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FEATURE STORY

Non-Floating Oils

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A vibrant underwater photograph featuring a bottlenose dolphin swimming gracefully towards the camera. The dolphin is positioned in the upper left quadrant of the frame. The background is a clear, light blue water. In the foreground, there's a dense growth of green sea fan coral on the left and various other coral reefs and rocks covered in green algae in the lower right. The lighting creates a soft glow around the dolphin and the surrounding marine life.

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10



FEATURES

- 10 Non-Floating Oils**
Response Challenges
- 22 MTS/MUV Company Spotlights**
- 32 Manned Submersible Operations**
- 34 Looking Ahead:**
Wood Mackenzie
- 42 Going the Distance**
with ICTINEU 3

DEPARTMENTS

- 14** Ocean Science & Technology
- 25** Offshore Energy
- 36** Subsea Intervention & Survey
- 46** Communication & Subsea Cables
- 51** Defense

IN EVERY ISSUE

- 8** Editorial
- 54** Stats & Data
- 58** Events
- 63** Ocean Industry Directory
- 70** Milestones



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The SEAmagine manned submersible conducting field operations..



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EDITORIAL

DR. MICHAEL HARVEY
Sales & Marketing/Special Projects
Triton Submarines, LLC



MANNED SUBMERSIBLES: The Next Chapter

Owning and using a submersible offers experiences that are truly transformative. Even for those who have spent decades scuba diving, the ability to spend up to 10 hours underwater in air-conditioned comfort, talking and breathing normally—at depths far below those possible even with technical scuba gear—viewing the underwater world through a clear acrylic sphere, and with no decompression necessary when back on the surface, seems magical. For those with no previous underwater experience, diving in a submersible is even more astonishing and remarkable. In the submersible industry, we know that the most important thing in closing a deal is getting a potential client down for a dive; they come up from their first dive gushing with enthusiasm and often ready to sign on the dotted line.

Those experiences and the rising trend to document and broadcast what you see and what you've done to the world at large via social media are part of a changing market in yachting and the submersible industry. One of the fastest growing segments of the yachting industry today is the expedition yacht market; many people are no longer content to just host parties at the dock, but they also want to travel (and be seen to travel) to exotic and far-flung locations around the globe. Submersibles allow an extra dimension to that travel, in that not only can you see the underwater seascape, but in almost all of those locations you can be assured that you and your fellow sub passengers are looking at things no other human has ever seen before.

The truly remarkable thing about this rising market is how common it has become for the individuals who can buy multimillion-dollar submersibles and the even more expensive yachts on which they are based to use them as research tools and film platforms. Most wealthy owners can't spend extensive periods on their yachts anyway, and many make their subs available for filming or scientific data collection projects when they are not there (though some like to be present and participate). Privately funded submersible-based research programs have started to fill a hole in the void left by the decline of government-funded underwater research, and if this trend continues we should see an increase in deep-sea scientific expeditions and research publications—good news for everyone.

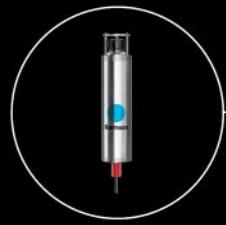
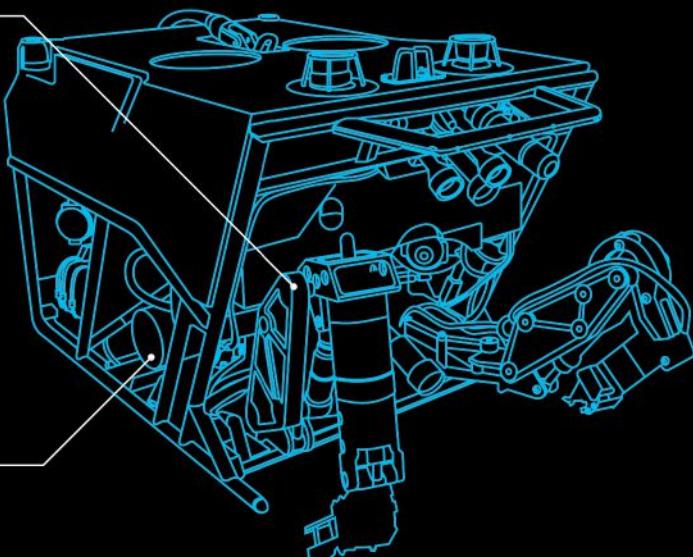
This has, therefore, driven another change in the submersible market. No longer is it enough to simply make expensive toys for the wealthy; we now include as options all the tools necessary to transform deep-diving submersibles into serious research, film, and work platforms. This requires a lot of forethought and design to be effective—not only do you need hardware that can easily be attached, removed, and interchanged, but you also need to integrate electronic capability and software programs. The challenge for the submersible industry today is to create a platform in which this integration can be done seamlessly on a vehicle that can perform the widest of tasks.

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NON-FLOATING OILS:

Response Challenges Lead to Unique Underwater Intervention Strategies

BY DAVID USHER, *chairman, Marine Pollution Control Corporation (Detroit, MI)*
& CHARLES KOHNEN, *president, SEAmagine Hydrospace Corporation (Upland, CA)*

In 2005, a barge containing a heavy slurry oil struck an oil rig displaced by Hurricane Rita and spilled over 1 million gallons. The oil immediately sank to the bottom due to its chemical makeup, rendering traditional, surface-based response techniques largely ineffective. Over 175,000 gallons of the oil were recovered by MPC using its proprietary pumping methodology, deployed by a large team of divers. This case resulted in renewed research into techniques for submerged oil spill response, including the use of manned submersibles.



Current Trends in Non-Floating Oil Use, Transport, and Response in North America

Observation of and concern over non-floating oils (NFOs) is by no means a new topic, according to Marine Pollution Control Corporation's (MPC) founder and chairman David Usher. Usher's oil spill response company celebrated its 50th anniversary this summer, but his roots go further back in the oil reclamation business and he recounts that as early as the 1940s it was "his family's business to develop and utilize techniques for handling submerged oils involving the application of heat or other methods for the effective handling and transportation of these products."

Today, the notable increase in the extraction and distribution of the non-conventional crude stocks from the Bakken formation in the U.S. and the Alberta oil sands formation in Canada is a primary driver of new discussion, with the topic often centered on methods for responding to spills of these heavy products. To address the unique response tactics that must be employed when dealing with spills that disappear from view when spilled in water, the U.S. Coast Guard in 2016 created a new way of classifying response organizations that are capable of dealing with a spill that presents itself below the water's surface.



Why do oils sink?



Considerations on the Fate and Behavior of Non-Floating Oils in Marine Environments

There are several grades and types of heavy oils that may or will sink in marine environments. The processes and reasons for this have been observed in the field and subsequently studied, classified, and documented by a number of spill response experts. This has resulted in a set of principles that can be applied during a marine spill event to determine if a subsurface trajectory potential exists.

Speaking in general terms, the processes below have been identified as leading to a submerged or sunken oil spill.

- The chemistry of the oil spilled is such that its specific gravity exceeds that of the water into which it is spilled (most commonly considered at 1.0 for pure water and 1.02-1.03 for salt water at standardized temperatures). In these cases, the oil will immediately sink when released. These oils are classified as Group V oils.
- The chemistry of the oil spilled is altered through weathering or evaporation such that the lighter ends are removed and the specific gravity then exceeds that of the water into which it has been released.
- Physical processes such as wave action, strong currents, and temperature conditions may promote the submergence of oil. These processes can also determine if the oil remains submerged and suspended within the water column, gather on the bottom as sunken oil, or will refloat.
- The oil becomes mixed with sediment or fines present in the water, causing it to acquire a higher density and leading it to submerge or sink. It should be noted that oil that is submerged or sinks because of such processes may then be subject to additional physical processes (such as warming), leading to the oil separating from the sediment and possibly refloating to the surface.

Submerged and Sunken Oil Spills: Grey Responses Leading to Research Efforts

There have been a number of incidents involving oils that have submerged or sunk in the last 20 years, all of which (along with earlier incidents) continue to inform and shape the current discussions.

In 1996, a spill of coal tar oil into the Detroit River during harsh winter conditions led to a recovery effort that included diver-assisted pumping, clamshell dredging, and a decanting process that involved a carbon filtration methodology. In 2004, the tanker *Athos I* suffered a casualty in the Delaware River, resulting in the release of over 200,000 gallons of heavy Venezuelan crude oil (normally classified as a Group IV oil). The oil from the *Athos I* was discovered to have a submerged component, which forced the unplanned closure of a nuclear power facility whose water intakes were located downstream of the spill site. The response to the 2005 DBL 152 barge incident in the Gulf of Mexico, which involved a submerged oil spill of over two million gallons of clarified slurry oil that immediately sank when released, served as the focus point for a comprehensive review of response practices and potentials in the U.S. Then in 2010, a large spill occurred on the Kalamazoo River in Michigan involving a Canadian oil sands product. This incident not only provided new data and created unique response challenges and methodologies, but also brought to the forefront new

risk parameters. Studies on the fate of submerged oil from the Deepwater Horizon incident will continue to inform us as they are released, analyzed, and discussed.

The DBL 152 oil spill served as a powerful catalyst for submerged oil response research. A series of multi-discipline efforts conducted by the U.S. Coast Guard Research and Development Center resulted in a substantial amount of relevant data and the release of two important reports that are available for download. The 2009 report *Heavy Oil Detection (Prototypes) Final Report* (Report No. CG-D-08-09, Kurt Hansen et al) describes a series of experiments on innovative submerged oil detection techniques, including the use of oil-discriminating multi-beam sonar and fluorescence polarization (FP) technologies. This work was then expanded upon to include the capability to recover submerged oil subsequent to detection, with three unique and promising technologies developed and investigated. Prototypes of all three systems were successfully tested at the OHMSETT facility in Leonardo, New Jersey, including a unique approach developed primarily between Usher's MPC and Charles Kohnen's SEAmagine Hydrospase Corporation involving the use of Manned Underwater Vehicles (MUVs).



The response to the 2005 DBL 152 barge incident in the Gulf of Mexico, which involved a submerged oil spill of over two million gallons of clarified slurry oil that immediately sank when released, served as the focus point for a comprehensive review of response practices and potentials in the U.S.



In 2011, MPC and SEAmagine tested submerged oil detection and recovery concepts at the OHMSETT Facility in Leonardo, New Jersey. During the test, the equipment was able to detect the oil placed in trays at the bottom of the test tank, then recover the oil, which was heavier to 140,000 cSt, through a heated suction device into a decanting system topside.

Inside the 1 atmosphere cabin, the manned submersible's pilot and the oil recovery technician can monitor an array of oil detection and control the suction nozzle into the mass of oil. The manned submersible can hold position over the oil mass without disturbing it or pushing oil into the sediments.



The Use of Manned Submersibles for NFO Response Operations

Using a set of design criteria that included rapid deployment capability, maximizing the effectiveness of each work shift underwater, reducing the hazards associated with diving operations, minimizing operational logistic burdens, and minimizing environmental impacts, MPC and SEAmagine designed and successfully tested, first in the field and then at the OHMSETT facility, a submerged oil recovery system based on novel pumping systems and using a MUV to control the underwater recovery itself.

The use of pumping techniques to recover submerged oil from subsurface environments is a technique proven during multiple spill response operations in the United States and overseas. The pump creates a negative pressure area at the recovery "skimmer" head, which draws oil (and water) into the pump and then transfers it to the surface via a hose for reclamation, treatment, or disposal. The "skimmer" head must be carefully directed into the submerged oil, a task that was normally undertaken by commercial dive teams is now replaced by a manned submersible.

"This new approach provides key benefits such as allowing pumping at depths exceeding 300 meters, reducing the need for large teams of commercial divers, increasing the working bottom time, and minimizing health and safety hazards", says Charles Kohnen of SEAmagine.

"The submersible's hovering capability reduces physical interaction with the contaminated bottom, increases visual access to bottom topography and the areas of contamination, reduces cross contamination and contaminant dispersal, and improves collection efficiency. The presence of an experienced oil recovery specialist in the 1 atmosphere submersible itself, with a direct view of the work area, and helped with various oil detection technologies, enables the maximum utilization of human abilities in the recovery process."

The MUV incorporated into the system was designed by SEAmagine and is a fully ABS (American Bureau of Shipping) classed 330 meters depth rated submersible featuring a transparent, spherical, two-person dive chamber with precise maneuvering and hovering capabilities. The submersible's effectiveness can be enhanced with specialized oil-discriminating multi-beam sonar and fluorescence polarization technologies, underwater lighting, underwater video equipment, recovery flow visualization equipment, georeferencing navigation, forward-looking sonar, and subsea communication. The MUV is connected to the pumping apparatus by means of a breakaway plate for emergency egress and uses a robotic arm to hold the skimmer head nozzle at the oil mass during recovery operations. This special skimmer is heated during recovery, and the suction and transfer

hoses comprising the transfer portion of the umbilical system may also be heated to aid in releasing oil into the system and ensuring that it flows smoothly to the surface. Pumping flow is controlled at the surface while a bypass valve at the skimmer head nozzle, controlled by the submersible operator, provides the ability to regulate intake of water and oil. The submersible operator also has control of the angle of deployment and reach of the skimmer nozzle using the robotic arm.

This new approach was successfully tested by MPC and SEAmagine in freshwater in Detroit, Michigan and at OHMSETT's facilities in New Jersey. Based on the results derived from the OHMSETT tests, upgrades to the suction nozzle mounted on the submersible have been developed.

"We are looking to adjust aspects of our design to maximize yield during deployments," says Usher. "In particular, a low-impact method for introducing heat at the intake through closing the heated water system into a loop that will improve oil flow into the recovery system without displacing the oil in the water column is one of our design goals." Based on the results and trajectory of the joint team's research and development to date, a viable system is now ready to take on the challenges of submerged oil response in conditions conducive to manned underwater interventions.

SUBSEA UK and SCOTTISH ENTERPRISE launch £15 million R&D Funding Call for Underwater Innovation

Subsea UK, in partnership with Scottish Enterprise, has opened an R&D funding call for innovation projects to drive forward research and development projects between Scotland and Japan that will help solve the industry's most complex technological challenges.

The project forms part of the Memorandum of Understanding (MOU) that was signed between Scottish Enterprise and Japanese philanthropic organization The Nippon Foundation at SPE Offshore Europe in September.

The strategic agreement aims to help both countries capitalize on opportunities in the growing subsea sector. The two parties will provide equal funding, totaling approximately £15 million to support joint projects between the two countries that maximize the use and development of digital technologies and challenge conventional industry methods and techniques.

Subsea UK, in partnership with Scottish Enterprise, and with support from NSRI and ITF, will coordinate and pioneer a program of research and development activities to accelerate the introduction and adoption of new and disruptive technologies.

The joint projects will address challenges identified by industry, capitalizing on Scotland's world-renowned subsea engineering expertise to develop solutions that will push the boundaries and increase each country's respective share of the sector—which is worth approximately £50 billion annually.

The extensive collaboration work with Japan will make a strong contribution to the delivery of the Subsea Engineering Action Plan, launched by Scottish Enterprise earlier this year, with the aim of capturing an even bigger slice of the £50 billion global subsea market by Scottish companies.

