverse weather or rough seas, a mission or an ROV launch could be aborted to save a wasted deployment, or worse. There are clear benefits for safety and efficiency.

Although the latest addition to the OCTOPUS suite was developed with ATLANTIS in mind, potential applications for the advisory extend beyond a single sector. ABB’s vision is to develop the module to serve multiple sectors, such as the cruise industry, where it could be used to plan short routes, and the offshore oil and gas industry, where it can map supply operations for rigs and floating offshore units.

The advisory software system has already been selected to provide gangway safety on the accommodation vessel *Edda Fides*, and this latest module confirms that, while OCTOPUS offers an immediate answer to shipping’s pressing container stack safety challenge, OCTOPUS can also assist in finding a smoother, safer and more efficient course for each vessel type. **ST**

Jukka Maattanen is the product manager at ABB Marine & Ports for the ABB Ability Marine Advisory System – OCTOPUS.

Vessel Monitoring and Control

Considerations for a Modern System

By Bruce Coward

When any leisure, commercial or military vessel departs to sea all the vessel's systems assume the additional role as a life support system for the passengers and crew until the vessel makes its next landfall. It is vital that the commander and watchkeepers are aware of any anomalous situation as early as possible so that corrective action may be taken quickly and the vessel's passage plan can be reviewed in light of changing circumstances.

Systems on board vary from propulsion to resource management to safety and hotel systems. Each system has priority considerations that will affect any corrective activities; for example, firefighting has a much higher urgency than overfull holding tanks, so the sequence data and anomalous situations that are presented need to be considered carefully to ensure correct management.

Historically, all vessel monitoring and control systems





has many associated costs; not only the initial installation but also the ongoing maintenance and troubleshooting of system failures. As the data are usually needed at other locations, such as wing bridges, engine rooms, crew's quarters, etc., this became difficult to arrange through dissimilar systems and caused further increase of costs for additional system cabling to various locations.

A Modern System

A modern system that can meet current and future needs both functionally and economically should have the following characteristics: all existing monitoring requirements, particularly with regards to safety and environmental monitoring systems, are included; correct controlling requirements of items to be switched or managed are included; multiple display and control locations required are all included; system sensors are appropriate to all items to be measured and monitored with due regard to suitability and classification requirements; a fully integrated CCTV capability that includes full touchscreen pan,



(Top) Oceanic Systems provided fire-suppressant foam tank level monitoring for a Chicago fireboat. (Bottom) Oceanic Systems preprogrammed the fuel supply and return system to meet a specified range for the Spirit P70.

tilt and zoom functions and network video recording and review; and appropriate and simple network cables at minimum bulk and weight that are easy to maintain and troubleshoot in the event of damage.

The basic monitoring requirements for a modern system include engines, generators, fuel, freshwater, wastewater and oil tanks, and electrical systems, and considerations should be made to other systems that can be monitored at little extra cost and with significant savings if a fault is detected early enough. For example, water makers with filter and membrane pressures and flow rates can show a gradual deterioration that can be rectified before it becomes a system failure. Other systems worth considering can include air conditioning systems with chiller and air handler monitoring that will allow the system to operate at its best efficiency and lowest cost.

Additionally, safety systems such as bilge level switch monitoring are important to catch a slow leak triggering a bilge pump intermittently before the leak becomes more serious, for example. Also with regard to safety, magnetic and proximity switches on watertight doors and other hull openings need to be secure while the vessel is at sea. Larger vessels typically have a dedicated fire warning and suppression system, but the modern re-

were disparate, with separate systems for monitoring engines, tanks, generators, electrical systems, bilge safety systems, fire alarms, etc. This resulted in a cluttered display of separate instruments at the helm and made it difficult to absorb relevant information quickly and easily.

These individual displays were also not aware of each other and could not prioritize situations if multiple alarm notifications occurred. Often, with a growing failure, there would be multiple lights flashing and multiple audible alarms going off simultaneously, which could confuse the watchkeeper rather than inform in a prioritized and controlled manner.

Another major disadvantage of these disparate systems was the significant complexity and weight of multiple cabling systems that had to interconnect the sensors and controls with the displays. This complexity and weight

quirement is to ensure that a fire alarm is also transmitted to the safety monitoring display screens, which can show a fully graphical display of fire location to allow a quick and accurate response. Having that safety information presented at multiple appropriate locations in the vessel ensures a safer passage.

In line with the increasing legislation regarding environmental pollution, it is also important that any liquid or exhaust discharges from the vessel are monitored and logged in case the data are needed in court. Sensors exist that can do both and ensure a fully up-to-date monitoring and logging system that can be depended upon if questioned.

Control Requirements

Modern vessel systems are increasingly being managed from control and monitoring system touchscreens, with simultaneous updates on all the distributed displays to maximize user efficiency. These typically will include navigation and other lighting systems internally, on deck and underwater. Generator control systems can include automatic stop and start and load sharing to allow for quiet running at anchor at night with correctly defined load management planning.

Switching of other vessel systems, such as air conditioning, air handling, fuel transfer, tank pump outs, water makers, engine room fans, etc., is easily managed with a significant reduction in power wiring using distributed power control modules. This goes a long way to reduce

the bulk, weight and cost of power cabling needed on board. Control of the vessel's subsystems from appropriate display locations within the helm and other display control positions reduces significant amounts of space for switch gear and multiple wiring harnesses, which is a big advantage. Multiple displays also have the advantage of showing the control status at each display location for management purposes.

Apart from the main helm position, modern vessels often have other locations where the monitoring and control information is required. Typically, displays are installed externally on flying bridges, or wing bridges. Within the vessel, displays are normally installed inside the engine room, the crew's quarters and the captain's cabin.

Suitable Sensors and Classification Requirements

When selecting system sensors, due regard should be taken to ensure that when required, only sensors recommended by classification societies are used. For example, bilge level detection sensors are usually required to be classified as they materially affect the safety of the vessel. Classed sensors can be three to four times the cost of perfectly good general purpose sensors, and care needs to be taken to ensure they are not just blindly specified to avoid unnecessary additional cost. A good example would be tank level sensors that must be rugged and reliable, but not generally classed, which can yield significant savings.

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CCTV Systems

Often, the monitoring and control system needs to include a fully capable CCTV subsystem to allow video displays of all the important security areas, such as the rear deck, side decks, engine room and common areas to ensure the safety of everyone on board. This system needs to be able to control pan, tilt and zoom functions on cameras, preferably with simple touchscreen operation on any display without requiring additional helm real estate.

It is also worth ensuring that the system has the ability to incorporate CCTV pictures in appropriate data displays, such as pictures of the engines on the same screen as the engine data, and can include infrared cameras for night vision, such as FLIR.

System Topography and Cabling Requirements

The most significant change in system design has been the increase in data networking, allowing multiple circuits to be monitored and controlled over simple low-cost and low-bulk networking cable systems. This has resulted in a reduction in cost, bulk and weight of cabling on board, with a corresponding increase in reliability and ruggedness.

Due consideration has to be given to the design topography in any system so that cabling runs are simplified, while potential damage on board is quick and easy to locate and repair.

One particular issue to be wary of are systems based on legacy designs that incorporate multiple, different cabling runs and types. Some systems use multiple parallel CAN networks, RS485 networks, serial data networks and Ethernet networks all in a single system, which adds greatly to the complication, weight, bulk and system costs during installation and ongoing maintenance.

Specialized Requirements

Modern monitoring and control systems should be able to carry out specialized tasks in addition to the basic system. Oceanic Systems has two great examples of this, where we supplied and commissioned systems for offshore wind farm support vessels being manufactured in Portland, England. They had an additional requirement to measure diesel fuel being dispensed onto the offshore wind towers that need to run generators in the build phase. We were able to add fuel flow measuring sensors and fixed totalizing displays so that effective tax records could be maintained, as duty was payable on the amount being dispensed.

Another specialized requirement we met was to provide fire-suppressant foam tank level monitoring for the Chicago Fire Brigade, where the foam-generating tanks were not suitable for conventional tank level sensors. We were able to supply a suitable sensor to meet the requirement.

It is also important that monitoring and control systems have the ability to apply logic to functions to meet more complex requirements. A good example of that was Oceanic Systems' Poseidon system installed in the latest Spirit Yachts P70 motor yacht. This vessel has four fuel

tanks and two engines. Contractual requirements were that the vessel had a specified range that could be met by burning the fuel from the tanks in a specified sequence, so the fuel supply and return system was preprogrammed to draw and return the fuel from the tanks in a controlled manner to meet that range.

Rising Trends

The desire for remote monitoring and control over local networks or via the cloud from anywhere in the world is changing the requirements of modern monitoring and control systems. These new capabilities also allow for remote support and diagnostics of onboard systems from various manufacturers, which in time will be the dominant support mechanism in light of the current pandemic.

We have seen the big advantage of this remote support when Oceanic Systems aided a vessel 3,000 mi. away and enabled the onboard engineer to locate a damaged sensor cable within 60 min., eliminating the need to fly in a support engineer. The time and cost savings were significant.