Neil Gordon, chief executive of Subsea UK, commented: "Scotland already accounts for 14% of the global subsea market, with approximately 370 companies generating an estimated annual turnover of £7.5 billion. Our experience and reputation means we are ideally positioned to work with Scottish Enterprise and The Nippon Foundation, supporting their ambitions for the sector."

ITF will provide additional expertise and specialist knowledge to support the technical management of the call process. As the industry expert in this area, ITF has many years of experience in conducting technology R&D calls for the oil and gas industry and has put in place a support mechanism with Subsea UK to ensure the learning and knowledge from the organization can be brought to each project.

David Rennie, head of oil and gas at Scottish Enterprise, added: "We have worked closely with Subsea UK and NSRI over the past three years to pull this initiative together and it's extremely encouraging to finally see our efforts come to fruition. This is a major deal that will see Scotland and Japan work collaboratively to pioneer the technology needed to overcome even the most complex of challenges faced by the subsea industry, now and for decades to come."

A series of lunch and learn workshops will be arranged and hosted at Subsea UK offices over the next few months to assist companies with the application process.



Call for
Submissions

Organizations are being asked to step forward for support by identifying how their ideas, products and services meet the needs of the evolving subsea sector.

Applications are being sought under the following themes:

- Subsea digital oilfield technologies (real-time underwater communication, inspection, monitoring and control, subsea sensors, robotics and artificial intelligence)
- Subsea oil and gas innovation (well productivity and intervention, well design, low-cost drilling, decommissioning, subsea factory, remote monetization, and challenging field development)

Companies can submit an expression of interest via the Subsea UK website up until March 2018 with full proposal applications due by June 2018.

For more information, visit
[www.subseauk.com/9122/
subsea-research-development-funding](http://www.subseauk.com/9122/subsea-research-development-funding).

The Underwater Centre Provides Kawasaki AUV Testing Site

The Underwater Centre, a world-leading provider of subsea testing and training and based on the tidal waters of Loch Linnhe in Fort William, has successfully supported the delivery of a complex Autonomous Underwater Vehicle (AUV) operational testing project in collaboration with Kawasaki Heavy Industries, Ltd (KHI).

This significant 15-day operational trial was planned for almost two years and involved the use of workshops, vessels, deepwater test sites, ROVs, and specialist support staff, amongst other assets.

With a focus on the growing demands for pipeline maintenance in the offshore oil and gas fields, Kawasaki has been developing cutting-edge component technologies of AUVs, utilizing the sophisticated underwater vehicle technologies deployed by Kawasaki internally.

The operational subsea trial used a prototype AUV and charging station; tasks included automated docking of the AUV to the in-water charging station, contactless charging, and large-capacity optical communication tests.

Experienced and specialist support was provided to Kawasaki to deliver deployment, operational, and recovery assistance utilizing the Centre's array of transport vehicles, crane, WROV, and vessels.

The Underwater Centre provided the use of its mechanical workshop to allow Kawasaki to prepare the AUV to help ensure that the team and equipment were well prepared for the testing phase. The Centre's ROV team mobilized both WROV and OBSROV assets in support of the deployment of a test station and provision of footage of the AUV in the water.



During the trial, representatives from major oil and gas companies, underwater vehicle and equipment operating companies, UK subsea scientific organizations and government agencies attended the Fort William test site to view demonstrations.

The Centre's unique location can accommodate various complexities of trials and testing projects, owing to the mixture of facilities, equipment, and staff; deepwater subsea testing site down to 150 meter; 500 meter private pier; electrical and mechanical workshops; 1.5m litre onshore tank; training and testing areas; and land and water-based vehicles, including work boats, FRCs, ROV vessels, diving barges, crane, fork lift, and transport vehicles.

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The advertisement features a large photograph of a white cruise ship sailing through icy waters, with snow-covered mountains in the background. The FAR Sounder logo is prominently displayed on the left, and the tagline "A WHOLE NEW VISION UNDERWATER" is below it. At the bottom, the slogan "Navigate with Confidence" is written in large, bold letters, followed by "3D Forward Looking Sonar" and the website "www.farsounder.com/polar".

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Supported by KONGSBERG experts and technology, the GEBCO-NF Alumni Team, one of 19 semi-finalist teams competing in the \$7 Million Shell Ocean Discovery XPRIZE competition, has completed Technology Readiness Tests of its unique Unmanned Surface Vessel (USV) / Autonomous Underwater Vessel (AUV) concept and associated combination of communications hardware and software to process and transmit data remotely. The test event was held on the fjord outside KONGSBERG's factory in Horten, Norway on 23 November 2017.

All Shell Ocean Discovery XPRIZE teams will hold testing site visits around the world for Round 1, which starts in November and continues until February 2018. XPRIZE officials in attendance at each test site will gather data on the teams' performance, which will be assessed against 11 key measurement criteria. All teams that meet these criteria will progress to the next round of field tests, with an announcement expected in March 2018. The assessment criteria have been designed to assess whether teams would have been capable of passing the originally planned Round 1 field tests, which were cancelled due to severe hurricane damage in Puerto Rico.

The Shell Ocean Discovery XPRIZE is a global competition challenging teams to advance deep-sea technologies for autonomous, fast, and high-resolution ocean exploration. The prize will stimulate even greater exploration and mapping of the ocean floor, helping to uncover our

planet's greatest wonders and resources for the benefit of humanity.

The GEBCO-NF Alumni Team's concept utilises a SEA-KIT unmanned surface vessel, USV Maxlimer. The SEA-KIT vessel has been built by Hushcraft in the UK. USV Maxlimer performed faultlessly during the Technology Readiness Tests event, where the team demonstrated the USV's unique ability to launch and recover a KONGSBERG HUGIN AUV and track it accurately on the surface during subsea survey operations.

The autonomous navigation and AUV tracking capabilities of the USV are possible through the integration of the KONGSBERG & Hushcraft custom developed automation and software configuration in conjunction with KONGSBERG's K-MATE common autonomous control engine. K-MATE will also be used by several unmanned and autonomous vessels delivered by Kongsberg Maritime, including the fully electric container feeder, YARA Birkeland. The autonomy controller has been developed in a collaboration between Kongsberg Maritime and FFI, the Norwegian Defence Research Establishment, and builds on the HUGIN AUV System.

The GEBCO-NF Alumni Team is led by alumni of The Nippon Foundation / General Bathymetric Chart of the Oceans (GEBCO) Postgraduate Certificate in Ocean Bathymetry Training Programme, now in its fourteenth year,

run at the Centre for Coastal and Ocean Mapping at the University of New Hampshire. GEBCO is the only organisation with a mandate to map the entirety of the world's ocean floor. The GEBCO-NF Alumni Team has worked very closely with advisors, industry partners, technology suppliers, and developers over the last year, so that the Team is now a truly international group of remarkable diversity representing 13 countries. The partnership with The Nippon Foundation, led by Chairman, Mr. Yohei Sasakawa, provided more than \$3 million U.S. dollars for the Team's concept to be developed. This funding provided the rare opportunity for researchers and commercial groups to work together towards a common goal—developing the tools to autonomously map the seafloor.

The HUGIN AUV Chercheur deployed by the SEA-KIT USV is owned and operated by Ocean Floor Geophysics (OFG). It is one of the best equipped survey and pipeline inspection AUVs in the world, with HISAS interferometric synthetic aperture sonar, multibeam, subbottom profiler, OFG Self-Compensating Magnetometer, water chemistry sensors, acoustic modem, and a state-of-the-art positioning system.

The GEBCO-NF Alumni Team's data processing solution utilizes Teledyne Caris components; and the development work to meet the requirements of the Shell Ocean Discovery XPRIZE has been undertaken with assistance from Teledyne CARIS.

MBARI's ROV VENTANA Undergoes an Overhaul

BY MEGAN BASSETT

While the MBARI research vessel *Rachel Carson* is in the shipyard for an important engine upgrade, the marine operations team that manages the remotely operated vehicle *Ventana* is taking full advantage of the nearly three months the vehicle is off the ship.

The first order of business was removing the large foam block from the vehicle. The block is designed to add just enough buoyancy to ensure that if anything goes wrong, the vehicle will float to the surface. Also, when the ROV operates with slight positive buoyancy, there is minimal disturbance to fine sediments on the seafloor from the ROV thrusters. This makes benthic research and observations much easier.

When the foam block came off the vehicle, the team found a few "surprises," explained Craig Dawe, technical support manager. The main surprise was damage to the main lift plate—the mechanism necessary for lifting the ROV on and off the R/V *Rachel Carson*. Members of the ROV team noticed small cracks in the stainless plate, which can lead to corrosion from water intrusion. There was also rust and damage to the structure surrounding the lift plate. Repairs to the lift plate were added to the two primary maintenance goals: 1) re-trim the vehicle and 2) replace the original hydraulic system. These repairs are no small feats on their own.

Ventana's center of buoyancy has been slightly "off" for most of its service life. This is due to an error made in the

specifications on the last foam block. The vehicle was functional and has successfully completed thousands of dives, but there is a distinctive "bucking," as Dawe puts it, "especially when you are focusing on a small animal in the midwater." This bucking is caused by a small misalignment of the center of thrust and the center of buoyancy, a mere six inches. The thrusters are being moved forward 6 inches, which will align the center of thrust and center of buoyancy and fix the bucking tendency and make "flying" much easier for the pilots, and produce higher quality video for MBARI scientists.

The second task on the to-do list is to replace the original hydraulic system. There have been repairs and upgrades over the years, but the main system is the same one put in 30 years ago! The new system will include a 2,300-volt, three-phase, electronic motor with new temperature and water-detection sensors. This task also involves re-plumbing the entire vehicle.

Finally, *Ventana* is getting a new 1,800 meter tether that will allow for more fiber-optic data channels and another roughly 300 meters of depth compared to the previous tether. The R/V *Rachel Carson* should be back at the MBARI dock by January 2018, when *Ventana* will be re-integrated with the ship and control room and ready to continue exploring the depths.

For more information, visit www.mbari.org.



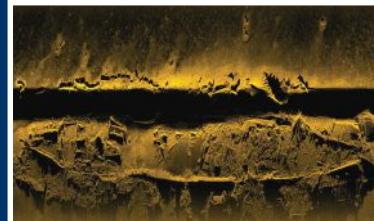
The front of ROV Ventana without the foamblock. Photo courtesy of Todd Walsh © 2017 MBARI.



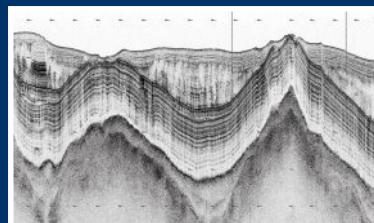
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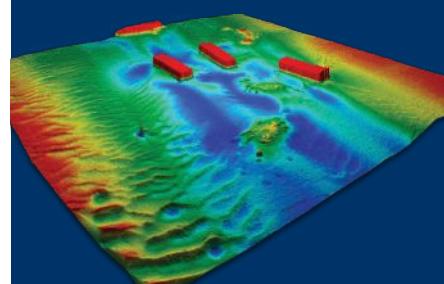
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WÄRTSILÄ

Introduces SMART MARINE ECOSYSTEM

Vision



The smart technology group Wärtsilä is at the forefront of harnessing the changes taking place in the shipping industry to deliver value and optimisation for its customers. By orchestrating these developments through the use of high levels of connectivity and digitalisation, Wärtsilä intends to lead the industry's transformation towards a Smart Marine Ecosystem.

"The world is moving towards a future that is more and more connected, and nowhere is this more apparent than in the shipping sector. The opportunities offered through smart technology will foster a new era of collaboration and knowledge sharing with customers, suppliers, and partners," says Roger Holm, president, Wärtsilä Marine Solutions.

Marine industry players are faced with major sources of inefficiency that impose a significant negative impact on business operations and profitability. These inefficiencies can be considered as 'waste'; the three most notable sources of such "waste" being overcapacity, inadequate port-to-port fuel efficiency, and time wasted waiting when entering ports and other high-traffic areas. Eliminating this waste forms the basis of Wärtsilä's strategy towards ecosystem thinking.

Wärtsilä sees four primary forces that will re-shape the industry. Shared

capacity will improve fill rates and reduce unit costs; *Big Data* analytics will optimise both operations and energy management; *Intelligent Vessels* will enable automated and optimised processes; and *Smart ports* will result in smoother and faster port operations.

"Servicing our customers means supporting them throughout the lifecycle of their installations. This means that we are looking at the smartest way of operating and maintaining assets as well as optimising performance in order to have the safest and most environmentally sound and efficient operating profiles. In the future, we shall be looking more holistically at customer business operations. Instead of optimising a single vessel, we may be optimising a fleet, or even the customer's business. In the long term, vessel-as-a-service becomes the ultimate means of providing asset and lifecycle management services," continues Pierpaolo Barbone, president, Wärtsilä Services.

One of many examples of important steps being made towards the future was taken when Wärtsilä, in collaboration with the vessel owner, successfully tested the remote controlling of a ship's operations by satellite from a distance of 8,000 kilometres. The test was carried out using standard bandwidth, and no land-based technology was used for communications between the vessel and

the remote operator work station. Other notable examples include the Wärtsilä HY, a fully integrated hybrid power module combining engines, an energy storage system, and power electronics optimised to work together through a newly developed energy management system, and Wärtsilä's wireless charging innovation for battery-powered vessels.

Wärtsilä has already opened one Digital Acceleration Centre (DAC), located in Helsinki, to speed up innovation and co-create with customers a range of new business models and solutions. These include the industry's most advanced intelligent vessel and other groundbreaking projects. A second DAC is scheduled to open in Singapore in December, and during 2018 two more will be opened in Central Europe and North America.

By applying smart technology to serve customers in a more sophisticated way, Wärtsilä aims to deliver greater efficiencies that lead to increased revenues and profitability for owners and operators around the world. The ultimate goal is to enable sustainable societies with smart technologies.



VIDEO

www.youtube.com/watch?v=1Ji7q7-O6cQ&feature=youtu.be



ABERDEEN UNIVERSITY Launches World-first Decommissioning Simulator

On 4 December 2017, Aberdeen's Robert Gordon University (RGU) launched a state-of-the-art decommissioning simulator to service the growing sector.

The simulator and the associated software is a world first and will be used to support decommissioning activities in the UK and other parts of the world.

RGU, in collaboration with funding partners The Oil & Gas Technology Centre and KCA Deutag and Drilling Systems, with technical support from Baker Hughes, a GE Company (BHGE), has established the simulator to focus on well-plugging and abandonment (P&A).

P&A is an area forecast to cost the UK more than £8 billion over the next decade, with around 2,500 wells expected to be decommissioned across the UK, Danish, Dutch, and Norwegian Continental Shelves.

The simulator can support both oil and gas operators and service companies with the planning and preparation for well P&A, in a similar way pilots get trained and tested on flight simulators. The simulator is a unique capability for RGU and for the industry and it has the potential to enhance the safety, improve the efficiency, and reduce the cost associated with decommissioning oil and gas wells.

RGU's partnership with The Oil & Gas Technology will also create new opportunities to develop and test technologies, accelerating new solutions in collaboration with the industry and technology providers.

Professor Paul de Leeuw, director of RGU's Oil and Gas Institute, believes the development of this unique decommissioning simulator will have numerous benefits for the industry. He said: "Operators and drilling contractors will be able to use the simulator to develop the technical and non-technical skills and capabilities of their rig crews for decommissioning wells, while improving team performance. Students will also benefit from training and development on the simulator."

Malcolm Banks, well construction solution centre manager at the Oil & Gas Technology Centre, said: "The Oil & Gas Technology Centre is delighted to be co-funding this exciting new facility that will help companies improve planning for the decommissioning of wells and accelerate technologies to drive efficiency and reduce costs in this growing area of the industry."

"The Centre is working in partnership with the industry and technology providers to develop new solutions that will revolutionize well construction, increase automation, improve integrity, and transform plugging and abandonment."

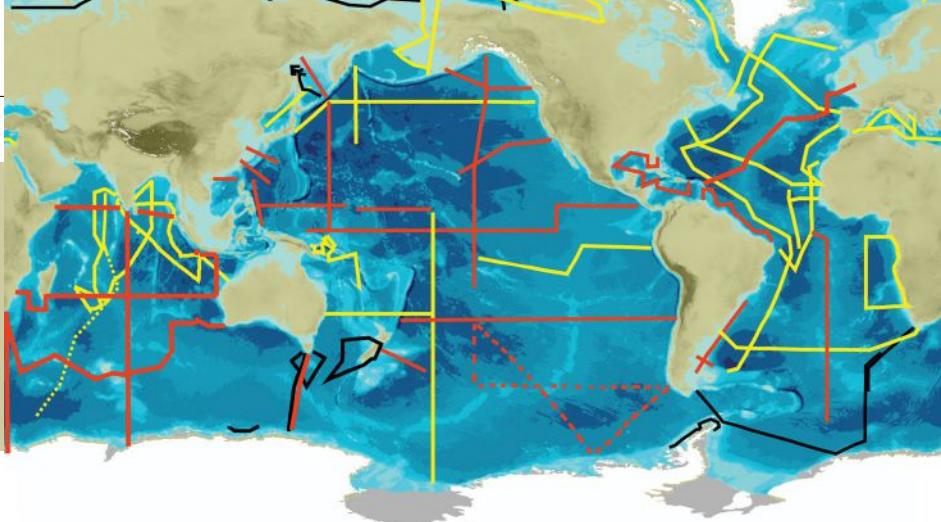
"With 12 well-related projects and field trials ongoing, and many more in the pipeline, state-of-the-art facilities like this decommissioning simulator, are essential as we aim to unlock the full potential of the North Sea and anchor our supply chain in North East Scotland."

Rune Lorentzen, KCA Deutag president of offshore and RDS, said: "As a world-leading drilling and engineering contractor, we continually strive to enhance the skills not only of our own personnel, but those working across the industry. We are therefore, delighted to be partnering with RGU as a centre of excellence to launch this innovative new training simulator."

Clive Battisby, COO drilling systems, added: "Using the physical tool data and CAD drawings taken from customers' real-world downhole tools has been added into the simulation to create a package of decommissioning tools to allow knowledge and skills to be learnt in a safe learning and very realistic environment."

GEOTRACES to Present at 2018 OCEAN SCIENCES MEETING

The following Town Hall style sessions at the 2018 Ocean Sciences Meeting (Portland, Oregon, osm.agu.org/2018) will feature the latest deliverables from GEOTRACES, an international study of the marine biogeochemical cycles of trace elements and their isotopes.



TUESDAY, FEBRUARY 13, 2018 | 12:45 PM - 01:45 PM | OREGON CONVENTION CENTER - D137-D138

DEVELOPING A FRAMEWORK for trace element, isotope, and other biogeochemical research in the GULF OF MEXICO & CARIBBEAN SEA

In addition to their dynamical influence on the formation of the Gulf Stream, the Gulf of Mexico and Caribbean Sea are strongly affected by continental margin processes such as major river inputs and significant submarine groundwater discharges. GEOTRACES studies have increasingly demonstrated the importance of ocean margins in affecting trace element and isotope (TEI) fluxes to the open ocean. Given the importance of these marginal fluxes for cycling of carbon and nutrients, the Gulf of Mexico has been a regional focus for recent OCB activities. However, these activities, as well as the 2010 Deepwater Horizon oil spill, have revealed major gaps in our understanding of how inputs to the shelf influence biogeochemical and biological processes in open waters, especially with regard to TEIs. Most such Gulf studies have focused on the Louisiana and West Florida shelves, with little attention to open waters and interactions with the Loop Current. The steering committees of US GEOTRACES and OCB are beginning a conversation devoted to TEI research in the Gulf of Mexico and Caribbean. We invite GEOTRACES, OCB, and other ocean scientists interested in these marginal seas to discuss processes of interest, existing programs and data sets, and potential steps forward.

ORGANIZERS: Alan M Shiller, University of Southern Mississippi; Heather M Benway, Woods Hole Oceanographic Inst.; Robert F Anderson, Columbia University & Lamont-Doherty Earth Observatory; Angela N Knapp, Florida State University; Benjamin S Twining, Bigelow Lab for Ocean Sciences; and Kristen N Buck, University of South Florida.

WEDNESDAY, FEBRUARY 14, 2018 | 12:45 PM - 01:45 PM | OREGON CONVENTION CENTER - D137-D138

Release of NEW GEOTRACES DATA PRODUCT

GEOTRACES has released its second data product (IDP2017). The new data product expands greatly on the first collection of results released in 2014 in two important ways: 1) adding a substantial body data from new cruises and 2) adding additional datasets not available in the 2014 data product from cruises across the five world Oceans (e.g., aerosols, isotopes, and biological parameters that support the emerging BioGEOTRACES initiative).

This expanded set of parameters available in the IDP2017, ranging across micronutrients, contaminants, radioactive and stable isotopes, and a broad suite of hydrographic parameters used to trace water masses provides an unprecedented means to understand the role of trace elements in shaping the functioning of the ocean system. We invite everyone to this Town Hall to learn about accessing IDP2017 and how it can be used for interdisciplinary research and teaching applications: www.bodc.ac.uk/geotraces/data/idp2017.

ORGANIZERS: Robert F Anderson, Columbia University of New York; Alessandro Tagliabue, University of Liverpool; Gregory A Cutter, Old Dominion University; and Maria Teresa Maldonado, University of British Columbia.

ABB Launches Sequential Turbocharging System

ABB Turbocharging announces its latest technology development, the Flexible integrated Turbocharging System for Two-Stroke Engines (FiTS2) at Marintec China, December 2017. The new sequential turbocharging system allows maximum fuel savings for two-stroke engines at part and low load, and at the same time maintains the flexibility to go to full engine output immediately. This offers significant long-term economic benefits for vessel operators and charterers with potential for fuel savings of up to 3%, depending on load profile.

Fuel and Emissions Reduction

FiTS2 is the result of ABB's continued commitment to reduce fuel consumption and emissions. It has been developed in close collaboration with low-speed two-stroke engine designer, Winterthur Gas & Diesel Ltd. (WinGD), which has developed a special tuning for FiTS2.

The new technology enables two-stroke engine builders to offer more flexibility, increasing the potential for higher efficiency and lower operating costs for their customers. NOx emissions from engines fitted with FiTS2 will also remain within IMO Tier II limits. Additional abatement technologies like SCR or EGR can be used to comply with IMO Tier III NOx emissions and will not greatly affect the system while still delivering fuel saving benefits.

Adapting to Operator Needs

Past high fuel prices and low vessel demand led to an increase in 'slow steaming' for very large cargo ships, resulting at times in operation outside of original design parameters and therefore causing increased maintenance and repair costs. Typical fuel bills for such vessels have been cited by McKinsey & Co* as "the largest cost item for shipping lines" and "often exceeding 40 percent of all costs" despite current lower oil prices.

As the market also continues to see the financial impact of overcapacities, FiTS2 is aimed at addressing the sustained cost versus operational flexibility challenge. FiTS2 will enable two-stroke engines to operate more efficiently at lower loads,

while still enabling rapid return to full engine power without compromise on original design-point efficiencies. As a result, significantly higher savings can be achieved with FiTS2.

Unique Design Enables Cost Optimization

To optimize engine efficiency via improved turbocharging in low and part load, the engine runs in lower loads with only one turbocharger in operation, whereas at higher loads (typically above 50% to 60% engine load) two turbochargers operate simultaneously. The same principle is applied for very large engines—with FiTS2 they will run with two turbochargers in lower loads and with all three turbochargers for higher load operation. The specially designed cut-off valves for the FiTS2 system are flow-optimized and integrated with the turbocharger casings, ensuring a compact and lean design. Furthermore, the valves can be operated rapidly and automatically under load, without interrupting operation of the engine up to full load.

Cut out of one turbocharger for lower engine loads leads to higher scavenging air pressure, increasing the compression ratio, and firing pressure optimized by special tuning of FiTS2. The result is enhanced engine efficiency and lower specific fuel consumption while remaining compliant with emission regulations.

Robust design and very wide compressor maps of ABB's A100-L and A200-L turbocharger series allow switching under load without surging and there are no requirements for additional bypass valves or pipework, making FiTS2 a uniquely simpler and relatively low-cost solution compared to any alternative. An additional benefit comes from the possibility to switch off the electrically powered auxiliary blowers at 25% engine load, instead of around 35% load. This enables additional savings via reduced power consumption and lower blower maintenance costs due to significantly fewer operating hours.

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www.seamagine.com.

SEAMagine Hydrospace Corporation is a California based company established since 1995 and a leading designer and manufacturer of small manned submersibles with over 12,000 dives accumulated by its existing fleet. The company produces two to six-person models with depth ratings ranging from 150 to 1,500 meters for the professional, scientific, and superyacht markets. All SEAMagine submersibles are classed by the American Bureau of Shipping (ABS) and are based on the company's patented technologies.

The company has been producing its two and three-person Ocean Pearl models for many years and is now additionally offering its latest three to six-person Aurora submarine product line. The Aurora design is based

on a hyper-hemisphere acrylic cabin but with its field of view greatly enhanced by moving the access hatch away from the top of the window into a separate compartment behind the main cabin. This design's unique ability to tilt at surface provides an extremely stable platform that does not require obtrusive forward pontoons that severely restrict peripheral viewing.

The Aurora-3C is the lightest and most compact three-person Aurora model with a dry weight of only 3,800 kilograms and a depth rating of 450 meters. This model will fit a standard shipping container and offers the largest hull interior in its weight category.

The Aurora-3 to Aurora-6 are larger three to six-person models with deeper depth ratings up to 1,000 and 1,500 meters.

Showcasing the value of manned submersibles for underwater filming, Aquatica Submarines delivers stunning productions in the newest format. Underwater filmmaking is notoriously problematic. Multiply the requirements of operating one camera underwater by six, and you have arrived at the crux of 360° cinematography's difficulty. In telling the story of the ancient glass sponge gardens of Howe Sound, the crew of Aquatica Submarines encountered and solved some of the greatest challenges to immersive underwater filmmaking—for media dynamo National Geographic.

The crew created a filming environment full of vibrant, multidimensional light and worked with a large team of underwater diving specialists to give structure to the dark landscape. Around these fragile sponges, the Stingray submarine proved agile and capable of running repeatable shot choreography through changing currents and tides. Sensitive to the pilot's commands, the sub maneuvered effortlessly in an environment where any misstep can lift clouds of silt off the bottom and mire the crew in minimal visibility.

The success of this expedition and others truly highlights and showcases the amazing ability of these underwater manned vessels. As a tool platform for multiple expeditions, the unique flexibility of Aquatica's submersibles brings opportunity for so many endeavors.

Aquatica SUBMARINES & SUBSEA TECHNOLOGIES



For more information, visit
www.aquaticasubmarines.com.

In order to increase science productivity and bottom time per dive day, HURL, over the past few years, has transitioned to a default dual sub dive model with its 2,000 meter PISCES IV and PISCES V submersibles.

The crowning achievement of this effort to date is the NSF-funded Deep Coral Ecosystem Recovery Assessment Project in the Northwestern Hawaiian Islands and Southern Emperor Seamount Chain, which was completed in mid-November 2017.

The \$3.5 million project covered roughly 90 ship days of which about 25 were used up to transit a total of ~4,500 nmi. Another 10 days were lost to weather outside the normal launch margins. In the remaining operational days, a total of 76 successful submersible

dives were conducted, during which 242 detailed bottom video transects 500 meter long were completed. A total of 1,533 coral samples were collected for genetic and paleo-oceanographic analysis. The total distance covered by the two subs was about 250 km, the average time submerged per dive day was 12 hours, and the average time spent on bottom transecting and collecting was 8 hours. At project depths ranging from 850 to 250 meter, the terrain consisted predominantly of current-swept, steep volcanic island cores and vertical carbonate atoll walls with numerous narrow cutbacks and overhangs and is considered unnavigable for all but the most advanced robotic underwater systems and teams.



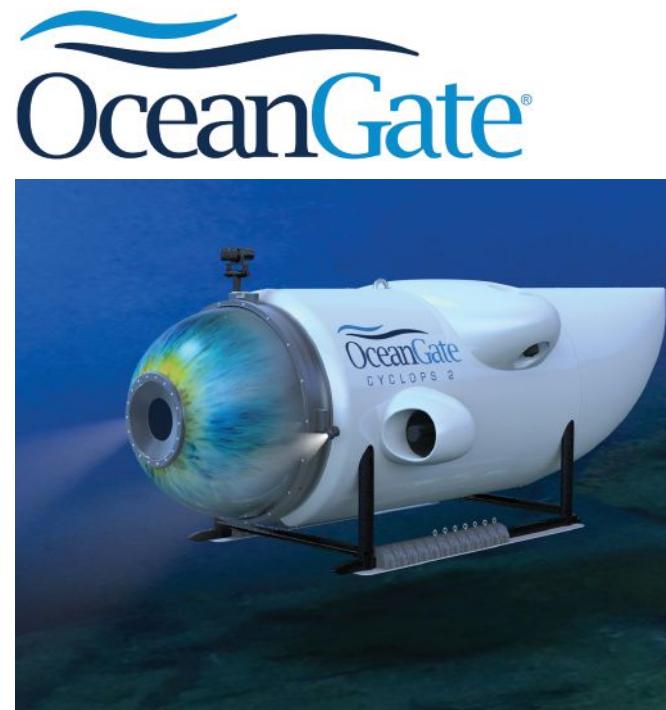
For more information, visit www.soest.hawaii.edu/HURL.

OceanGate, an operator of manned submersible services for site survey and inspection, data collection, media production, and deep sea testing will soon launch Cyclops 2, a five-man submersible to reach depths of 4,000 meters. When completed, it will be the only privately owned submersible in the world capable of diving to such depths and the first since 2005 to survey the historic RMS Titanic shipwreck.

Featuring the largest viewport of any deep-diving submersible, her carbon fiber and titanium construction makes Cyclops 2 lighter than any other deep-sea submersible so she can be more efficiently mobilized. Outfitted with external 4K cameras, multi-beam sonar, laser scanner, inertial navigation, and an acoustic synthetic baseline positioning system, the submersible hosts the most advanced technology available.