The other trend we see is the need to run a full data logging system for the monitoring and control system to support the vessel in the event of litigation with regard to equipment failure or environmental situations. The system needs to store all monitoring and control data in suitably sized nonvolatile data storage that can only be read and erased under management control. Recent installations have required this capability on chartered wind farm support vessels so that engine and other systems' operation can be reviewed to ensure recommended operation.

Conclusion

The choice of a monitoring and control system for today's vessels needs to take into consideration the current and future capability requirements and the whole life cost of the system, including initial purchase cost and ongoing maintenance and support.

In today's fast evolving world, increasing legislation and environmental requirements are defining what monitoring and control system functionality is required at the time of installation. However, the increase in the requirements mandated means that the monitoring and control system is easily updated and modified to fit those new requirements. In particular, the network cabling of a system allows for flexible and economic upgrades and additions without compromising system integrity or maintainability. **ST**

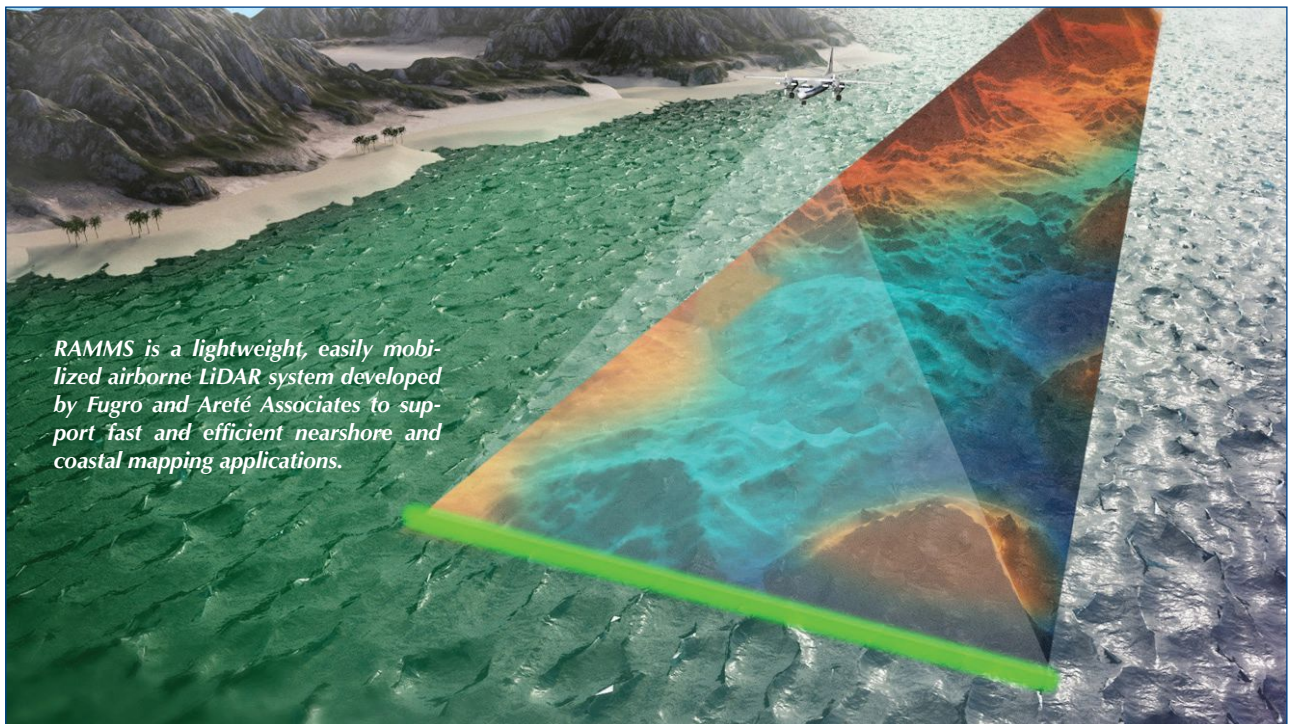
Bruce Coward is the founder and CEO of Oceanic Systems (UK) Ltd., based in Hampshire, U.K. He founded Oceanic Systems in 2003 and has been designing and manufacturing world-class NMEA2000-based integrated alarm, display and control systems for leisure, commercial and military vessels since then.



Mapping for Sustainable Coasts

Airborne LiDAR Bathymetry, USV, MBES Create Detailed Data Sets

By Richard Goosen • Shannon Earl



RAMMS is a lightweight, easily mobilized airborne LiDAR system developed by Fugro and Areté Associates to support fast and efficient nearshore and coastal mapping applications.

The ability to efficiently map and monitor the coastal zone is of increasing importance to the health and wealth of our planet. The United Nations (UN) estimates that nearly 2.4 billion people now live within 100 km of the coast. That figure amounts to nearly 40 percent of the world's population. Of these coastal residents, approximately 600 million live within low-elevation areas; a number on track to exceed 1 billion by 2050. The impacts of development associated with this rapid population growth, coupled with the compounding effects of climate change, threaten the long-term viability of coastal communities and the economies on which they are built.

Sustainable Coasts Start with a Map

Coastal zone mapping programs merge nearshore, shoreline and coastal elevation data for seamless depictions of the land-sea interface. These comprehensive data sets provide a common, science-based framework for decision making that supports a wide range of coastal management applications. Examples include: economic development, infrastructure planning, environmental protection, resource management, disaster mitigation and emergency preparedness, among many others.

Despite these obvious advantages, high-accuracy, high-quality mapping remains out of reach for many users across the globe due to the time and costs asso-

ciated with their creation and maintenance. This is true among developed and developing nations alike. The UN Decade of Ocean Science for Sustainable Development (2021-2030), which officially started on January 1, is working to address these and other ocean science data gaps by empowering and engaging stakeholders across disciplines, geographies, generations and genders to strengthen management of the world's oceans and coasts for the benefit of humanity.

Ensuring greater access to coastal zone mapping data will require new and innovative technologies to streamline data development and delivery. As the world's leading geo-data specialist and a preparatory phase partner of the UN Ocean Decade, Fugro's work toward these goals is well underway. In the Americas, the company's effort is being managed from its Hydrography Center of Excellence in Houston, Texas. Over the past several years, the center has debuted two important technologies: an airborne LiDAR mapping system known as RAMMS (Rapid Airborne Multibeam Mapping System) and a USV called Blue Shadow.

RAMMS: Small Sensor, Big Benefits

RAMMS is a next-generation airborne LiDAR bathymetry (ALB) capability that delivers industry-leading depth penetration and point densities for nearshore and coastal mapping. Commercialized by Fugro in August 2018, the system was developed in collaboration with Areté of Northridge, California, based on 20 years of cutting-edge military technology for mine detection developed via the US Navy Small Business Innovation Research (SBIR) program. The inherent requirement for mine-hunting technology is the ability to detect small, mine-like objects. This capability translates very well to nautical charting and other hydrographic surveying applications, which require detection of all hazardous objects, such as uncharted shoals and shipwrecks.

For the surveying and mapping community,

RAMMS represents a paradigm shift in the collection of airborne bathymetry data. Comprising a first-of-its-kind multibeam (pushbroom) LiDAR sensor, the low-power system is air-cooled and contains no moving electro-mechanical parts. This innovative design eliminates the weight, size, power, heat and reliability issues associated with traditional scanning laser technology. It also eliminates the need to choose between high data density and good depth penetration, a limitation common to traditional ALB systems. Delivering 25,000 range observations per second while achieving three times the visual water clarity (3-Secchi disk depth), RAMMS meets International Hydrographic Organization (IHO) Order 1 survey standards.

In addition to better quality data, RAMMS also provides multiple operational efficiencies over standard ALB systems. The sensor is compact in size and weighs just 14 kg (30 lb.). As such, it can be deployed in small aircraft or even uncrewed autonomous vehicles (UAVs), resulting in lower mobilization costs, increased mission times and a reduced carbon footprint. It is also easily integrated with other remote-sensing technologies for collection of multiple complementary data sets in the same airborne mission. For coastal projects, this approach commonly involves a topographic LiDAR system and a three-band (RGB) or four-band (RGBI) orthographic camera, which enables data collection over nearshore and inshore areas.



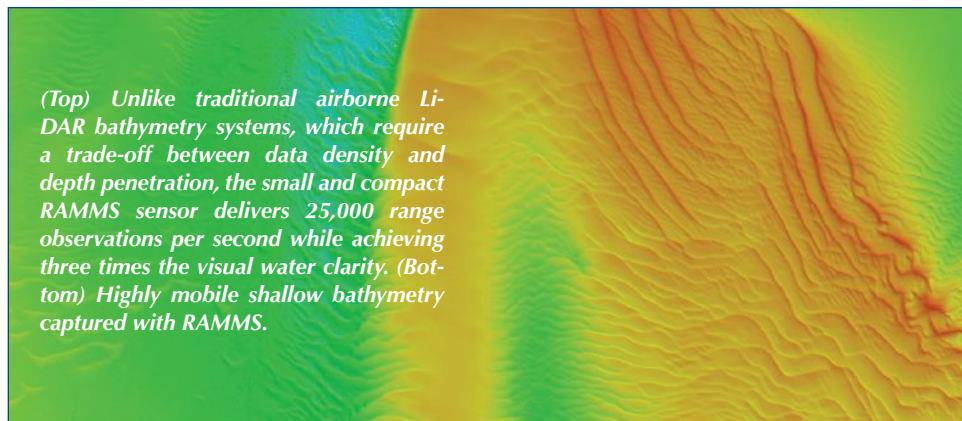
RAMMS in Action

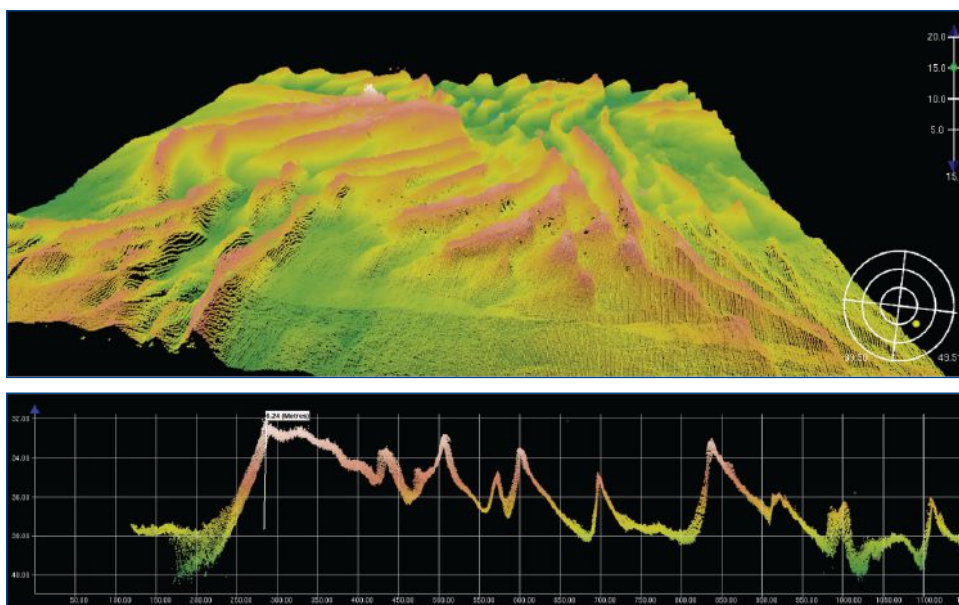
Since commercializing RAMMS 2.5 years ago, Fugro has used the system to map more than 45,000 sq. km, working throughout North America, the Caribbean and in Europe on coastal zone mapping, nautical charting and offshore wind development projects.

In 2020, Fugro commissioned another RAMMS sensor to meet increased demand for the technology. The company now has multiple systems available in the Americas and Europe to facilitate project scheduling and improve client response in these growth markets.

From an operational standpoint, RAMMS is yielding major sustainability benefits to Fugro and project owners. Reduced travel for field crew, reduced shipping for mobilization and reduced fuel costs for

(Top) Unlike traditional airborne LiDAR bathymetry systems, which require a trade-off between data density and depth penetration, the small and compact RAMMS sensor delivers 25,000 range observations per second while achieving three times the visual water clarity. (Bottom) Highly mobile shallow bathymetry captured with RAMMS.





(Top to bottom) RAMMS-generated point cloud of a sand wave field from the seabed overview; further examination of the sand wave area showing vertical extent. Fugro's Blue Shadow USV is engineered for efficient, flexible operations, including working at night, in both coastal and offshore environments.

the aircraft are all contributing to large reductions in the carbon footprint of RAMMS-based projects. One early project performed in Jamaica showed estimated reductions in CO₂ emissions of 5.1 metric tons and an estimated overall carbon footprint reduction of 80.5 percent.

Multibeam Technologies Still Apply

When it comes to coastal and nearshore mapping, ALB is not the only answer. All laser systems are limited by water clarity and depth. At the limits of ALB, acoustics take over to capture seafloor data in turbid waters and areas beyond 3-Secchi water depth. In conditions where ALB becomes ineffective, or where particularly dense data are required, multibeam echosounder technology (MBES) takes over. The high resolution and precise positioning of seabed objects that is possible with MBES on board a surface vehicle extend the ability to accurately map the seabed out to the deepest areas of the oceans.

Blue Shadow: A Force-Multiplier

To increase the efficiency and safety of these surveys in nearshore and coastal waters, Fugro recently introduced its next-generation USV, the Blue Shadow, which was built in collaboration with L3Harris (previously ASV Global).

The system serves as a force-multiplier on hydrographic and geophysical survey operations and is suitable for medium- to large scale project areas. Working alongside a parent vessel, the 9-m USV boasts a wave-piercing design for stability, which allows it to operate within a high weather tolerance and in high sea states. It is also outfitted with advanced situational awareness technologies for 24-hr. operations and incorporates obstacle and collision avoidance technologies to ensure survey missions are conducted to the highest safety standards. Similar to RAMMS, the Blue Shadow also offers significant safety and sustainability benefits through reduced staffing needs and fuel requirements.



Fugro used the Blue Shadow in the Americas for the first time last summer during a nautical charting survey for NOAA. The project took place in Apalachicola Bay and comprised six sites totaling approximately 1,475 sq. km. Working concurrently with a parent vessel in both nearshore and offshore areas, the Blue Shadow collected project data 24 hr. a day for multiple days at a time.

As a result, Fugro doubled productivity compared to the 2018 and 2019 field seasons, which involved projects in nearby waters. In addition to updated nautical charting, the project also supported the Florida Coastal Mapping Program by providing the first-ever comprehensive mapping data in the western portion of the Big Bend Region.

Once the Florida project was complete, Fugro deployed the system to South Australia to support nautical charting within Gulf St Vincent and Investigator Strait on behalf of the Australian Hydrographic Office (AHO). As with the Apalachicola Bay survey, the Blue Shadow will help expedite data collection while improving operational safety and sustainability.

***“Ensuring greater access to coastal zone mapping data
will require new and innovative technologies
to streamline data development and delivery.”***

It All Comes Down to Delivery

Making coastal zone mapping data more accessible to more users requires improvements not only in data acquisition but also data processing and delivery. Fugro's Back2Base technology is key in this regard, allowing secure transfer of large data sets from the marine environment to onshore processing facilities. As a result, quality control and initial data-processing phases can occur in near real time, providing clients with earlier access to project data and faster project turnaround. Cloud computing is also being adopted for use on coastal zone mapping projects. Benefits include additional efficiency gains through virtual data-processing workstations; client access to live project data via a dedicated virtual workstation; and the ability to download project data on demand once map production is complete.

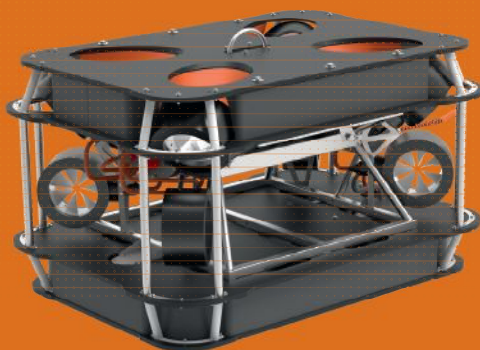
The Time for Coastal Is Now

While these and other Fugro innovations have been years in the making, their development is well-timed to support UN Ocean Decade objectives by addressing

UN Ocean Decade challenges, including issues of data accessibility. Only through an increased understanding of the world's oceans and coastlines will it be possible to meet the UN Decade's stated goal of obtaining “the science we need for the ocean we want.” Working in partnership with clients, stakeholders and colleagues, Fugro aims to continue moving technology forward and, in doing so, improving knowledge of the world's coastal zones to help ensure a safe and livable world. **ST**

Richard Goosen (R.goosen@fugro.com) completed 17 years in the U.K. Royal Navy before joining Fugro in March 2018 as a senior hydrographer. With a long history of managing high-specification bathymetric surveys using shallow and deep MBES, his work has broadened recently into ALB, and he is currently based in Fugro's Houston office.

Shannon Earl (searl@fugro.com) is a marketing and public relations manager for Fugro in the Americas region. She has nearly 25 years of experience with Fugro and is part of the company's Ocean Science Initiatives team, writing about activities and projects related to the United Nations Decade of Ocean Sciences for Sustainable Development and the Nippon Foundation-GEBCO Seabed 2030 Project.



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StormGeo Expands to Denmark

StormGeo, specializing in shipping solutions for voyage planning, route advisory and fleet performance management, has opened a new office in Copenhagen, Denmark.

StormGeo has been supporting customers in Denmark's offshore wind market for many years.

Start-Up Ecosystem Seeks Partners

Signal Ventures, the investment arm of the Signal Group, is seeking entrepreneurs and start-ups in the maritime sector to join its ecosystem of technology partners.

Led by Greek entrepreneur Ioannis Martinos, Signal Ventures focuses on B2B SaaS (software as a service), advanced analytics, optimization and artificial intelligence technologies for the maritime and trade sectors.