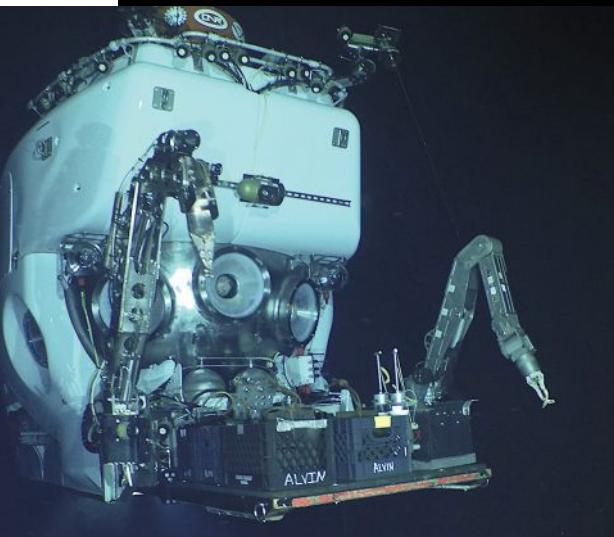
Evolving the launch platform designed by HURL, OceanGate's mobile subsea launch and recovery platform and deep-sea manned submersible, Cyclops 2, work in tandem to form an integrated dive system used to launch and recover the sub and serve as a service and maintenance platform. The integrated system eliminates the need for A-frames, cranes, and scuba divers, allowing expedition crews to efficiently mobilize and operate in remote locations on a wide variety of ships.

Initial dives will begin in January 2018 in Puget Sound before deploying to the Bahamas for deep-sea validation in April. The 2018 Titanic Survey Expedition is a six-week expedition to capture the first ever 4K images of the iconic wreck. These images will be paired with high-definition laser scans to create an interactive 3D model of the wreck and provide an objective baseline to assess the decay of the wreck over time.



For more information, visit www.oceangate.com.

ALVIN



For more information, visit
www.whoi.edu/main/hov-alvin.

The deep submergence vehicle Alvin is an advanced, state-of-the-art, deep-diving submersible available for direct observation and investigation of the deep ocean.

Alvin provides a front-seat, first-person diving experience that is unmatched by remote imaging systems, enabling excellent investigations of deep-sea environments. Alvin's numerous sensors provide large quantities of high-quality data, and new digital network interfaces allow integration of unique scientific devices and sampling tools. Digital images, HD video, and dive data travel over a new fiber-optic computer network for superb image collection and advanced systems monitoring and data analysis.

Alvin recently completed the most extensive period of systems upgrades and improvements in its 50-year history. New systems include a larger personnel sphere, ergonomically designed interior, enhanced five-window viewing area, digital command

and control system, improved propulsion system, advanced imaging system with high-definition still images and 4K/HD video, digital scientific instrument interface system, enhanced science workspace, and manipulator positioning as well as numerous other improvements.

The Alvin Program's engineers and technicians are available to assist with any project, utilizing their many decades of engineering and operational expertise toward solving complex and challenging problems in the deep sea.

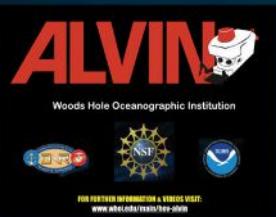
In 2020, Alvin will complete the final systems conversions for operations to 6,500 meters, enabling access to over 95% of the world's oceans. Alvin is owned by the U.S. Navy's Office of Naval Research (ONR) and operated as a part of the National Deep Submergence Facility (NDSF) at the Woods Hole Oceanographic Institution.

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br.total.com/en-us/libra-challenges-one-largest-discoveries-brazilian-pre-salt.

TOTAL Announces First Oil from the LIBRA Mega-Field Offshore Brazil

Total announces first oil from the Libra mega-field, located in ultra-deep waters 180 kilometers offshore Rio de Janeiro in the pre-salt Santos Basin in Brazil. The floating production, storage and offloading (FPSO) unit Pioneiro de Libra has a capacity of 50,000 barrels of oil. This start-up of the early production system will generate revenue while also enabling technical data to be collected to optimize the subsequent development phases.

"Total is pleased that production has begun on the giant Libra field, which is a multi-billion barrel resource," said Arnaud Breuillac, president, Exploration & Production at Total. "Libra is a major asset in Total's portfolio and fits into our strategy of investing in highly competitive projects with low break-even points. The start-up is a major step in the development of this field, and Total is bringing its deep offshore expertise to the project."

Beyond this early production phase, the Libra development will further continue with the next investment decision for the Libra 1 FPSO with a capacity of 150,000 barrels per day. In the years ahead, other production units of similar capacity will be invested in so that the field can be developed to its full potential.

Total in Brazil

Total has been present in Brazil for over 40 years, has more than 2,800 employees there, and operates through five affiliates in the exploration and production, gas, lubricants, chemicals, and renewable energies (solar and biomass) segments.

Total Exploration & Production's portfolio of assets currently includes 15 exploration blocks, located in the Barreirinhas, Ceará, Espírito Santo, Foz do Amazonas, and Pelotas basins.

In February 2017, Total and Petrobras signed agreements covering a number of upstream and downstream assets in Brazil, cementing the Strategic Alliance announced in December 2016. Under that deal, Total will hold a 22.5% stake in the Lara concession area in Block BM-S-11 and a 35% stake in and operatorship of Block BM-S-9 in the Lapa field concession, which came on stream in December 2016. Additionally, technical cooperation between the two companies will be strengthened, particularly through joint appraisal of the exploration potential in promising areas in Brazil and through the development of new technologies, particularly in the deep offshore. The transaction is subject to approvals by the relevant regulatory entities.

The Libra field is operated by **PETROBRAS (40%)** as part of the international consortium whose other partners are **TOTAL (20%)**, **SHELL (20%)**, **CNOOC (10%)** and **CNPC (10%)**.

Is America Losing Out in Race for Arctic Oil?

BY GREG LEATHERMAN, Ocean News & Technology

Speaking at the Wilson Center on 28 November 2017, U.S. Secretary of State said, "The Arctic is important today and it's going to be increasingly important in the future, particularly as those waterways have opened up. What I can tell you is [that] the United States is behind. We're behind all the other Arctic nations...They've gotten way ahead of us. The Russians made it a strategic priority."

He's right. In November 2017, the Russian navy received the 6,000-ton icebreaker The Ilya Muromets, its first new icebreaker in three decades. And it's just the beginning. Russia plans to add four more in the coming years.

"So, we're late to the game," said Secretary Tillerson. "I think we have one functioning icebreaker today," though he noted that he believes there is money budgeted to build one more.

Russia has made no secret of plans to expand its Arctic presence. President Vladimir Putin outlined his desire to protect his Russia's Arctic interests in official naval strategy policies released in September 2017 and his nation has built numerous new military facilities in the region.

The reason? Oil. It is the official position of Russia's Marine Arctic Geological Expedition (MAGE) that there is plenty of recoverable oil in the Arctic and that Russia has a claim to a large portion

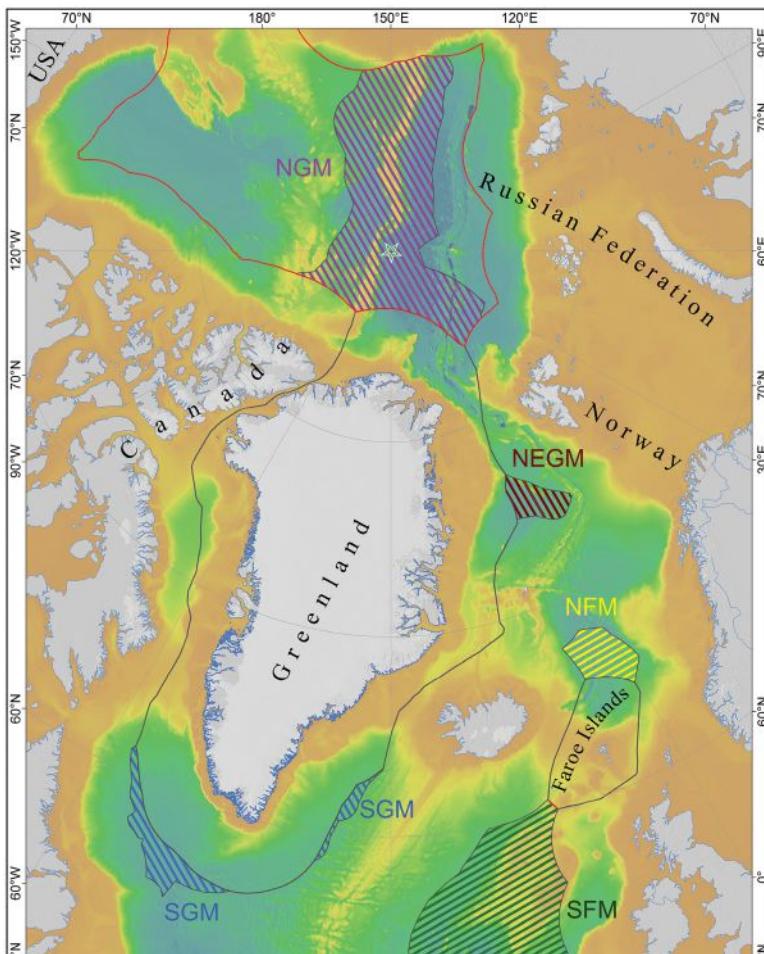
of that oil. This expedition does more than make scientific observations. In 2017, MAGE participated in four well construction projects and operated 15

For example, the Lomonosov Ridge is claimed by Russia, Norway, and Canada, and each nation is making formal claims to the Commission on the Limits of the Continental Shelf (CLCS) under the United Nations.

And it's not just about icebreakers. Shipping is another rapidly emerging economic activity in the Arctic. For example, earlier in 2017, Weathernews Inc. of Tokyo, Japan launched WNINSAT-1, a commercial microsatellite providing observation data to support a polar routing service for the shipping industry. While such a route has not yet been fully realized, this early investment in such an endeavor clearly indicates Japan's belief that it will happen sooner, rather than later.

"Even the Chinese are building icebreaking tankers," said Secretary Tillerson. "Now, why are they building icebreakers? They're not an Arctic nation. Because they see the value of these passages ... But the whole Arctic region, because of what's happened with the opening of the Arctic passageways

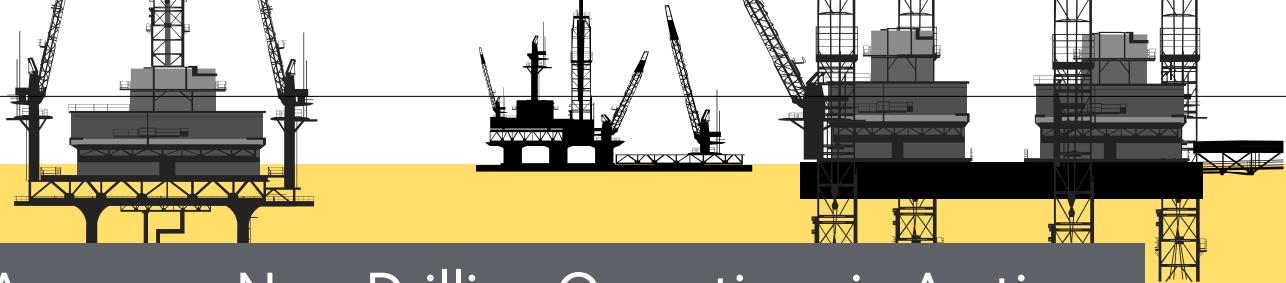
from an economic and trade standpoint, but certainly from a national security standpoint, is vitally important to our interest."



Map showing five Arctic territorial claims submitted to the UN CLCS by the Kingdom of Denmark. Black lines show the Exclusive Economic Zone (EEZ) around the Faroe Islands and Greenland. 200 M lines in the Arctic Ocean are shown with a red line, and the location of the North Pole is indicated with a white star.

vessels to support existing drilling rigs in the Arctic and Far Eastern Russia regions.

Just how much Arctic oil Russia can recover may depend on the outcome of territorial disputes playing out in the United Nations, where multiple nations claim ownership of the same areas.



BSEE Approves New Drilling Operations in Arctic

The Bureau of Safety and Environmental Enforcement has approved Arctic exploration operations on the Outer Continental Shelf for the first time in more than two years. BSEE approved an Application for Permit to Drill on 28 November 2017. Eni U.S. Operating Co. Inc. submitted the application in August. Drilling the exploratory well from a man-made artificial island in the Beaufort Sea is expected to start as early as December 2017.

The Bureau's approval allows Eni to move forward with new exploration in federal waters, but only after a thorough review by BSEE Alaska Region personnel to ensure the request met appropriate technical adequacy, safety, and environmental sustainability standards.

"BSEE Alaska Region staff conducted a thorough and complete review of Eni's well design, testing procedures, and safety protocol," said Mark Fesmire, BSEE Alaska Region director. "Exploration must be conducted safely and responsibly in relation to the Arctic environment and we will continue to engage Eni as they move forward with drilling its exploratory well."

According to Eni, new exploratory well operations will add an additional 100 to 110 jobs during the drilling of the well, and any potential plan of development is dependent on the results of Eni's proposed exploration wells. At minimum, new development could lead to

the creation of 100 to 150 jobs in the region and new production of 20,000 barrels of oil per day.

Eni's exploratory drilling will take place on Spy Island, a man-made artificial island approximately 3 miles offshore Oliktok Point, in State of Alaska waters. Both the island and Oliktok point are already home to Eni production facilities comprising 18 producing wells, 13 injector wells, and 1 disposal well. Eni is now proposing to use extended-reach drilling techniques to drill into federal submerged lands.

The extended reach drilling will target a formation in the newly formed Harrison Bay Block 6423 unit, a 13-lease unit on the OCS that BSEE approved in December 2016. Eni will explore the Harrison Bay Block 6423 Unit in partnership with Shell and plans to drill two explorations wells plus two potential sidetracks over the next two years.

Prior to the start of drilling operations, BSEE Alaska Region engineers and inspectors will conduct required pre-drill inspections at the Spy Island location. As part of the inspections, BSEE engineers and inspectors witness equipment test and verify that all operations are being conducted in accordance with approved plans and permits.

"I am always mindful of the need to protect the environment and our subsistence way of life, and I appreciate BSEE and the Department of Interior's commitment to responsible development," said North Slope Borough Mayor and whaling captain, Harry K. Brower, Jr. "The Borough and the majority of our residents have long supported the careful and responsible development of oil and gas resources within our region that protects the balance between economic development and our subsistence way of life."

BSEE Alaska Region personnel, in coordination with State of Alaska, currently oversee oil production at Northstar Island in the Beaufort Sea, producing approximately 10,000 barrels of oil per day. A second project in the Beaufort Sea, known as Liberty, is currently open to public comment with the Bureau of Ocean and Energy Management. If permitted, Liberty would be the first completely federal Outer Continental Shelf production facility in the Alaska Region.

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Tidal Energy Test Site

Installation Completed in Cape Cod Canal



The first of its kind in the US, the Bourne Tidal Test Site (BTTS) was installed in the Cape Cod Canal during early November. On the day before Thanksgiving, a barge owned by AGM Marine, Inc. pulled up its moorings and was towed back to New Bedford, leaving the BTTS ready for business.

AGM Marine (Mashpee and New Bedford) drove three piles in the first three days and assembled the structure on top of the piles. In the past two days, the work platform was secured along with the winch that will power the lifting member to which the turbines will be attached. The structure is secure in the water off the Railroad Bridge and the US Army Corps of Engineers' Cape Cod Field Office.

The structure was built at MassTank (Middleboro, MA). They are experienced at manufacturing steel tanks and large structures for all sorts of applications, including marine and heavy industrial uses.