Signal Ventures offers its partners access to unique data-processing capabilities, vessel port calls, emissions, port and weather information, venture capital, mentoring, and hands-on team building support.

Signal drives incorporation, accounting, legal and HR activities so that founders can focus on their product.

The ecosystem already includes technology start-ups active in ship bunkering, oil and dry bulk analytics, and marine weather.

Collaboration Cuts Drilling Costs, Emissions

A collaborative, green solution developed by Kongsberg Maritime, COSL Drilling Europe AS and drilling equipment provider NOV is poised to generate major environmental and financial savings in offshore drilling operations. COSL's ambitious Energy Control project has been launched as a means of simultaneously slashing greenhouse gas emissions and substantially lowering fuel and maintenance overheads on the company's rigs situated on the Norwegian Shelf in the North Sea. Collaboration yielded an integrated solution combining Kongsberg Maritime's energy management systems with NOV's research into energy optimization.

New Ultralow-Emission Notation

Bureau Veritas (BV) has developed a new notation to recognize the performance of ultralow-emission vessels (ULEVs). Jan De Nul Group's newest trailing suction hopper dredgers have become the first ships to receive this recognition. The Jan De Nul units are specifically designed for ultralow emissions, including installation of a two-stage catalytic filter system, and can outperform the most stringent low-emissions operational policies.

Electrofuel Project in Finland

The commercialization of electrofuel (e-fuel) production using sustainable electricity and sequestered carbon dioxide got a boost from €3.3 million in funding from Business Finland. Coordinated by VTT, the e-fuel research

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project is connected with the Neste Vetur Ecosystem and aims to integrate hydrogen production through high-temperature electrolysis using a solid oxide electrolyzer cell with carbon dioxide sequestration and Fischer-Tropsch fuel synthesis. The goal is efficiency improvement by 10 to 15 percent compared to current technologies in the production of e-fuels.

Global emissions from the transportation sector currently make up about 15 percent of the world's greenhouse gas emissions. The market for synthetic fuels that has emerged in the wake of an acute need to reduce emissions is expected to grow to millions of tons by 2030 in Europe alone. The market for electrolysis technology, which is a key to the production of synthetic fuels, is expected to grow more than 20-fold in the coming five years. The production of e-fuels is often referred to by the names power-to-liquids (PtL) or power-to-X (PtX).

Nautel Acquisition

Nautel has acquired ownership of France-based Kenta. The addition expands Nautel's existing offerings to customers in the maritime sector. Kenta was established in 1990 and specializes in radio frequency communication systems, primarily Global Maritime Distress and Safety Systems (GMDSS).

NAVTOR Enhances Offerings

NAVTOR looks to extend its success in e-navigation into leadership in vessel analytics and performance optimization with the acquisition of Tres Solutions. The purchase follows on the heels of NAVTOR's launch of NavFleet, a fleet management application delivering real-time operational insight, performance optimization and enhanced business decision making.

New Environmental Tech Interest Group

The Society for Underwater Technology (SUT) has formed a new special interest group: the Marine Environmental Science Special Interest Group (MES SIG). Its creation brings the number of SIGs run by SUT to a dozen. MES SIG will prepare guidelines on appropriate subjects and provide advice to governmental and nongovernmental organizations.

Davie Partners with GE on Icebreakers

Davie, a Canadian builder of polar and ice-capable ships, has welcomed GE as a strategic partner in its Polar Icebreaker program, which is the flagship of Canada's National Icebreaker Centre (NIC). Launched in August 2020, NIC is a center of excellence for polar technologies and Arctic expertise. It reflects Davie's role as Canada's icebreaking partner and builder of the new icebreaker fleet, under the National Shipbuilding Strategy. A new *Polar* class will enable Canada to maintain a continuous Arctic presence.

Dredging to Restore Recreation Site

Sediment dredged from shipping channels leading to the Helen Delich Bentley Port of Baltimore is helping restore the underutilized Ridgely's Cove park proper-

ty in Baltimore City as a multi-use recreation area with walking trails. Restoration of Ridgley's Cove makes use of sediment from the Maryland Department of Transportation Maryland Port Administration's Cox Creek Dredged Material Containment Facility. The project is the largest example of innovative reuse of dredged sediment from Baltimore Harbor channels.

Orders for Seismic Exploration Tech

MIND Technology Inc.'s Seamap unit has entered into a memorandum of understanding with an international seismic exploration company to provide two GunLink 4000 systems and associated equipment and spares. The orders should be completed in MIND's fiscal year ending January 2022.

Dock Rehab in Northwest Alaska

Every spring in the remote Northwest Alaska community of Kotzebue, the huge sheets of ice covering Kotzebue Sound begin to crack and break. Massive chunks of 4-ft.-thick ice are carried by the powerful currents of the Kobuk and Noatak Rivers, scraping and grinding violently along Kotzebue's only fuel and cargo dock. Decades of brutal seasonal damage, as well as typical wear and tear, have taken their toll on the 50-year-old dock.

Crowley Fuels, the current owner of the infrastructure, has completed an extensive renovation project, expanding the dock by 30 ft., adding safety features and fortifying it against the elements to serve the company and the community for many years to come.

RBR to Develop Ocean Sensors for Canada

RBR has received funding from Canada's Ocean Supercluster's Accelerated Ocean Solutions Program (AOSP) to develop integrated ocean sensors for autonomous ocean platforms in collaboration with Canada's Department of Fisheries and Oceans and Dalhousie University's Department of Oceanography. The Advancing Smart Integrated Ocean Sensors for Autonomous Platforms Project will develop new sensor technologies aimed initially at the Biogeochemical Argo program.

Bahamas Cooperates with WCPFC

The Bahamas Maritime Authority (BMA) is now a co-operating non-member (CNM) of the Western and Central Pacific Fisheries Commission (WCPFC). The Bahamas strongly supports efforts to eradicate illegal, unregulated and unreported (IUU) fishing. Cooperation with WCPFC paves the way for the Bahamas to establish a fisheries cargo trans-shipment authorization program with the commission to allow reefer carriers flying the Bahamas flag to undertake high-seas trans-shipment of cargo originating from the WCPFC regulatory area. This will open new commercial opportunities to Bahamian-flagged reefers.

Newport News Downsizes

Newport News Shipbuilding, the largest industrial employer in Virginia, is laying off 314 staff and demoting about 120 managers, AP reported. These are the shipyard's first layoffs in five years. **ST**

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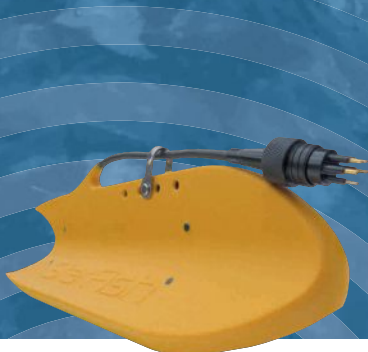
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Updated Navigation



A high-altitude variant of the hybrid navigator SPRINT-Nav allows USVs and underwater vehicles to extend their operational envelope. Operating at 400 kHz, this variant achieves reliable bottom lock at up to 230 m altitude above the seabed, which is critical for, as an example, station-keeping in coastal surveys where GNSS could be denied or interrupted. Sonardyne International Ltd.

Underwater Optics

Custom-manufactured sapphire lenses, windows and domes can withstand fast-moving sand, particles, saltwater and pressure to 10,000 psi for use in AUVs, ROVs, submersibles and other deepwater applications. They feature Mohs 9 hardness, which is second only to that of a diamond. Meller Optics Inc.

Next-Generation AUV

The HUGIN Endurance boosts operational duration to approximately 15 days, enabling extended survey and inspection missions far from shore without the support of a mothership. A maritime broadband radio communications system has been added, allowing the AUV to surface and share large quantities of data swiftly with any suitably equipped installation. Kongsberg Maritime.

Doppler Speed Log

DS85 penetrates turbulent water to provide incredibly accurate speed measurement. Speed and distance

measuring equipment (SDME) is required for SOLAS vessels of 150 GT or more, and DS85 delivers maximum stability for these ships. Furuno USA Inc.

Advanced Analytics

ABB Ability Genix Industrial Analytics and AI Suite is a scalable advanced analytics platform that collects operational, engineering and information technology data from onboard equipment and converts it into actionable insights. The solution enables analysis of the relationships between processes and events on a vessel or across a fleet. ABB AS.

Emergency Transponder



ATT-400/AODC is a rugged acoustic transponder that meets offshore standard DNV-OS-E402. It was developed in response to industry needs for a replacement to the discontinued Sonardyne 7192 AODC emergency transponder, used to mark and relocate commercial diving bells. RJE International Inc.

Inverter/Charger

Two new FREEDOM XC PRO Marine models are compact and lightweight, featuring 50-A transfer relay and dead-battery charging. They can charge any battery chemistry, including lithium ion, and have NMEA 2000 communications, which allows the inverter/charger to integrate with other compliant devices. Xantrex LLC.