The next step for the test site will be to install the data acquisition, processing, and transmission system atop the platform. Engineers from Impact Labs (New Bedford, MA) will be working out there in the weeks to come to analyze and test the systems. On the heels of that work, University of Rhode Island engineers have expressed interest in deploying one of their Acoustic Doppler Current Profilers (ADCPs) to collect data that will enable them to precisely map the water velocity variations during several tidal cycles. This information will be extremely helpful for future operations.

MRECo is actively seeking tidal device designers who require a place to get their equipment in the water to test

performance and energy output. What's unique about this test stand is that it is pre-permitted, easily accessed by small boat or crane from shore, and can be customized. The water velocity is in the 4-knot range, which will enable developers who are aiming toward areas with higher water velocities such as the Bay of Fundy, for example, to make invaluable design improvements before scaling up.

Several turbine developers have expressed interest in using this site to obtain data on their devices that are being aimed at remote, portable applications such as replacing diesel power generation for islands or for site-specific energy generation.

MRECo welcomes those who have expressed interest in using the site to evaluate corrosion effects, biofouling in high currents, environmental impacts of turbines, and much more.

The BTTS is the latest addition to the New England Marine Energy Development System (NEMEDS), which is a network of testing facilities located in a 100-mile radius. These test facilities will help tidal energy device designers obtain valuable information that will enable them to scale up and commercialize more efficiently.

EXXONMOBIL Starts Production at HEBRON FIELD

Exxon Mobil Corporation's Hebron project started production safely and ahead of schedule. At its peak, the project will produce up to 150,000 barrels of oil per day.

Discovered in 1980, the Hebron field is estimated to contain more than 700 million barrels of recoverable resources. The Hebron platform consists of a stand-

alone gravity-based structure that supports an integrated topsides deck that includes living quarters and drilling and production facilities. The platform has storage capacity of 1.2 million barrels of oil.

The platform is located about 200 miles offshore Newfoundland and Labrador in water depths of about 300 feet. During its eight-year engineering, construction and startup phase, the Hebron project contracted hundreds

of vendors throughout the province of Newfoundland and Labrador and created about 7,500 jobs during the peak of the construction phase. The project achieved more than 40 million hours without a lost-time injury during construction.

Above: The completed Hebron Oil Platform, before it was towed out to the edge of the Grand Banks off Newfoundland Canada. Photo courtesy of Wikipedia.

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JW FISHERS SONAR VIEW Side Scan Sonar

HYWIND SCOTLAND to be Equipped with 1-MW Battery System

Hywind Scotland, the world's first floating wind farm, will next year be equipped with a battery to store power from the wind farm. The purpose is to "teach" the battery when to hold back and store electricity and when send power to the grid, thus increasing value of the power.

Statoil has awarded a contract to Younicos to deliver a 1-MW battery system that will be connected to Hywind Scotland. The storage solution project, named Batwind, will be operational from Q2 2018. This is the first battery storage system connected to a floating wind farm. Batwind is a partnership between Statoil and Masdar.

"As part of Statoil's strategy of gradually supplementing our oil and gas portfolio with profitable renewable energy, getting to understand energy storage is important. With more renewables coming into production, it will be crucial to handle storage to ensure predictable

energy supply in periods without wind or sun. Batwind has the potential to add value by mitigating periods without wind—and by that making wind a more reliable energy producer year around. This could expand the use and market for wind and renewables in the future," says head of Hywind Development in Statoil, Sebastian Bringsværd.

The two 10-foot modular battery containers will be placed at the Hywind Scotland onshore substation in Peterhead, Scotland. Whereas a standard battery will charge and re-charge, the purpose of the Batwind storage solution project is to understand how a battery can help increase the value of the produced electricity and how a battery best can work together with the wind farm and the grid.

"Through Batwind we are including software—or a brain if you like—on top of the battery to ensure that the battery

For more information, visit www.statoil.com

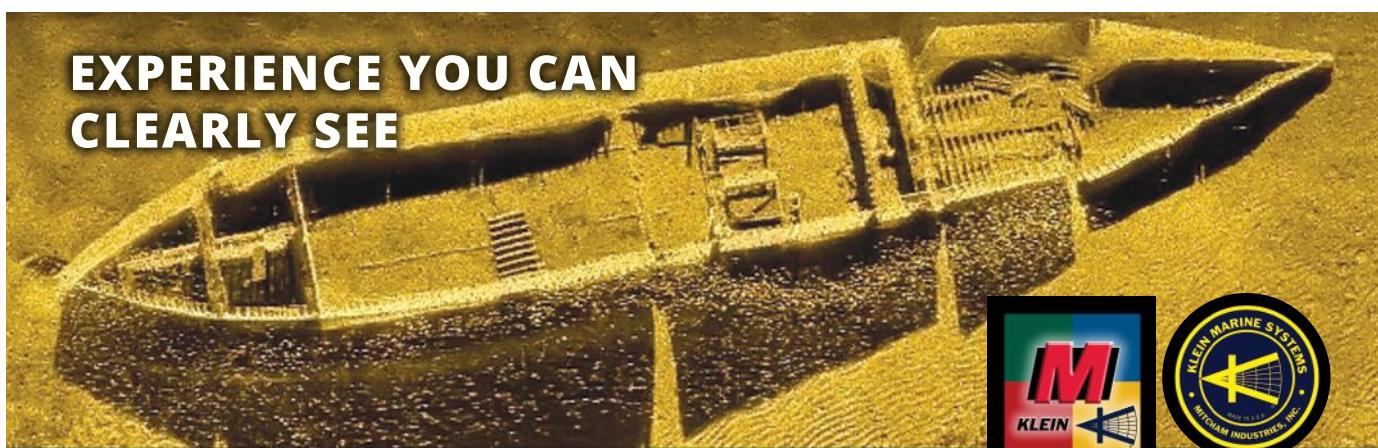
behaves the way we want. We want the battery to automatically know when to hold back and store electricity and when to send it out to the grid."

"Battery energy storage systems have existed in the market for several years and are rapidly developing. However, there is limited knowledge of how to make a battery act based on dynamic information in order to maximize value of renewable energy," says Bringsværd.

Based on the learnings and testing of the 1-MW/1,3-MWh battery storage system, Statoil and Masdar will assess next steps in further developing the solution.

Hywind Scotland is operated by Statoil on behalf of partner Masdar, where Statoil holds an ownership share of 75% and Masdar 25%.

EXPERIENCE YOU CAN CLEARLY SEE



From shallow water applications to deep water surveys, Klein has the right equipment for the job. Side scan sonar is our core business area, and we continue to provide innovative solutions that meet 21st century demands. Our worldwide reputation is built upon more than 50 years of experience providing quality products and excellent customer service.

For more on how Klein is making the oceans transparent, call (603) 893-6131 or visit us at KleinMarineSystems.com



VIDEO

www.youtube.com/watch?v=VtP7zMTptP4

Left: View of the Dudgeon wind farm. Photo courtesy of Jan Arne Wold-Woldcam/Statoil ASA.

DUDGEON Offshore Wind Farm Officially Opens

On November 22, 2017, operator Statoil and partners Masdar and Statkraft officially opened the Dudgeon offshore wind farm in Great Yarmouth, UK. Since the investment decision was made in 2014, construction costs have been reduced by more than 15%, from GBP 1.5 billion to approximately GBP 1.25 billion.

All 67 turbines at the 402-MW Dudgeon offshore wind farm are now delivering electricity to the UK grid, providing renewable energy to around 410,000 homes.

"Dudgeon represents an important contribution to realizing the UK's renewable energy strategy. The UK has already achieved impressive reductions in CO₂ emissions, with clear policies to phase out coal—last year achieved the lowest CO₂ emissions since before year 1900. Statoil is proud to contribute to this both by being a large supplier of natural gas and by our investments in offshore wind," says Statoil's CEO Eldar Sætre.

"As part of our strategy to develop from an oil and gas company to a broad energy major, Statoil will grow significantly in profitable renewable energy, with an ambition to invest around NOK 100 billion towards 2030. Dudgeon has successfully been developed in cooperation with Masdar

and Statkraft and is a key part of Statoil's strategy to complement our oil and gas portfolio with profitable renewable energy solutions as well as adding to Statoil's strong UK presence," says Sætre.

Dudgeon is located 40 kilometers off the coast of Norfolk in England. Local suppliers account for more than 40% of the value creation in the Dudgeon project.

"Today marks the completion of a three-year journey to deliver our third wind power project in the United Kingdom, but only the latest step in our collaboration with Statoil and Statkraft. We're proud to have played a significant role in the delivery of Dudgeon, both on the operations side and in terms of financing. The teamwork among our three companies has been exceptional, a key factor in the successful delivery of this flagship wind energy project," says Mohamed Al Ramahi, CEO of Masdar.

"Over recent years, Statoil has worked hard to reduce costs, improve efficiency, and increase profitability in both our oil and gas projects and our renewable projects. Reducing costs by more than 15%, or GBP 250 million, at Dudgeon and completing the construction phase without any serious incidents is a great achievement by all three partners," says Statoil's executive vice president for Technology, projects and drilling, Margareth Ørvrum.

Towards 2030, it is estimated that the installed capacity of offshore wind in Europe can grow from 12 GW (2016) to 70 GW. Improved technology, increased deployment, and lower costs are the key drivers turning offshore wind into an attractive power source, outcompeting traditional sources of energy in important markets.

Statoil already has a sizeable renewables portfolio. Its current offshore wind portfolio has the capacity to provide more than 1 million

homes with renewable energy. This includes the Sheringham Shoal wind farm in the UK, the Arkona offshore wind farm in Germany, and Hywind Scotland, the world's first floating offshore wind farm, which came into production in October. The operations center and maintenance base for the Dudgeon offshore wind farm is located in Great Yarmouth.

For more information, visit www.statoil.com.



Manned Submersible Operations CONSENSUS STANDARD

BY WILL KOHNEN

*Marine Technology Society
Chair, Manned Underwater
Vehicles Committee*

Will Kohnen is president/CEO of HYDROSPACE Group Inc, co-founder of SEmagine Hydrospace Corp., chairman of the MTS Manned Underwater Vehicles committee, Chair of the ASME PVHO Sub-Committee on Manned Submersibles and Track Chair for the Manned Submersible program for the Underwater Intervention conference.

Opposite (from left): LT Kevin Kuhn USCG; William Kohnen, MTS MUV; Joseph Brzuszkiewicz, ASME; Wayne Lundy, USCG, CDR; John H. Miller, USCG; Thane Gilman, USCG; LT Jonathan Duffett, USCG.

The U.S. Coast Guard has a long-standing history of safety in regulating manned submersible operations in U.S. waters, permitting private and institutional submersible ownership and their operation in coastal waters. In 1993, more specific operational safety guidelines were issued in response to a wave of commercial expansion of large tourist submarines. These were innovative guidelines, and the U.S. provided useful leadership for flag state organizations worldwide. The submersible market, however, has seen significant developments over the past 25 years, and the current safety guidelines have become cumbersome, creating repeated and unproductive legal disputes over interpretations. The net result is an adverse environment for Manned Underwater Vehicle (MUV) innovation and technology development, restricting commercial growth within the industry and doing little to guarantee public safety in the long run. The MUV Industry is in a unique position to engage in constructive discussions to shape the industry's future. Accordingly, in October Will Kohnen, chairman of the Marine Technology Society MUV Committee, headed to Washington D.C. to present an overview entitled "Manned Underwater Vehicle Operations Consensus Standard," a summary of committee suggestions to update and simplify existing categories within Coast Guard regulations.

The presentation was part of the 2017 ASME - U.S. Coast Guard Workshop on Marine Technology and Standards. The event, jointly sponsored by the American Society of Mechanical Engineers & U.S. Coast Guard, was a technical exchange on marine industry-related codes and standards and government regulations. The conference was opened by Rear Adm. J.P. Nadeau who pointed out the importance of developing regulations that keep up with the current market conditions and that the best time to look at regulatory updates is when there is no crisis in the industry. The event took place over two days and was open to the public.

The MUV presentation did not fit easily into any of the designated technology sessions, which covered LNG and alternate fuel ship propulsion, offshore platforms, autonomous ships, automation and cybersecurity, and marine environmental protection. Therefore, the MUV presentation was part of the general regulation and standards session to review guidelines and explore concepts to help identify new operations categories for manned submersibles.

New guidelines were developed from existing best practices and industry expertise, the current baseline of safe, productive MUV operations. The presentation focused on guidelines based on the types of activities and types of participants involved in MUV operations. The overview offered four categories of operations: 1) large tourist passenger submersibles; 2) professional classed submersibles; 3) experimental submersibles; and 4) recreational submersibles.

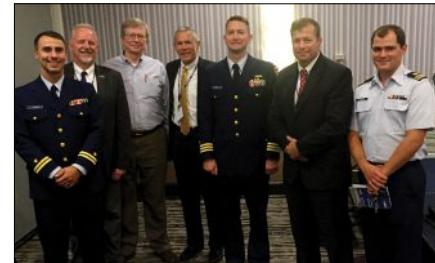
Among these, only the large tourist submersibles, which involve the general public, would continue to require full and complete inspection by the U.S. Coast Guard in order to protect the public participants from dangers and risks that they may, or may not, comprehend. The other three categories involve some level of participant education and define clear operating boundaries to permit commercial operation without formal U.S. Coast Guard inspections.

Creating such operations "sand boxes" and clearly identifying the safety/risk envelope of each category will ensure public safety by enabling all participants to exercise informed consent in their participation. With informed consent, the U.S. Coast Guard no longer is the sole guardian of the safety of participants, creating an efficient system of safety regulation that leverages industry expertise. Each operator self-regulates and decides its preferred category of operation, but must also adhere to specific requirements. Non-compliance would constitute willful misrepresentation of public safety and be subject to U.S. Coast Guard adjudication. Key to the function of all the categories, except for the recreational sector, is the ability to conduct commerce and provide economic development in the MUV industry to foster growth, innovation, and new technology.

At the conclusion of the workshop, Coast Guard leadership acknowledged that regulatory change requires resource allocation, research, and due diligence—and cannot be easily initiated because of the time investment on their side. Additionally, current top level directions at U.S. Coast Guard are trending towards de-regulation and increasing efficiency of regulations.

The Coast Guard officer pointed out that change is initiated by one of three situations: 1) external crisis that demands action, 2) a request from Congress, or 3) from the emergence of an industry consensus standard. This is a clear opportunity for the MUV Community to come together and take control of the future of our industry.

The manned submersible operations regulations in the U.S. have not been reviewed since 1993. After nearly 25 years of MUV industry developments, this is an opportunity to be forward thinking and create a better, simpler regulatory framework that can be adopted globally and benefit the Coast Guard, the industry, and serve public safety in an increasingly complex world. The objective of the MUV presentation was to make public MUV industry issues and concerns that need attention. It also offered an open invitation to join the MTS MUV committee in its endeavor to develop the MUV operations consensus standard.



"Creating such operations "sand boxes" and clearly identifying the safety/risk envelope of each category will ensure public safety by enabling all participants to exercise informed consent in their participation."

The next workshop to work on the consensus standard will take place at the 15th Annual MTS MUV Symposium held at Underwater Intervention 2018, in New Orleans, February 6-8th, 2018.

FOR MORE INFORMATION,
VISIT
www.mtsmuv.org
OR
www.underwaterintervention.com

LOOKING AHEAD with WOOD MACKENZIE

Confirmed New FIDs in 2017 (# of Subsea Trees)

Source: Wood Mackenzie Global Project Tracker



The past few years have been devastating for the deepwater oil and gas market as severely depressed commodity prices have forced E&P's and the supply chain to seriously evaluate whose assets are developed and how this can be done more efficiently and at a lower break even price. Collaboration, consolidation, and project re-assessment have been the major themes of the industry for the better part of the past three years. The subsea market experienced the trough of demand in 2016 and, as such, 2017 has shown

promising shifts in demand trends (1H 2017 represented 98% of FY2016 awards). That said, the subsea industry remains in an unstable position as operators look towards a more stable oil price outlook and an optimal strategy for efficiently developing their deepwater reserves.

According to WoodMac's Global Project Tracker, the global deepwater industry has seen around a dozen FIDs through the first three quarters of the year. A positive sign within these FIDs is the global diversity of the projects that touch most of the

major deepwater basins, indicating good progress of reworking project economics. One trend to note, however, is the average size of these FIDs compared to pre-2014. Looking at size by subsea tree count, 2017 FIDs average seven units per project. In 2013, this average was closer to 10 units per project. This is an indicator of one of the key strategies to reduce spend materializing in smaller, more compact developments, favoring subsea tiebacks.

Upcoming FIDs in the next 18 months (10+ Subsea Trees)

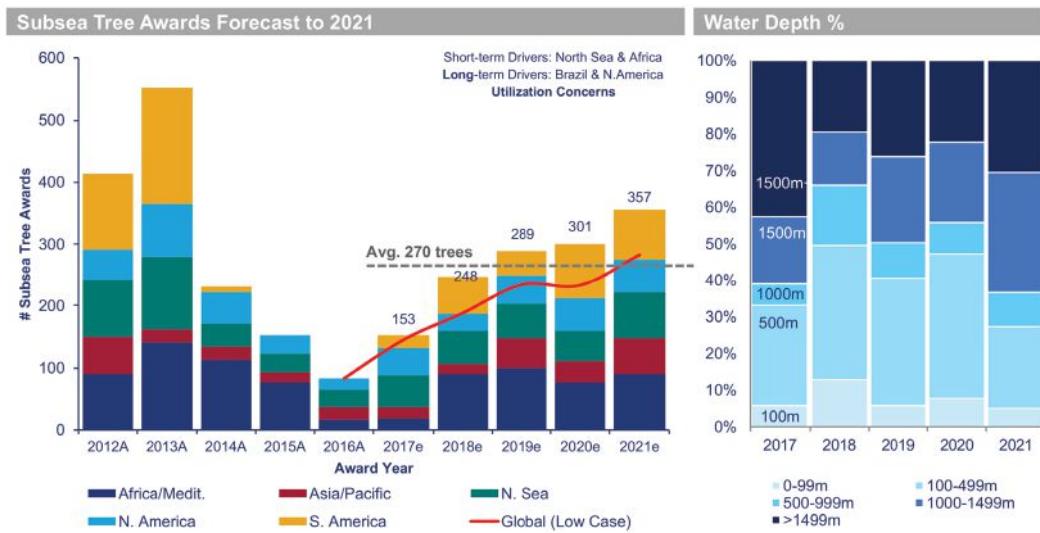


WoodMac projects that while the second half of 2017 is less likely to be as strong as the first half, 2018 is expected to see a significant uptake in FID activity, with several large delayed projects lined up for the green light. Again, this directionally positive forecast for 2018 relies heavily on continued efforts at controlling project costs. Whether by a comprehensive design overhaul, enhanced well design, or taking advantage of the cyclical cost savings, a good majority of these projects have been waiting in line for execution but were stalled due to unfavourable project economics.

FOR MORE INFORMATION:
www.woodmac.com

Subsea Tree Awards to 2021

The new normal for the subsea OEMs will be in the 250-270 trees/annum range.



According to WoodMac's Subsea service, the industry, looking ahead, will need to adjust to a new normal in terms of subsea demand. A lower for longer oil price outlook will inherently limit the full potential of the subsea world. Larger, more complex projects have recently been pushed to the right in favor of smaller, less costly alternatives. While we expect the results of the multi-year initiative to reduce the cost of developing in deepwater to start materializing within the forecast period, it is key to keep in mind that very little happens quickly in the space. Another critical component to historical trends has been Petrobras who contributed over 30% of 2013's global subsea

tree demand. We have seen no new subsea tree demand from Petrobras for their Brazilian developments since 2013, and although we expect Brazil to play a part in the forecast, WoodMac does not expect that demand to return to historic levels.

WoodMac's Upstream Supply Chain group covers the global deepwater market with a focus of illustrating how assets realize their value through the development cycle and who the E&P's work with in the supply chain to achieve it.



Wood Mackenzie™, a Verisk Analytics business, is a trusted source of commercial intelligence for the world's natural resources sector. We empower clients to make better strategic decisions, providing objective analysis and advice on assets, companies and markets.

Registration for UNDERWATER INTERVENTION 2018 Now Open

UI2018 UNDERWATER INTERVENTION

UI2018 is the preeminent event for everybody that works in the commercial diving and underwater ROV industry. Taking place at the Morial Convention Center in New Orleans, Louisiana, from February 6-8, the event features educational tracks and sessions from the thought leaders in the industry; networking opportunities; and the latest products, services, and innovations.

Co-hosted by the Association of Diving Contractors International and the ROV Committee of the Marine Technology Society, UI will draw industry leaders from around the globe.

FOR MORE INFORMATION OR TO REGISTER, visit www.underwaterintervention.com.

COMMERCIAL DIVING

The Commercial Diving Track helps keep the industry updated by discussing topics, including lessons learned from challenging projects, panel discussions by leading authorities in hyperbaric medicine, presentations discussing the combination of technology, training and advancements in assisting divers of today, educational and safety topics, and workshops that assist with equipment maintenance and training. For divers to meet or exceed expectations on the job site, they must draw upon their skill set, knowledge, and tools to perform their tasks. These workshops will provide some insight to preparing your divers to do just that and can help your company stand out and succeed during these challenging economic times.

UNMANNED MARITIME VEHICLES

Unmanned Maritime Vehicles (UMVs) are broadly understood to include unmanned undersea vehicles (UUVs) and unmanned surface vehicles (USVs). Both of these vehicle classes have an important role to play in supporting underwater intervention applications. Seafloor and pipeline route survey, meteorology and oceanography (METOC), and structure inspection are some common examples. In this session, recent field results and new technology concepts will be presented. Just as the technology focus is broad, so too will the market sectors be wide ranging. Presentations from defense, science, exploration, and, of course, offshore energy will be included.

REMOTELY OPERATED VEHICLES

Historically, the ROV Track at Underwater Intervention has focused on swimming tethered robotics for usage in oil & gas as well as scientific and military applications. This year's technical track is expanding to cover both unmanned ground vehicles as well as unmanned aerial vehicles for usage in various commercial and scientific applications. Topics covered within the purview of this year's technical track include all aspects of equipment and application for tele-operated robotics. From the human machine interface to power to deployment methods/equipment to the sensors to the end-effector, the latest topics of interest by leading industry experts will be covered.

MARINE EDUCATION

The 2018 Marine Education Track will highlight innovative education and training programs that are helping to prepare students of all ages for the marine industry. From formal degree and certificate programs to entrepreneurial opportunities where students are at the forefront, these programs represent best practices in marine technology education.

MANNED SUBMERSIBLES

Each year, the MUV Track builds presentation themes in following areas: emerging design and engineering innovations; advances in material science and fabrication; operations and procedures; commercial and research applications; and regulatory updates. In each of the presentations, the focus is on manned submersible vehicles, but many of the discussion presented in our track directly impact other areas of deep water intervention. This year, the presentations will feature developments from MUV operations, including the ALVIN at Woods Hole USA, the Shinkai6500 from JAMSTEC in Japan, Ictineu 3 from Spain, Idabel from Honduras, Deepflight from the Maldives, and SEAmagine presenting on their pilot training program in Argentina. Oceaneering will present a special historical review of the deepest pipeline repair ever performed using the MANTIS MUV—a retrospect from an operations perspective. Technology presentations will feature developments on new hazard mitigation strategies for in-hull Lithium battery fires, new design studies for acrylic windows, and deep ocean-wide field camera systems.

KLEIN UUV-3500 Successfully Integrated into Riptide 1MP UUV

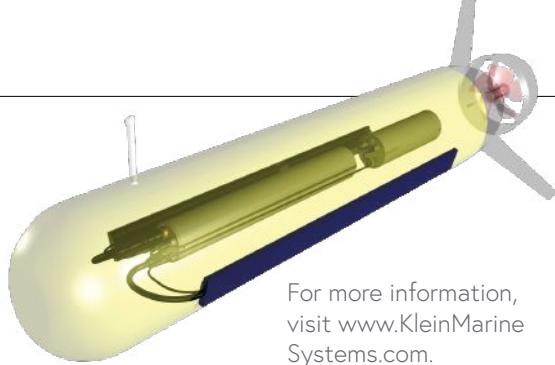
Klein Marine Systems, Inc., a wholly owned subsidiary of Mitcham Industries, Inc. announces the successful participation in a US SOCOM industry event in Key West, Florida of a Klein Model 3500 installed in a Riptide Autonomous Solutions 1MP UUV, a 1 Man Portable 7.5" (190mm) diameter Unmanned Underwater Vehicle (UUV), sometimes called an Autonomous Underwater Vehicle (AUV).

The intent of this industry event was to evaluate the effectiveness of diver assistance available with different platforms and sensors. The Klein UUV3500 Combined Side Scan and Interferometric Bathymetric Sonar produces very high combined side scan sonar data and interferometric bathymetry data, which when the data sets are merged, produces higher

Probability of Detection (Pd) figures for small and difficult to detect targets, providing an effective alternative—particularly on small AUVs—to the size, complexity and motion sensitivity of highly expensive side scan sonar generating synthetic beams (SAS).

This demonstration provided an excellent example of the potential for rapid integration of a high-performance sensor, such as the Klein 3500 Combined Side Scan and Interferometric Sonar, onto a low cost AUV platform, such as the Riptide UUV/AUV platforms.

The Riptide 1MP was successfully launched from shore into the ocean in shallow water, executed a preprogrammed mission and returned to the operator standing on the shore



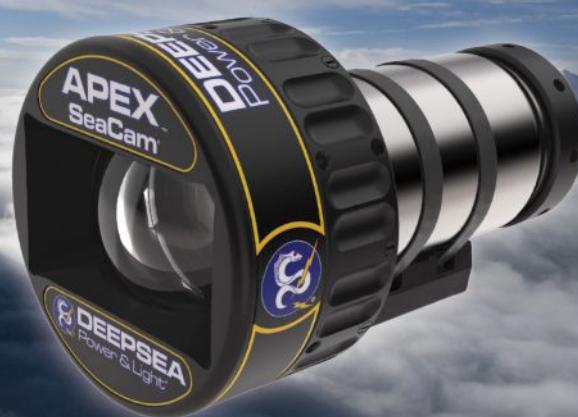
For more information, visit www.KleinMarineSystems.com.

with the propulsion motor stopping exactly as the operator's position, proving, among other things, Klein transducers' excellent hydrodynamic performance. It is interesting to notice that the Klein UUV3500 Combined Side Scan and Interferometric Sonar was fully integrated into a Riptide UUV/AUV in less than 4 working days, demonstrating easy-to-integrate features of the UUV3500 architecture (mechanical, electrical and software) and a remarkable cooperation result between the Klein Engineering Integration Team, which supports all integration efforts of new and existing customers, and the Riptide Engineering Team.



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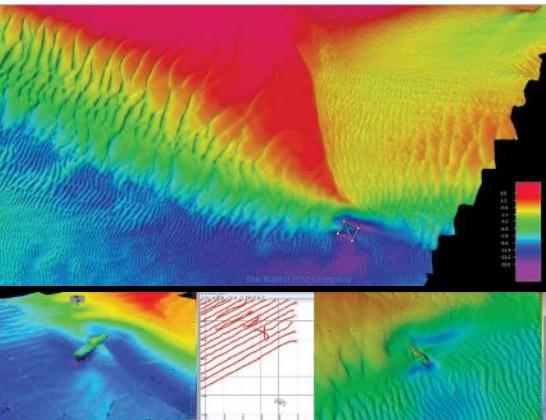
Zoom Capabilities - 12x optical zoom in 4K UHD and HD output formats, and 24x combined lossless digital zoom in HD.

Robust Design - 6,000 m rated titanium housing and optical dome tested with over 10,000 pressure cycles to 10,000 psi during the design process.

Flexible Configuration - FleXlink™, CWDM fiber optic, and coax output options. Sony VISCA compatible.

Contact us today for more information: 1 800 487 3775 sales@deepsea.com www.deepsea.com/apex-seacam

FINDING THE WRECK OF THE BRUNSWICK



1 SURVEYING THE PORT OF BRISTOL

The entire buoyed channel of the Bristol Port Company's statutory harbour area is surveyed in full over a three-year period. In 2017, the area for investigation was the Bristol Deep, off the coast of Clevedon. The nine-day survey was spread over the spring tides from June to August. The survey started in the deep shipping channel and progressed north towards the drying sand bank of the Middle Grounds.

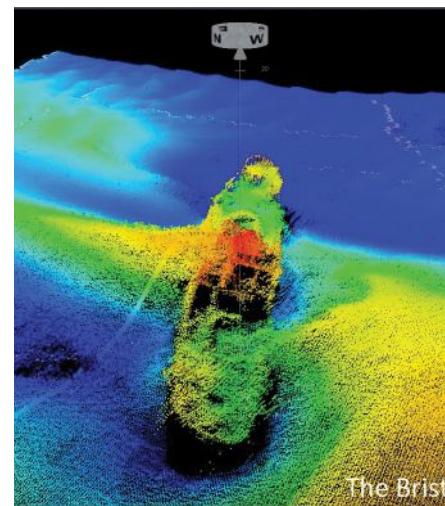
The Middle Grounds has a spit of sand known as the Welsh Hook. This arrowhead-shaped spit of sand this year was found pointing to a wreck at its tip. The data was a little noisy due to the very high turbulence around the wreck, but with an additional infill line, full coverage was possible—and there was no doubt as to the existence of a wreck.

The first sighting of the wreck. Data collected with a Teledyne RESON SeaBat 7101 Multibeam Echosounder. Data processing in Teledyne PDS.

3 GOING BACK TO THE SITE FOR SECOND SURVEY

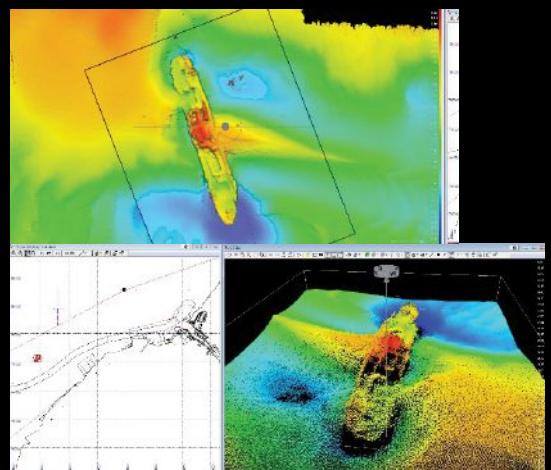
On 11 July, we returned to Bristol Deep and gathered more data over the wreck to produce a clearer image, if possible. Our Teledyne Reson 7101 multibeam is usually operating at just 10 pps, creating a 0.5 meter grid, but for this second survey of the wreck we ran at maximum capacity of 50 pps creating a 0.25 meter grid. After processing, a raised forecastle and aft deck were noticeable with the bridge amid ships and a cargo hold forward of this. This along with the size of 65 meter long by 9 meter wide, led to estimates of it being a late 19th or early 20th century cargo ship.