Small Antenna

The compact form factor v45C is a 45-cm unit that will bring VSAT to markets where there is limited space available for communications equipment, such as workboats, leisure craft, fishing boats, and small commercial and government vessels. Intellian Ltd.

Monitoring, Control System



Poseidon 7 is ideal for 25- to 60-ft. vessels. NMEA2000-certified, it monitors and controls various systems and can be configured to create a multi-page data and control display using the simple drag-and-drop editor. It has a vast library of options for gauges and controls and the ability to import schematics, images and backgrounds. Oceanic Systems (UK) Ltd.

Wide-Swath LED Light

The DuraLED 50 lamp can thoroughly illuminate confined environments, such as engine rooms, under-deck compartments, lazarettes and cargo holds. Its durable housing resists impact, shock, UV and corrosion damage. Hella marine Inc.

Online Learning

CLASSROOM is a virtual education experience developed with a focus on ropes for workboat, mooring and utility. It offers more than 30 courses, available at any time. Samson Rope Technologies.

New Engine Options

Four versions of the popular X72DF dual-fuel engine platform are now available to provide ship design flexibility while helping owners reduce installed power and emissions. The X72DF suits newbuild LNG carriers, Suezmax tankers,

Panamax and sub-Panamax containers and Capesize bulk carriers. Winterthur Gas & Diesel Ltd.

Subsea Buoyancy

Hardball Floats suit a wide variety of oceanographic applications. The buoyant core of the float is made of epoxy-based DeepTec solid syntactic foam, housed in a thick-walled, high-density polyethylene exterior for maximum impact, abrasion and

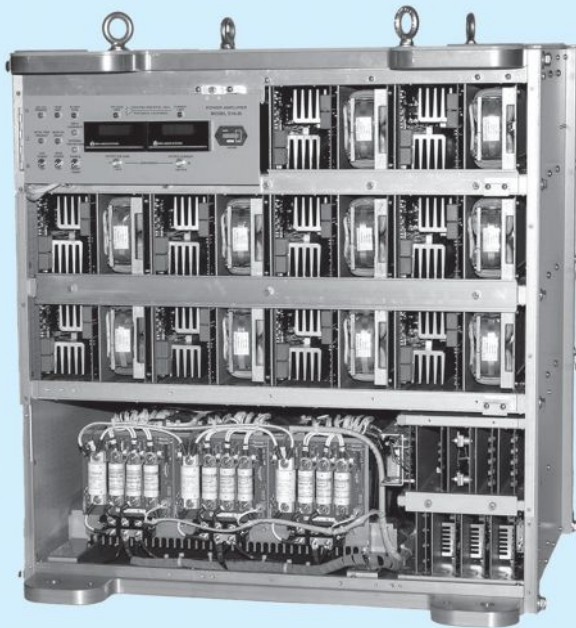
biofouling resistance. DeepWater Buoyancy Inc.

Cinematography Drone

Boxfish Luna uses advanced imaging from Sony and a 200-mm precision optical dome to capture crisp and clear imagery up to 1,000 m underwater. Filmmakers can record in full frame up to 8K 10-bit video with precision zoom control. Boxfish Research Ltd. **ST**

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Studying Fish Larvae Dispersal Could Help Conservation

How the larvae of colorful clownfish that live among coral reefs in the Philippines are dispersed varies widely, depending on the year and seasons. This Rutgers-led finding could help scientists improve conservation of species.

Right after most coral reef fish hatch, they join a swirling sea of plankton as tiny, transparent larvae. Then currents, winds and waves disperse them, frequently to different reefs.

During seven years of surveys of coral reef-dwelling clownfish, scientists measured how the dispersal of larvae varied over the years and seasonally, including during monsoons. They found that larvae dispersal varied a lot on both time scales.

Their research suggests that when scientists account for dispersal variability, rather than just using data from a single year or an average over time, estimates of the persistence of fish populations will be lower.

"That means when we don't account for dispersal variability, we could be overestimating the stability of coral reef fish populations," said researcher Katrina A. Catalano, a doctoral student in the Department of Ecology, Evolution, and Natural Resources in the School of Environmental and Biological Sciences at Rutgers University–New Brunswick.

"If we study dispersal variability in more species over greater time scales, we will better understand what causes the variation and can better design protected areas for the conservation of species."

Robot Fleet Tracks, Monitors Microbial Communities

Researchers from MBARI, the University of Hawai'i at Manoa and Woods Hole Oceanographic Institution, after years of development and testing, have successfully demonstrated that a fleet of autonomous robots can track and study a moving microbial community in an open-ocean eddy. Autonomous robotic fleets enable researchers to observe complex systems in ways that are otherwise impossible with purely ship-based or remote-sensing techniques.

In a time when the COVID-19 pandemic is reducing opportunities for researchers to go to sea, autonomous fleets offer an effective way to maintain a persistent presence in features of interest.

Oceanic microbes are essential players in the global climate system, producing roughly half of the world's oxygen, removing carbon dioxide, and forming the base of the marine food web.

Open-ocean eddies can be over 100 km (62 mi.) across and last for months. Phytoplankton thrive when these eddies spin counterclockwise in the Northern Hemisphere and bring nutrient-rich water from the depths up toward the surface.

Many marine microbes live in a ubiquitous open-ocean feature called the deep chlorophyll maximum (DCM). In this ocean layer, light from above and nutrients from below converge to create an ideal environment for phytoplankton.

Updated Workboat Delivered

Silver Ships Inc. has delivered a refurbished 48-ft. workboat to the University of Southern Mississippi (USM).

The vessel in its original state was an Endeavor 45 built by Silver Ships in 2008 for the Mississippi Department of Marine Resources (DMR).

The transformation from an Endeavor 45 constructed as a cabin patrol vessel for Mississippi DMR to an Endeavor 48 research vessel involved careful strategy, design and reconstruction. The vessel needed to be updated and refitted to serve as an offshore research vessel to support the USM School of Ocean Science and Engineering's deep-ocean underwater surveys using various UUVs. The new and improved vessel will conduct testing, maritime research and underwater surveys in the Gulf of Mexico for private and governmental partners.

How to Reach Net-Zero Carbon Emissions

Reaching zero net emissions of carbon dioxide from energy and industry by 2050 can be accomplished by rebuilding U.S. energy infrastructure to run primarily on renewable energy at a net cost of about \$1 per person per day, according to new research in *AGU Advances*.

Researchers have created the first published roadmap specifying how to achieve carbon neutrality by 2050 to limit global warming to 1.5° C and avoid the most dangerous impacts of climate change.

The researchers found the U.S. can reach zero net carbon emissions by mid-century by methodically increasing energy efficiency, switching to electric technologies, using clean electricity (especially wind and solar power) and deploying a small amount of carbon capture technology.

The pathways studied have net costs ranging from 0.2 to 1.2 percent of GDP.

Discovery of Immense Hydrocarbon Cycle in Ocean

The few hydrocarbons that trace their origin to biological sources may play a larger ecological role than scientists originally suspected.

A team of researchers at University of California, Santa Barbara and Woods Hole Oceanographic Institution investigated this previously neglected area of oceanography for signs of an overlooked global cycle. They also tested how its existence might impact the ocean's response to oil spills. They demonstrated that there is a massive and rapid hydrocarbon cycle that occurs in the ocean, distinct from the ocean's capacity to respond to petroleum input.

There are less than a dozen common hydrocarbons that marine organisms produce, including pentadecane and methane. Meanwhile, petroleum comprises tens of thousands of different hydrocarbons. **ST**

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Wave Power on Israel Grid

Eco Wave Power has started grid connection works in the Port of Jaffa, Israel. The works involve preparing the tunnels necessary for the electric cables.

The Eco Wave Power cable system will span approximately 170 m of underground cables. Due to the onshore nature of the Eco Wave Power technology, the grid connection works will not involve any cable laying on the seabed. The cable length will be significantly shorter and more cost-efficient than cables used for offshore energy projects.

Canada's Oil, Gas Industry Looks to Clean Tech

The Newfoundland and Labrador Environmental Industry Association, Noia, and the Oil and Gas Corp. of Newfoundland and Labrador are working together to accelerate awareness and the pursuit of clean technology opportunities in Canada's offshore oil and gas industry. The organizations formed a joint committee in 2019 to work collaboratively and identify priorities to advance clean technology in the offshore oil and gas industry.

In 2020, the organizations received support from the Atlantic Canada Opportunities Agency, the Department of Industry, Energy, and Technology, and the Oil and Gas Corp. of Newfoundland and Labrador to engage in a series of important studies related to clean technology offshore.

Two key studies were recently completed: the feasibility of powering future offshore oil and gas operations with clean electricity from shore; and powering existing and future operations with offshore wind energy.

Additional studies are also ongoing and focused on: defining the region's clean tech research and development strengths relevant to the oil and gas industry; emerging environmental performance measurements and expectations to ensure the local supply chain maintains

its competitiveness internationally; and recommendations on regulatory and innovation support frameworks that will drive and enable clean growth within the industry.

Information obtained from these studies will help lay the foundation for the industry to develop its approach to helping the province and country achieve net-zero emissions by 2050.

ABS Joins IWSA

ABS has joined the International Windship Association (IWSA), the nonprofit that promotes and facilitates the uptake of direct wind propulsion solutions for commercial shipping.

ABS has become increasingly involved with wind propulsion over the last few years and released its guidelines for wind-assisted propulsion system installation in June 2020. ABS is also leading the delivery of the WiSP initiative, a joint industry project established to help overcome barriers to the uptake of wind-assisted propulsion, improving prediction and validation methods, and reviewing and recommending changes to the regulatory framework related to wind-assist systems.

AIP for Wing-Sail Propulsion

DNV GL has awarded an approval in principle (AIP) to Korea Shipbuilding and Offshore Engineering (KSOE) for a wing-sail auxiliary propulsion system for ships, the result of a joint research project between KSOE, the shipbuilding holding company of Hyundai Heavy Industries Group, and SK Shipping to develop wind-powered eco-friendly propulsion solutions.

The new wing sail propulsion system can be installed on many types of vessels and is expected to further increase the efficiency of future ship operations.

The AIP is a big step toward awarding a ship DNV GL's new additional class notation, WAPS (Wind Assisted Propulsion System).

In addition, DNV GL has recently developed a standard for the certification of wind-assisted propulsion systems in response to inquiries for the independent assessment of those systems.

Blue X WEC Prototype

Edinburgh wave energy developer Mocean Energy is gearing up to deploy its scale prototype, Blue X wave energy converter (WEC), at the European Marine Energy Centre (EMEC) in Orkney, Scotland.

Mocean Energy has signed a berth agreement to test at EMEC's Scapa Flow site.

The Blue X has been fabricated at Fife fabricators AJS Production and has been funded by Wave Energy Scotland's Novel WEC program. It is a floating hinged raft with a unique geometry that improves performance and increases survivability by diving through the largest waves.

The Blue X has been transported to Forth Ports Rosyth, where the technology will be fully assembled, ballasted and wet tested. Once complete, the device will be shipped from Aberdeen to Orkney.

Shell Buys into Ireland Floating Wind Farm

Shell has purchased a majority stake in Simply Blue Energy's Emerald Project, a floating wind farm in the Celtic Sea off the south coast of Ireland. It is the latest in a string of new offshore wind ventures for European oil majors, which are all looking to apply their existing offshore engineering and project management capabilities to new revenue opportunities.

Emerald will start with an initial 15- to 25-turbine, 300-MW floating array, with plans to scale up to 1 GW over an eight- to 10-year time frame.

Simply Blue's technology partner is Principle Power, a California-based company that has installed five floating turbines to date.

The two companies are also working with French oil major Total on the Erebus floating power project off the coast of Wales, just on the other side of the Celtic Sea from Shell's Emerald Project. **ST**

Partnership to Advance Use of Uncrewed Systems

NOAA and the University of Southern Mississippi have signed a 10-year agreement to partner on ways to improve how uncrewed systems (UxS) are used to collect important ocean observation data and augment NOAA's operational capabilities. The agreement provides a framework for collaborating with NOAA scientists and UxS operators on projects to further UxS research, development and operations.

UxS have the potential to transform how NOAA meets its mission to better understand the oceans and their ecosystems. While the use of UxS is not new to NOAA—agency scientists have been experimenting with and using uncrewed systems for research for decades—the recent increase in the availability of highly capable UxS has brought a corresponding increase in their innovative use as a force multiplier for many NOAA programs. Advancing partnerships with academia will be essential to the development and use of these technologies.

Autonomy, Wireless-Helm Tech For Ship-Build Customers

Sea Machines Robotics has entered into a strategic alliance with Damen Shipyards Group to incorporate the company's autonomous and wireless-helm systems as standard features in Damen's global vessel build catalog.

In addition to installing the autonomous-command and wireless-helm systems, Damen will train users to operate Sea Machines' systems via the company's in-house simulator. Fully integrated with Sea Machines' technology, the simulator will generate a realistic marine domain in which employees and the company's clients can learn to use Sea Machines' intuitive user interface and become familiar with modern autonomous-command capabilities. These capabilities include autonomous transit behaviors and collaborative autonomy for un-

manned daughter-craft operations and pre-configured-pattern autonomy for task-based workboat missions.

Nautilus Platform in Kognifai

Kongsberg Digital and Nautilus Labs have partnered to include the Nautilus Platform fleet and voyage optimization tool in the Kognifai open ecosystem. By teaming Nautilus Platform with KONGSBERG's Vessel Insight service, the companies will deliver joint value to clients through seamless extraction, contextualization and analysis of quality vessel data for use in AI-driven performance tools.

The agreement will see the integration of Nautilus Platform within Kognifai, complementing the applications already in place from Kongsberg Digital and third-party developers. These include Vessel Insight, which provides a secure and dependable vessel-to-cloud data infrastructure which captures, aggregates and contextualizes all data derived from a vessel's sensors and other assets, transferring it for storage in the cloud.

Nautilus Labs puts machine-learning algorithms to work, deploying historical, real-time and predictive analytics to optimize fleet and voyage performance.

Development of Microsatellite For Norway

The Norwegian Space Agency has awarded Space Flight Laboratory (SFL) of Canada a contract to develop the NorSat Technology Demonstrator (TD) microsatellite. With a primary mission of testing new technologies in space, NorSat-TD will validate payloads and concepts from Norway, the Netherlands, France and Italy.

SFL, which developed the operational NorSat-1 and -2 microsatellites launched in 2017, as well as NorSat-3 expected to launch in the second quarter of 2021, has been contracted to design and build the NorSat-TD spacecraft and perform

integration and testing of all systems and payloads. NorSat-TD has completed its final design review and is slated for launch in 2022.

The Norwegian Coastal Administration relies on NorSat-1 and -2 to accurately track large commercial vessels in its territorial waters and beyond. NorSat-TD will fly technology that is planned to augment the ship-tracking capability of Norway with a miniaturized AIS receiver and aims to expand the technology available for future missions, including micropropulsion, precise point positioning and laser-based communications.

Furuno Helm Suites In New LA Pilot Boats

The Los Angeles Pilot Service has taken delivery of two new pilot boats equipped with full suites of Furuno marine electronics.

The 56-ft. Angels Pilot and Angels Navigator have been outfitted with complete integrated helm suites designed to assist in their mission of piloting ships in and out of Los Angeles Harbor, the busiest seaport in the Western Hemisphere.

The pair of Camarc-designed boats were built by Vigor Industrial in Vancouver, Washington, and have made their way to their homeport in Los Angeles, California.

Live-Fish Carrier Runs on Hybrid Power

Yanmar has delivered engines for an innovative hybrid power solution for the live-fish carrier, *Ro Vision*, which was awarded Norway's prestigious Ship of the Year Award in 2020 for its outstanding technology and design. The vessel is powered by three of Yanmar's 6EY22ALW diesel generators integrated with a 600-kW battery pack from Siemens, which together provide power for onboard systems and electric propulsion. The Yanmar engines have a selective catalytic reduction system to reduce nitrogen-oxide emissions.

With the Norwegian aquaculture and fishing industry setting its sights on the future, new boats are being built with increasing concern for the condition of the live fish, the welfare of the crew and the environment. **ST**

Innovative Icebreaker

The Finnish Transport Infrastructure Agency has launched the *Calypso*, a new icebreaker concept boat equipped with an innovative hybrid motorized removable bow powered by Danfoss Editron. The icebreaker vessel is currently moored in Mustola harbor in Lappeenranta and has begun operating on Lake Saimaa and the deep waterways of the surrounding area.

The removable bow, the world's largest motorized of its kind, has been delivered by Turku Repair Yard as part of the Winter Navigation Motorways of the Sea II project. The €7.6 million scheme, co-funded by the EU Connecting Europe Facility program, aims to develop and enhance the maritime winter navigation system and its safety. One of its key targets was the creation of a motorized icebreaking removable bow concept, which would enable ice-strengthened vessels to be used as icebreakers during the winter. This bow is capable of breaking ice up to 70 cm thick.

Online FarSounder Training

FarSounder has launched an online training platform. The first program to be released in the series is the FarSounder Technician Training. This online class allows students to gain an in-depth understanding of how to commission, service and maintain the Argos series of 3D forward-looking sonars.

The virtual program creates a learning environment that allows technical professionals to gain the knowledge they need on their own schedule, from anywhere in the world, at any time.

NOAA Report on North Atlantic Right Whales

NOAA Fisheries has published an assessment of regulations issued in 2008 to reduce deadly vessel strikes with endangered North Atlantic right whales, of which only about 360 remain. NOAA Fisheries found that vessels are ignoring voluntary and, in some cases, man-

datory speed zones, putting North Atlantic right whales in harm's way.

The assessment is consistent with Oceana's analysis last year that found ships ignoring a voluntary speed zone in an area south of Nantucket designed to protect endangered North Atlantic right whales.

Remote DP Courses

Kongsberg Digital (KDI) and the Nautical Institute have introduced an approved remote simulation solution for Dynamic Positioning (DP) Induction Courses. This has been developed by KDI to support training centers worldwide during the COVID-19 pandemic lockdowns and has now been approved by the Nautical Institute.