The Wreck seen in maximum resolution. Data collected with a Teledyne RESON SeaBat 7101 Multibeam Echosounder. Data processing in Teledyne PDS.



2 A WRECK APPEARS FROM THE DATA

At first, I didn't realise this was a new wreck as there is one close by called the 'Johann Carl', and there was no reason to expect anything new in this area as it had been surveyed many times. As the area was partially outside of our RTK radio transmitting zone, I had to wait to gather the POSpac data in order to be able to process, but as soon as possible I began processing the data. I showed the image to the Deputy Harbour Master Conservancy. He looked back over all the surveys of the area. In over 40 years, the wreck had not been detected. It would seem that during all previous surveys, the Middle Grounds sand bank had been around 200 meter further south showing the location of the wreck as 2 meter below chart datum. The wreck lies below this at 5.5 meter below chart datum.



4 THE FATE OF THE BRUNSWICK IS REVEALED

Much research followed to determine the specific vessel, and the cargo vessel Brunswick was deemed the most likely candidate by both ourselves and then Historic England. Of the 29 wrecks in the area, the Brunswick is the only large, metal-hulled cargo vessel that matches the dimensions. It was also described as having grounded on the Welsh Hook on a foggy Christmas Eve in 1900. What caused the sand bank to shift so much further than ever surveyed before? Where in the estuary system has this sand gone and what else may lie beneath the sand of the Severn Estuary?

The Wreck of the cargo vessel Brunswick. Data collected with a Teledyne RESON SeaBat 7101 Multibeam Echosounder. Data processing in Teledyne PDS.

ABOUT THE RESON SEABAT 7101

The RESON SeaBat 7101 is a bathymetric sonar, operating at 240 kHz, measuring up to 511 discrete soundings equally spaced across a wide 150° swath. The SeaBat 7101 has been a workhorse of a multibeam sonar across the globe for almost two decades. The SeaBat 7101 has since been replaced by the SeaBat T-series, a product line building on modular components enabling the customers to design the sonar they need for a specific job. The SeaBat T-series multibeam sonars provide up to 1,024 soundings per ping and is fully frequency agile across its frequency range.

THE CHALLENGES OF SURVEYING AN AREA WITH THIRD HIGHEST TIDAL RANGE IN THE WORLD

Our multibeam surveys are carried out using a Applanix Pos/MV for RTK position and motion and a Teledyne RESON 7101 multibeam echosounder. Teledyne PDS is used for processing the data and the initial stage of charting before exporting to AutoCAD.

Estuary surveys are undertaken based on our survey program, with the most frequent surveys being the Severn Bar and Denny Shoal sand banks surveyed every 2 months; the final approach to the ports, known as King Road, surveyed annually; and the rest of the buoyed channel within the harbour area surveyed in full over a 3-year cycle.

With the third highest tidal range in the world at 13.2 meter MHWS, our sandbanks are ever changing; however, a further challenge is the mud. Tides cause mud particles to become fluid and highly mobile. The result is unreliable multibeam data detecting soft pockets of navigable fluid mud. For this reason, our almost-weekly entrance surveys are conducted using a Teledyne Odom Hydrographic CV200 and Stema Silas density software to detect the navigable horizon. Surveys further out in the estuary can be affected by the fluid mud on neap tides as the multibeam signal struggles to penetrate the "fluff" or it may detect a layer of fluid mud in the deeper areas of the estuary. For this reason, surveys are conducted on spring tides where the predicted tide

is greater than 12.6 meters. Couple this with needing a good weather window and it can become difficult to fit in all the surveys. The bigger areas can take the whole summer to complete, during which time the sand can shift quite dramatically; this area is so dynamic that sand waves do not always match up even after just 20 minutes between survey lines. These factors take a little work initially, however with experience coming from being solely based in this area we know most of the quirks of working in the Severn Estuary.

BY EMILY HAND, *Hydrographic Surveyor,
Bristol Port Company*



VIDEO

[www.video.teledynemarine.com/
video/10678726/surveying-
dredging-and-monitoring-fluid-
mud-in-a](http://www.video.teledynemarine.com/video/10678726/surveying-dredging-and-monitoring-fluid-mud-in-a)



Performance Testing Begins at Ohmsett

At Ohmsett, testing and R&D opportunities abound! Our unique capabilities and realistic marine environment play an essential role in developing new technology that will be cleaning the world's water in the future.

Features & Capabilities:

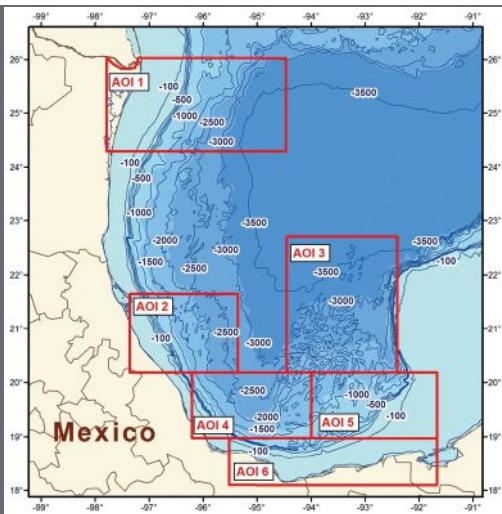
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Ohmsett, the Bureau of Safety and Environmental Enforcement's (BSEE)
National Oil Spill Response Research and Renewable Energy Test Facility





Location of AOI 1 and other areas proposed in CGG's multi-client airborne GravMag program offshore Mexico.

CGG Releases Airborne GravMag Survey over Perido Fold Belt, Mexico

CGG Multi-Physics has announced completion of the acquisition, processing, and interpretation of a multi-client airborne gravity and magnetic survey of approximately 38,000 line km over the Perido Fold Belt.

Data acquisition of area AOI 1 was completed in December 2016 utilizing a Basler geophysical survey aircraft. This survey is the first of six areas to be acquired in a wider program totaling 200,000 line km across the Mexican Gulf of Mexico. Additional acquisition in the other areas indicated in the map left is planned for 2018.

The newly acquired Perido Fold Belt data has shown an interesting correlation of significant discoveries along the flanks of basement topography. The data and interpretation will help explorers map

crystalline basement, which is not well imaged by seismic, to construct an improved Earth Model. The airborne survey also collected continuous data through the "transition zone" from the marine environment to onshore.

The comprehensive interpretation, combining this new data set with available geologic and geophysical data, was undertaken by CGG's in-house interpretation team in Houston. A full geophysical interpretation report, which includes mapping of basement, sediment, and any intrusives or salt that may be present, will provide important insights to exploration and de-risking of prospective areas by oil companies.

For more information, visit www.cgg.com.

Decommissioning Calls for Ideas

Scotland's Oil and Gas Technology Centre (OGTC) has opened its first digital transformation and decommissioning 'Calls for Ideas.' There's c.£1million up for grabs with each Call, to be invested in a portfolio of projects that can unlock the full potential of the UK North Sea. The Calls launch on 14 December.

<http://ont.news/2Al1ZGk>

Saab Seaeye Receives Order for Falcon from Korean Coastguard

The Korean Coast Guard has ordered a Saab Seaeye Falcon for undersea investigations and research. This follows the sinking of the ferry MV Sewol in 2014, resulting in the deaths of 304 passengers, mostly schoolchildren, that generated a need for more response resources including underwater robotic vehicles.

<http://ont.news/2ygw5sC>

Valeport to Supply Advanced, Customized Probes to Saab Kockums

Valeport has announced its contract to supply four customized MIDAS SVX2 probes to Saab Kockums. The advanced probes combine sound velocity with salinity and density technologies to deliver superior data profiles. MIDAS SVX2 was selected for its commercial off the shelf (COTS) status which contributed to project cost and lead time efficiency.

Global Marine Group Acquires Fugro's Trenching & Cable Lay Business

Global Marine Group's (GMG) Fugro acquisition significantly enhances their portfolio of service offerings to the market and provides them with highly capable, proven assets. Fugro will become the preferred provider of marine site characterisation and asset integrity services to GMG.

Improving Riser Safety with Composite Buoyancy

Landing String Solutions LLC signed an agreement with Trelleborg's offshore operation for Trelleborg to manufacture its patented landing string buoyancy system featuring 100% composite materials. Both companies aim to market the solution to a wider customer base globally. Landing string buoyancy enables drilling contractors to deploy longer heavier casing and other downhole tubulars, reducing rig time, maximizing efficiencies, and lowering costs.

<http://ont.news/2jyhhh>

JW FISHERS' Side Scan Sonar Uncovers History

For more information
visit, www.jwfishers.com.

What can be done when disaster strikes and the unforgiving sea claims expensive or invaluable objects?

JW Fishers has assisted in the recovery of countless ships, anchors, aircraft, indispensable equipment, and, in the most devastating of cases, love ones. One of the most effective tools for underwater search and recovery is a Side Scan Sonar (SSS) system. The JW Fishers' line of SSS systems are able to search a large area quickly and to produce a detailed image of the ocean floor, regardless of water clarity.

The Fulton County Sheriff's Office purchased a JW Fishers dual frequency side scan system and has found some interesting things in a short amount of time. One fascinating discovery was the foundation and well of an old house in Sacandaga Lake.

The history surrounding this valley is remarkable! In 1907, after decades of debate, the State Water Supply Commission conducted a study on water storage for flood prevention and power development in New York State. The commission gave their report to legislators in 1908, requesting the construction of a reservoir in the Sacandaga Valley. 1902 served as case-in-point of the commission's request as New York faced severe flooding on the Hudson. This pushed New York State to appoint a Water Storage Commission to study the causes of flooding. The year 1913 proved to be the most disastrous in history for down-river communities, including Albany, Green Island, Rensselaer, Troy, and Watervliet, who saw the flooding of entire valleys. The Hudson River Regulating District (HRRD) was formed "to regulate the flow of the Hudson and Sacandaga Rivers as required by the public welfare including health and safety."

A plan was developed that included 16 new reservoirs, one of which was in the Sacandaga river valley. Over 1,000 citizens were required to leave their land. Dams were built to store the water and in the early 1930s the area was flooded and remains a large body of water to this day. The reservoir was named "Sacandaga" after the river it was formed from, an Indian name meaning "the drowned land." In the 1960s, the name was changed to "The Great Sacandaga Lake."

The Tonawanda State Police is another outstanding organization that uses JW Fisher's "right tools for the job" to serve their community. They utilize their JWF Side Scan Sonar quite often and are constantly training to become masters of the system. They are frequently called to search for missing evidence or drowning victims. One of their newest resources is a 27-foot vessel equipped with the latest technology to help make searching safer and easier. Lieutenant Scott Sheehan has been to JW Fishers' facility several times for training on both his department's Side Scan Sonar and SCAN-650 systems. His team has developed an impressive competence with the equipment in a variety of situations, even being called upon by surrounding counties when needed.

Alldive Ltd., based in Malta, specializes in propeller polishing, in-water surveys, underwater video and photography, hull and underwater cleaning, and underwater welding and cutting, both inside and outside of Maltese harbors. They use their JW Fishers Side Scan Sonar system for bottom surveys to



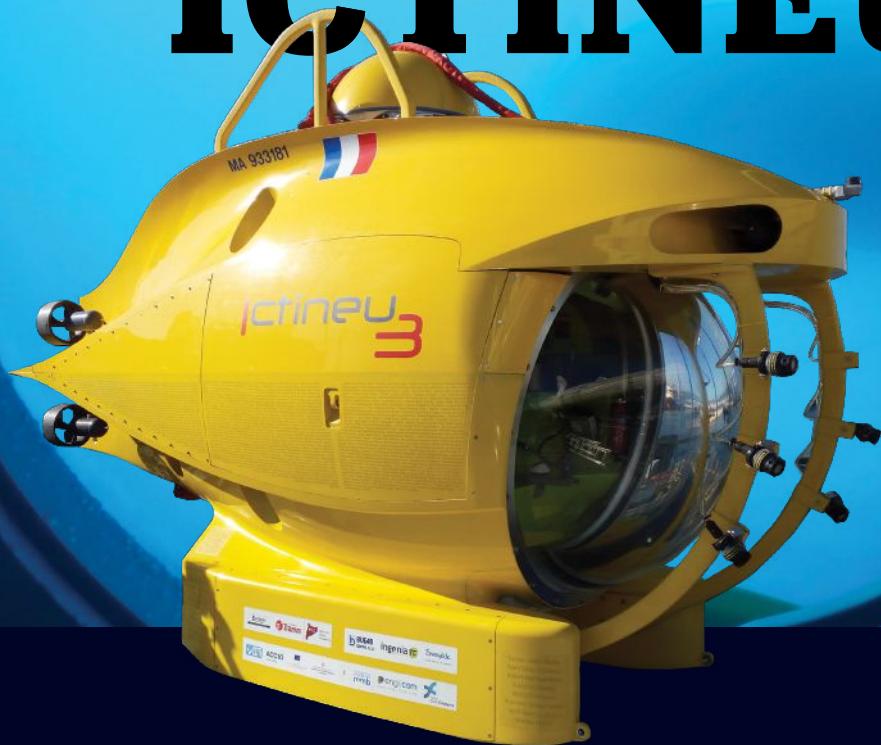
include fish farms, jetties, and for the recovery of lost anchors. JW Fishers' equipment is just some of the various tools they utilize to search the open waters. They are an experienced commercial diving company that relies upon a trusted manufacturer to provide the right tools for the job—JW Fishers Mfg. These sonar tools include:

- The SSS-1200 kHz is an excellent choice for law enforcement agencies and dive rescue groups that are searching for small, soft targets such as drowning victims. This frequency produces very high-resolution images, but has a max scan range of only 30 meters per side (maximum swath covered is 60 meters/200 feet).
- The SSS-600 kHz has very good resolution and scans up to 75 meters on each side of the towfish (maximum swath covered is 150 meters / 500 feet). This system is good for locating a variety of targets from drowning victims to submerged vehicles and structures.
- The SSS-100 kHz has good resolution and scans up to 600 meters on each side of the towfish (maximum swath covered is 1,200 meters / 4,000 feet). This system is good for searching large areas to look for large targets such as sunken ships and downed aircraft.

1. The Town of Edinburg. "Sacandaga Reservoir," www.edinburgny.com/reservoirhistory.html
2. Ibid.

Going the Distance with ICTINEU 3

BY KIRA COLEY,
UK Correspondent



“We had to make a decision:

the weather was terrible, it was a long distance, and the currents were strong, but if we were successful we'd be the first submersible to do it," said Carme Parareda, co-founder, administrator, and COO of ICTINEU Submarins SL. In October 2016, the ICTINEU 3 was on an archaeological expedition in Baix Empordà, 100-kilometers North of Barcelona. Led by the Subaquatic Archaeological Center of Catalonia (CASC)—the Catalan Government agency for underwater archaeology—the mission was to survey poorly explored areas off the coast in search of ancient, long-forgotten shipwrecks. During the project, ICTINEU had to transport the submersible on land between ports, but instead took to the ocean to complete a record 12-kilometer transect in search for possible archaeological remains and test the vehicle's capabilities under challenging conditions.