Since the start of the pandemic, KONGSBERG has been ramping up the delivery of cloud-based e-learning and remote training solutions to support education and training institutes and meet the challenges imposed by the impossibility of carrying out tuition in a physical classroom situation. The latest addition to its cloud-based simulation training solutions is a remote DP simulation application, which enables instructors to continue providing their students with mandatory DP simulation-based education through remote access to KONGSBERG's K-Sim DP technology.

By temporarily approving remote simulation training, the Nautical Institute is helping the industry to maintain mandatory DP skills through the pandemic crisis. The remote training solution is valid until April 1, 2021, with the option to further extend approval depending on the coronavirus situation.

Evidence of MPA Benefits

Researchers at the University of California, Santa Barbara and the California Department of Fish and Wildlife sought to determine to what extent the spillover effect from marine protected areas (MPAs) compensated for the fishing grounds incorporated into marine reserves. They leveraged catch reports from

lobster fishermen, as well as scientific surveys. Their results affirm the benefits that MPAs confer to fisheries and ecosystems.

The team compared lobster populations and catch records from waters off the coast of Santa Barbara and Goleta. From 2012 through 2018, divers conducted surveys of the size and abundance of lobsters at five sites studied by the Santa Barbara Coastal Long Term Ecological Research program (SBC LTER), which is part of the National Science Foundation's LTER network. Three of these reefs have always been open to fishing, while two of them (Isla Vista and Naples reefs) were incorporated into two marine reserves in 2012.

The team observed that the number and overall biomass of lobsters increased in and around the marine reserves once fishing was prohibited. This suggested that lobsters were indeed proliferating inside the reserves and spilling out into surrounding areas, just as predicted by the theory.

They also found that annual lobster landings more than doubled in the fishing block with the two MPAs during the six years after their establishment, despite the 35 percent reduction in fishing area in that block. In contrast, the annual catch in blocks without MPAs remained relatively unchanged over that time span.

This study is one of the first to quantify and document that the establishment of marine reserves actually enhances catch, despite reducing the area for allowed fishing.

ROV to Facilitate Seashell Collection in the Deep

ScubaCom has a specimen seashell permit in South Australia (SA) closely managed by the SA Fisheries Department. The company aims to ensure every seashell sold has been collected under strict environmental management.

Most seashell collection will be done with a JW Fishers' Sealion-2 ROV, depth-rated at 300 m. The ROV has a modified manipulator arm with docking station to scoop up seashells effortlessly. **ST**

contracts

MacGregor, part of Cargotec, Helsinki, Finland, has secured an order to deliver 36 traction winch systems, 72 storage reel brakes and electrical control systems to the specialized concrete mat sinking unit ARMOR 1, currently under construction at Thoma-Sea Marine Constructors in Louisiana for the U.S. Army Corps of Engineers. SIA Solutions LLC.

RINA, Genoa, Italy, has signed a joint development project agreement to develop a ground-breaking ship design capable of being fueled by ammonia or methanol. Shanghai Merchant Ship Design & Research Institute.

Ellicott, Baltimore, Maryland, has shipped two dredges to Bangladesh to continue supporting the country's dredging efforts. The Ellicott Series 2070 (20-in./500 mm) Dragon dredges will join dozens of other Ellicott 18-in. (450 mm) and 20-in. (500 mm) dredges currently involved in projects to keep rivers flowing and flood risks at bay. Undisclosed.

Kraken Robotics Inc., St. John's, Canada, has received a subsea battery order totaling \$1.5 million and funding awards for \$2.0 million across three projects. Undisclosed.

Wärtsilä, Helsinki, Finland, has signed a five-year agreement for optimal maintenance to reduce the fuel consumption and emissions of two offshore well intervention vessels using the latest digital technology for real-time monitoring and support. Siem Offshore.

Stream Marine Training, Paisley, Scotland, has been made the preferred provider of MCA STCW approved training courses to seafarers that need to update their mandatory safety critical training. Stellamar.

Svitzer A/S, Copenhagen, Denmark, has signed an agreement to jointly develop RECOTUG, the world's first fully operational and fully remotely controlled tugboat. Kongsberg Maritime and ABS.

Sterling PlanB, Vancouver, Canada, has a new partnership to expand access to purpose-designed energy storage solutions to marine customers in the Netherlands, Belgium and Luxembourg. Gebhard Electro.

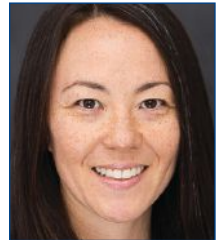
Marlink subsidiary Telemar, Hamburg, Germany, has signed a service maintenance deal to deliver bridge maintenance services across 50 vessels. Fairplay Towage.

The Nippon Foundation-GEBCO Seabed 2030 Project, London, England, has signed a letter of intent to establish a partnership to assemble a global compilation of high-resolution bathymetric data. Global Multi-Resolution Topography Synthesis Project at Columbia University's Lamont-Doherty Earth Observatory.

Ocean Technologies Group, London, England, will help provide industry stakeholders in maritime learning with a single, end-to-end learning journey, combining on-demand digital training and assessment, virtual and simulation events via cloud-based solutions, and in-person learning experiences at maritime training centers or aboard ship. Wärtsilä Voyage. **ST**

people

Janice Yasui has joined Teledyne RD Instruments' team in San Diego, California, as a subject matter expert. She will work collaboratively with engineering, sales and marketing to advance the technology and market applications for Teledyne RDI's full line of acoustic Doppler products. She has served as a quartermaster in the U.S. Coast Guard and as a hydrographer at NOAA.



MacArtney Underwater Technology has appointed **Saurabh Sharma** as regional sales manager to offer the full MacArtney product line, system solution technology and expertise to customers in India and the Middle East. Sharma joins MacArtney from Fugro. His focus will be developing the commercial marine business and expanding sales in the ocean science and naval sectors.

Oceanic Systems (UK) Ltd. has promoted **Ryan Pannell** to the main board of directors as engineering director. He joined Oceanic in 2016 as a development engineer and quickly progressed to engineering manager.

Alisa Preston has joined Global Diving & Salvage Inc. as director of marine technology. She will lead the growth of Global's underwater technology resources, supporting existing business lines while creating new opportunities.

Dr. Ike Irby has been named policy adviser in the Office of U.S. Vice President Kamala Harris. Irby previously served as a senior policy adviser to Harris in the U.S. Senate, where he covered climate, environment, energy, transportation and infrastructure.

Sea Machines Robotics has promoted **Phil Bourque** to the role of business development and sales director for the U.S. government. He will advance government contracts and related special projects.

Caterpillar has appointed **Alex Berg** as new global head of pleasure craft and yachting. He will help strengthen customer relationships. **ST**

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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 oysters were used for shellfish cultivation, according to the joint study. [3-28SEA.MOS](#)

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 into the summer. The prototype, an improved version of the laser weapon system, will be installed on the USS Ponce for at-sea testing in the Persian Gulf. Navy leaders have made directed-energy weapons a top priority to counter what they call asymmetric threats. Gulf Navy leaders have made directed-energy weapons a top priority to counter what they call asymmetric threats. Gulf Navy leaders have made directed-energy weapons a top priority to counter what they call asymmetric threats. [3-28SEA.MOS](#)

Ferry Sinks Off Coast of South Korea
With 400 passengers onboard, a ferry sailing from Incheon, South Korea, to the island Jeju sank near the southern tip of South Korea Wednesday, near the southern tip of South Korea Wednesday, near the southern tip of South Korea Wednesday. [3-28SEA.MOS](#)

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 on the Virginia-class ships will receive a pay raise. The increase in pay comes as an effort by the Navy to attract and retain sailors. The increase in pay comes as an effort by the Navy to attract and retain sailors. [3-28SEA.MOS](#)

US Senate Reviews DOE Budget Request
For fiscal year 2015, the Department of Energy requested \$21.8 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. [3-28SEA.MOS](#)

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 of the plane, and night vision cameras are being used in the effort to scan the waters off the coast of Northwest Australia. Chris Johnson from Naval Sea Systems Command told Sea Technology how the U.S. Navy is helping in the search. [3-28SEA.MOS](#)

2014 Sea Technology Buyers Guide Now Available
Published annually by Compass 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, national government organizations, educational institutions, oceanographic research vessels and geophysical survey vessels.

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meetings

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

MAY

May 4-6—AUVSI XPONENTIAL, Virtual. www.xponential.org.

May 18-20—Aquaculture UK, Aviemore, Scotland. +44 (0)1453 836363, www.aquacultureuk.com or carvonio@divcom.co.uk.

JUNE

June 8-10—Capitol Hill Ocean Week, Virtual. <https://marine-sanctuary.org/capitol-hill-ocean-week-2021>.

June 15-17—Seawork and Marine & Coastal Civil Engineering Expo, Southampton, England. www.seawork.com and www.mcceexpo.com.

June 28-29—Floating Wind Solutions, Houston, Texas. <https://float-ingwindsolutions.com>.

AUGUST

August 16-19—AUVSI XPONENTIAL, Atlanta, Georgia. www.xponential.org.

August 16-19—Offshore Technology Conference, Houston, Texas. www.otcnet.org.

August 17-18—CLEAN PACIFIC, Renton, Washington. www.clean-pacific.org.

August 23-27—World Water Week, Virtual. www.worldwaterweek.org.

August 31-September 2—MAST Europe, Toulon, France. <https://mastconfex.com/europe2021>.

August 31-September 2—Subsea Tieback, Galveston, Texas. www.subseatiebackforum.com.

SEPTEMBER

September 7-10—SPE Offshore

Europe, Aberdeen, Scotland. +44 (0) 1224 253807, gillian.george@bigpartnership.co.uk or www.offshore-europe.co.uk.

September 13-17—London International Shipping Week, London, England. +44 1296 682104, ljacobs@elabor8.co.uk or <https://londoninternationalshippingweek.com>.

September 20-22—Oi Middle East, Abu Dhabi, United Arab Emirates. www.oceanologyinternationalmidlleast.com.

September 20-23—OCEANS 2021 San Diego – Porto, California and Virtual. <https://sandiego21.oceans-conference.org/global-oceans-2021-san-diego-porto>.

September 20-24—NMEA/RTCM Conference & Expo, Anaheim, California. 410-975-9425, enauer@nmea.org or www.expo.nmea.org.

OCTOBER

October 12-14—Ocean Business, Southampton, U.K. www.oceanbusiness.com.

October 26-27—Offshore Energy, Amsterdam, Netherlands. www.offshore-energy.biz.

NOVEMBER

November 2-5—Aquatech Amsterdam, Amsterdam, Netherlands. +31 (0)6 51815306 or a.koomen@rai.nl.

November 16-17—Subsea Asia, Kuala Lumpur, Malaysia. www.subseauk.com/11668/sub-sea-asia-2021.

November 16-18—CLEAN GULF, San Antonio, Texas. www.clean-gulf.org.

November 24-25—Marine Renewables Canada, Halifax, Canada. 902-717-0716 or amanda@mari-nerenewables.ca.

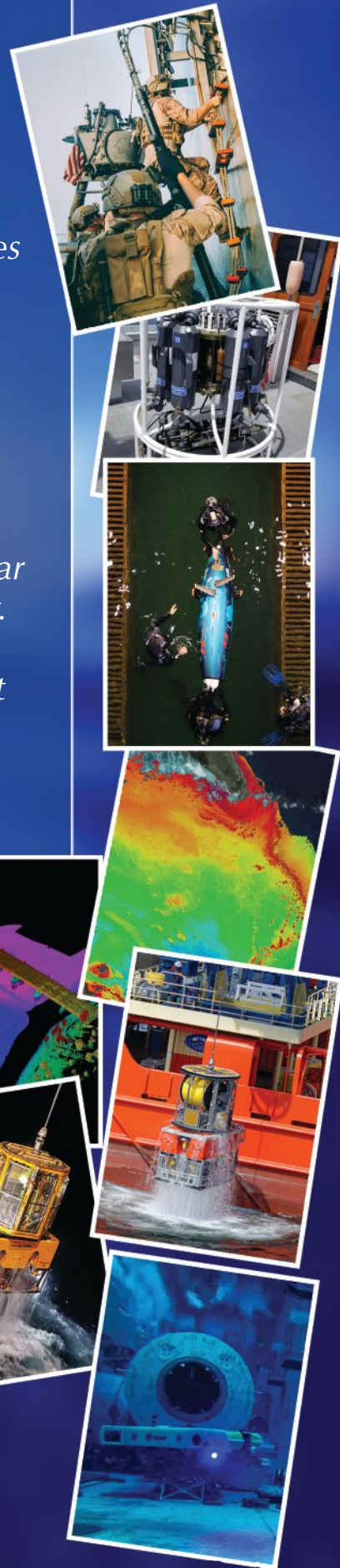
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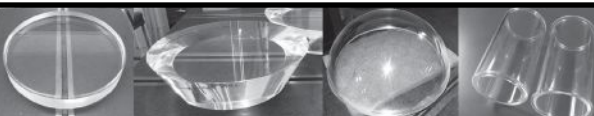
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International Cooperation Will Accelerate Polar Research—John Woods

John Woods is the deputy director of the U.S. Navy's International Engagement Office. His areas of focus include the polar regions. Prior to this position, he did polar-focused work with NOAA at the U.S. National Ice Center and NASA with Operation IceBridge. Woods is also a retired U.S. Navy Reserves meteorology and oceanography officer, and he is a graduate of the United States Naval Academy.



A meet was being hosted by the Joint Arctic Command (JACO) in Nuuk, Greenland, to organize and plan the next steps toward getting a seven-nation cooperative polar agreement one step closer to signature. This was the third meeting of its type since the idea's inception in 2015.

Military services from the U.S., Canada, Denmark, Sweden, Norway, Finland and New Zealand (this agreement covers both Arctic and Antarctica's polar regions) have been in negotiations to get this landmark agreement toward "going into force."

The agreement is a framework memorandum of understanding (MOU) titled the International Cooperative Engagement Program for Polar Research (ICE-PPR).

The ICE-PPR MOU initial meeting was hosted by Finland in 2016. During the coffee break, I had a discussion with Denmark Joint Arctic Command's Maj. Gen. Kim Jesper. The presentation just prior to the break highlighted the need for more observations in the High Arctic to increase the accuracy of numerical weather prediction models, which are critical for safe operations in high latitudes. The major limiting factor to more observations is deployment costs. Jesper signaled to his operations officer, who was also in attendance, and told him: "Make this happen."

Just over three months later, a team from the University of Washington, U.S. Navy, Environment Canada and the U.S. buoy manufacturer LBI Inc. arrived at Thule Air Force Base in Greenland, the Top of the World. The team worked closely with the U.S. Air Force meteorology team, the Danish-led Air Operations team and the Royal Danish Air Force as a C-130 was scheduled to assist with two flights over the North Pole to drop these valuable weather sensors. The effort was coordinated by the International Arctic Buoy Programme (IABP).

"The ability to access partner military aircraft for buoy deployments allows for specific targeting to fill gaps and more effectively maintain an optimally spaced Arctic observing network," said the IABP coordinator, Dr. Ignatius Rigor (University of Washington, Polar Science Center).

Four years after the ICE-PPR MOU initial meeting, the seven participant countries signed the agreement into effect in November 2020. This allows the exchange of information to harmonize participants' defense and national security requirements and better define future cooperative efforts in the polar regions.

The ICE-PPR Executive Steering Committee (ESC) will gather representatives of each participating nation to evaluate past efforts, consider current focus areas, and examine projects and exercises of interest for future collaboration.

To advance shared goals, initially, there are four ICE-PPR working groups to explore, study and report on issues related to environmental, human performance, platforms and situational awareness focus areas.

The MOU was signed during the COVID-19 pandemic, so the first official meetings have been held remotely. Norway plans to host the 2021 ESC Annual Meeting, pandemic travel permitting.

The four working groups (environmental, human performance, platforms and situational awareness) have held regular meetings both at the national (U.S. only) and international (all participants) levels for the past year in preparation for the MOU signature. With the MOU now in effect, the working groups are developing project arrangements to identify new collaborative work at the international level.

Project topics are currently being explored that focus on increasing observations, human factors and polar communications.

Once a project topic is identified, all participants are given an opportunity to contribute both personnel, funding and resources (labs, platforms, ranges, geographic area) to the effort.

A unique aspect of this agreement is the inclusiveness across all services within the ministry/department of defense (MoD/DoD) of each participant. This allows for efficiency, and any service may leverage the ICE-PPR MOU. Additionally, subject matter experts from other government agencies, academia and industry may also contribute to the forum's activities by entering into arrangements with the MoDs/DoDs of their respective nations.

The current ICE-PPR U.S. Executive Steering Committee member is RAdm. Lorin Selby, the chief of Naval Research. Selby also coordinates with his service counterparts from both the U.S. Air Force and U.S. Army to ensure a unified Department of Defense approach. ICE-PPR is also represented within the broader U.S. polar research community through an Interagency Arctic Research Policy Committee (IARPC) self-forming team.

The ICE-PPR MOU will remain in effect for 25 years and will allow for the long-term sharing of interests in a strong cooperative relationship that will preserve safe, stable and secure polar regions. **ST**

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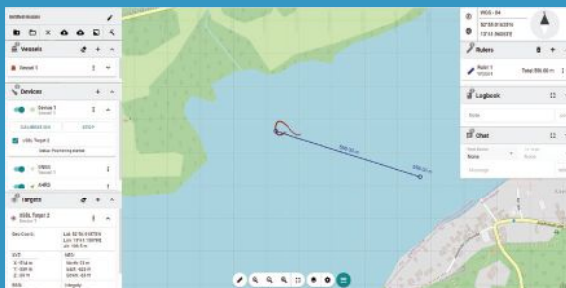
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