"By road, we needed a truck and crane to transport the vehicle, and it would have taken an entire day to get from one port to the other," said Parareda. "The other option was to transport the submersible by sea, but it was a very long distance and we knew it would be a challenge. Yet, it was an opportunity for us demonstrate for the first time the autonomy of ICTINEU 3 and prove the vehicle can do what we have always claimed. Besides, if we did it we could explore a part of the coast that has not been explored before by the archaeologists—and who knew what we could find on our journey from St. Feliu de Guixols to Palamós."



There was a storm approaching, and the waves were already lashing the coast. If the team decided to go ahead with the mission, the absence of a harbor between ports meant they could not stop—it was all or nothing. The crew completed the routine checks of all the systems and charged the batteries to full capacity. To support navigation, one team member was positioned on land to help coordinate and prepare for the arrival at the harbor.

There were also other considerations that meant an adjustment from the original idea of completing a transect 60 to 70 meters depth: "We decided to reduce the depth of the dive because the trawlers were authorized to fish to 50 meters that day. It is very close to the coast, and the last thing you want to happen when you are in a submersible is to get caught in a trawl net – that that would be the most frightening thing that can happen! Instead, we dived at 45 meters to be sure we were not in the same area as the fishing vessels."

Finding the Way

Along with the weather and trawlers, Parareda was concerned about the communication between the submersible and the surface vessel.

"To help with navigation, we have an acoustic USBL system for communication and positioning. But there are some difficulties that we had to consider. For example, if you are in very deep waters, such as 500 meters, the surface vessel has excellent reception but in very shallow water the vessel must be directly on top of the submersible otherwise we will lose communication. The surface team had to advance along with us, but the sea was very rough, and they had big waves to deal with. It was very difficult for them as everything on board was moving, falling, and crashing about but they were able to keep the path. We could see them through the top hatch of the submersible which was comforting for us, but a massive challenge for them."

One of the advantages of following the coastline is that by sticking to the same depth; it should guide Parareda and her crewmates to the

next port. But mostly, the crew of ICTINEU 3 relied on the communication with the surface team to know what direction to travel. "The USBL system allows the surface vessel to always know the position of the submersible. The surface team guides us and gives us the heading we had to follow with our compass. We also had a Doppler system that gave us the velocity or speed of the submersible. In principle, it was quite easy; the difficulty for us was that we had a powerful facing current coming from the north-east and this made the navigation quite tricky. We were driving into the current, so we had to correct the heading constantly, which made advancing quite a challenge from above and below the ocean's surface."

Now, ICTINEU submersibles have an interface with the Doppler system. This interface provides the crew with a plot and coordinates, making them less dependent upon the surface vessel while navigating through the water.



Opposite: During the transect, the Thetis shape could be seen through the top hatch, 45 meters above. Inset: The ICTINEU 3. Above top: Rough seas off Palamós in a similar day to the transect one. Photo from inside the submersible through the top hatch. Inset: Arriving at Palamós port after the transect. Photos courtesy of Ictineu Submarins SL.

Going the Distance

Most research submersibles today can only travel from 1.5 to 5 kilometers underwater due to the limitation of the battery banks and vehicle efficiency (hydrodynamics + consumption). ICTINEU submersibles, however, can travel up to 40 kilometers.

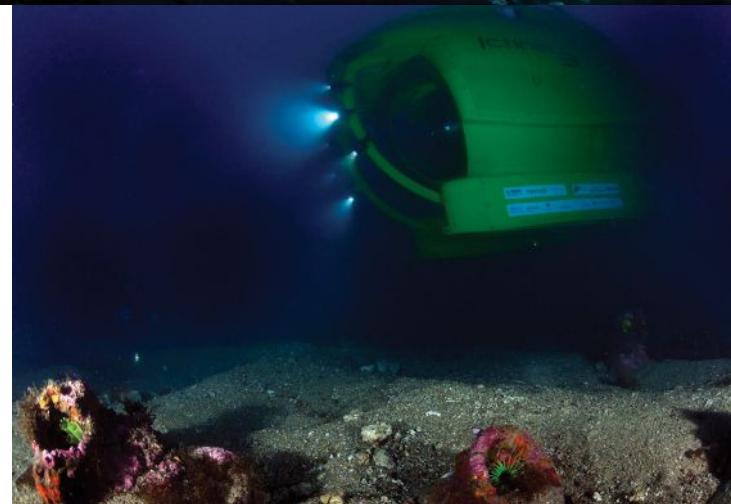
Parareda said: "No other submersible of this type has ever completed a transect of this length before, mostly because of the amount of energy that these types of submersibles consume. Small research subs usually have lead-acid batteries on board which provide a very limited capacity. For example, when diving to 6,000 meters, you save energy by descending for two hours in total darkness without lights until you reach the seafloor. This can have big limitations on the size and length of a survey mission. At ICTINEU, we have a Li-Po battery system which gives us more autonomy. Plus, the unique hydrodynamics of the vehicle optimizes energy efficiency, helping us travel long distances and explore areas no human has seen before."

While the distance from harbor to harbor was some 12-kilometers, due to the currents the ICTINEU 3 traveled approximately the equivalent to 18-kilometers (in terms of energy), taking around seven hours whilst using only 45% of the battery capacity.

"It was very exciting. I usually work with surface control, and I've dived but not for that long. It was a lot of work, so the seven hours passed very quickly. I was always busy checking the navigation and helping the archaeologist on board to survey the seafloor and look for remains. It was disappointing from the archaeological point of view because we didn't find anything of interest between the ports, and the seafloor was like a desert—there was no life. But for me, it was a fascinating experience."

While the crew found no sign of shipwrecks during the transect, the archaeologists had suspicions of wrecks in the area stemmed from fisherman reports and discoveries of remains nearby.

Just off the coast of Palamós, ICTINEU 3 discovered three new wrecks from the Roman Imperial era. One of the three is now the most important wreck of this type found in the Mediterranean. Covered entirely by sand, the Roman cargo vessel seemed to be carrying 1,000 to 2,000 amphorae—tall ancient Roman jars with narrow necks—that appear full of "garum," a fish sauce that was very popular in the era among the Roman court. The lids of the amphorae are still visible and sealed. It is thought that the ship struck nearby tiny islands known as ants, which are difficult to see in bad weather.





The Next Challenge

"After the success of the transect and overall mission, we now want to expand this further. We are looking for sponsors to make a 40 kilometer underwater transect between the two Mediterranean Islands of Minorca and Mallorca. This transect may have a mean depth of 140 meters. The goal would be to make the navigation near the seafloor and take the opportunity to document the status of the ecosystems with geo-referenced footage," said Parareda.

A standard submersible mission can last from 4 to 12 hours, and the ICTINEU submersible has enough life support (oxygen, CO₂ cleaning, water, food, etc.) for three people and—if things go wrong—four emergency days in addition to the mission. But this next challenge, which Parareda hopes to complete in 2018/19, would take the ICTINEU crew around 17 hours. It will require a detailed study of currents in the area to save maximum energy, and a two-person crew on board to ensure enough life support is available during this long, record-breaking transect. By using a real-time messaging system, Parareda plans to report discoveries live to the surface, and from the mother ship, a real-time broadcast could be done to the public.

Parareda explains, "We expect to prepare this mission with the cooperation of the scientific community who have been studying these Balearic waters for a long time now. Yet these areas remain unexplored. The presence of deep canyons nearby and the pristine waters of this area raises the expectations of discovering rich, diverse ecosystems. Not only will this next challenge allow us to test the full capacity for the ICTINEU submersible, what we find below the ocean's surface could offer many surprises."

Opposite: Images from the last day of the mission, a wreck in front of Palamós. Photos courtesy of Risk Carlos Virgili.
Above: The ICTINEU 3 mission team.

MONET CABLE SYSTEM is Ready for Service

Algar Telecom (Brazil), Angola Cables (Angola), Antel (Uruguay), Google, and TE SubCom, a TE Connectivity Ltd. company (NYSE: TEL) and an industry pioneer in undersea communications technology, announced that the Monet Cable System (Monet) has reached Ready for Service status. Commercial traffic should be able to commence shortly. This milestone means that the 10,556-kilometer cable that connects Florida to Brazil is complete and prepared to provide more than 64 Tbps of capacity to users.

Built using SubCom's Open Cables concept, Monet was

built in a way that provided the consortium with choice and flexibility in the selection of line cards while continuing to take advantage of the latest wet plant technology. Monet provides a powerful and stable internet backbone designed to serve the current connectivity needs in the Latin American region and to pave the way for increased capacity demands in the future. Debra Brask, vice president of project management of TE SubCom, said of the project: "The successful implementation of Monet is the result of excellent teamwork between TE SubCom and the purchasers to mitigate



MONET SUBMARINE CABLE FACTS

- Monet is owned by Algar Telecom (a Brazilian telecom company and ISP), Angola Cables (an Angolan telecom company operating in the wholesale market), Antel (the Uruguayan telecom company) and Google.
- The 100 G-capable cable system will provide a low-latency route from Brazil to North America with a minimum bandwidth of approximately 64 Tbps.
- Shore landings for Monet include Boca Raton, Florida, USA.; Fortaleza, Brazil; and Praia Grande, Brazil.

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Battery Systems

project risks. TE SubCom is proud to have delivered on time a flexible, highly reliable system to this distinguished group of customers."

Antonio Nunes, chairperson of the Monet Executive Committee, said: "We are proud to have completed this project with SubCom in the most efficient manner possible. The open cable approach enabled each Monet party to meet its respective network objectives while still benefitting from

the strengths of a joint build partnering model. Each of the parties, working with TE SubCom, was able to create a network that should meet our technology and cost needs well into the future."

IT'S WHAT'S ON THE INSIDE THAT COUNTS



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MARLINK and OMNIACCESS to Create a Leading Maritime VSAT Company

Backed by Apax Partners, Marlink has signed a definite agreement to acquire a majority stake in OmniAccess. The existing management team of OmniAccess will remain unchanged and continue to keep a significant sharehold of the company.

The new combined group is the worldwide leader in maritime VSAT services, generating close to \$500 million in revenue, employing about 1,000 people, and operating a global infrastructure, supporting an install base of more than 4,000 VSAT vessels. Established in 2002 and headquartered in the "yachting capital of the Mediterranean," the island of Mallorca, OmniAccess is a leading global provider of broadband connectivity services and solutions to

the high-end superyacht and boutique cruise line customers. OmniAccess offers a complete portfolio of cutting-edge IT and broadband connectivity services and solutions to over 300 of the world's largest superyachts in addition to ocean and river-cruise vessels.

With a staff of over 70 specialists, OmniAccess operates an advanced global proprietary VSAT network with more than 24 satellite-beams in both C-

and Ku-band, uplinked from six Teleport locations in Spain, Germany, Hawaii, Australia, and the USA. OmniAccess provides industry-leading nextGen BroadBeam®VSAT solutions for Internet connectivity at sea with ultra-high speeds of up to 300 mbps, augmented by the nextGen iO 4G & WiMax terrestrial connectivity services. The portfolio is further enhanced by the extensive suite of Plexus advanced integrated maritime IT networks and IPTV solutions.

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The Barracuda is a new breed of ROV, designed to work in high current. Small, Streamlined, Extremely Powerful and loaded with Advanced Capabilities.

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Shark Marine Technologies Inc. www.sharkmarine.com sales@sharkmarine.com Ph: (905) 687 6672



FOR MORE
INFORMATION, VISIT
www.marlink.com
and
www.omniaccess.com.

OmniAccess shares with Marlink the entrepreneurship and relentless drive to be in a pole position of the maritime satcom industry in terms of cutting-edge technology, innovation, service quality, and ultimate customer satisfaction. While leveraging the Marlink Group capabilities, OmniAccess will remain a stand-alone company, functioning as the competence center for broadband connectivity solutions for the high-end superyacht and boutique cruise-line customers.

"We are very proud that OmniAccess is joining forces with Marlink," said Erik Ceuppens, CEO of Marlink

Group. "OmniAccess is a truly unique company with in-depth understanding, expertise, and capabilities to serve the sophisticated superyacht segment better than anyone else. Together, we extend and strengthen the Group's global leadership position in the maritime broadband communication and IT market, with a unique position in all maritime segments."

"We are absolutely delighted to join forces with Marlink," said Bertrand Hartman, CEO and founder of OmniAccess. "Marlink is a very reputable and well-established player and I am convinced that the extended capabilities

and scale of this great cooperation model is very beneficial to all our customers and allows us to serve them better than ever."

The transaction remains subject to customary regulatory approval and Closing is expected in the first half of 2018.

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Find out more at rowetechinc.com





MARLINK Deploys TAMPNET'S 4G LTE in the Gulf of Mexico

Marlink has introduced a significant connectivity boost for its Gulf of Mexico customers with the addition of Tampnet's cutting-edge 4G LTE services to its high-speed Sealink multi-band network. Offshore support vessels and ships can order Tampnet 4G connectivity fully integrated with the Marlink network as SmartConnect, augmenting the already available VSAT, L-band satcom, and Wi-Fi services Marlink provides to oil & gas and merchant marine operators in the region.

Marlink's decision to deploy Tampnet 4G LTE in the Gulf of Mexico follows its successful integration with the Sealink network in the North Sea in 2016.

The new influx of low-latency bandwidth to the Sealink network in the Gulf of Mexico comes at a time when some workboats and offshore vessels are being re-activated for duty, so installation of the compact and low-cost hardware needed on board can be included as stacked vessels return to operation with their Marlink multi-band services back online. Likewise, the system is very simple and low-cost to install on vessels already operating in the Gulf.

Marlink's decision to deploy Tampnet 4G LTE in the Gulf of Mexico follows its successful integration with the Sealink network in the North Sea in 2016, which provided customers with improved redundancy for operational continuity in all conditions, in addition to a new low-

latency link ideally suited for real-time communication. Marlink's Norwegian customer Simon Møkster, an early adopter of Tampnet 4G LTE in the North Sea, found that the service provided a stable and secure foundation to enhance its use of Skype for Business, which it was already using for daily operations across its fleet of advanced offshore support vessels.

"Tampnet 4G LTE augmented the Sealink high bandwidth VSAT, L-band, and terrestrial 3G/4G we have on board all vessels in our fleet by giving us a very low-latency which is improving business critical applications, in addition to other use such as telephony, video conferencing, instant messaging and data sharing on Skype for Business," said Terje Gjerde, ICT Manager at Simon Møkster. "Sealink services with Tampnet contribute to our ability to operate more effectively through greater collaboration and the use of digital, data focused applications, enabling us to provide even more value for our charter clients."

"Tampnet 4G LTE has been tried and tested in the North Sea and the Gulf of Mexico with focus on fixed installations, but by integrating it with our Sealink network we are making communications even more flexible to support the safety and operational efficiency of mobile assets like offshore support vessels," said Tore Morten Olsen, president maritime, Marlink. "Tampnet serves to strengthen

Marlink's already extensive capacity dedicated to offshore operations in the Gulf, helping to ensure that operators seeking an edge by using digital applications can be confident in an always available and cost-effective link to the Internet."

Tampnet 4G LTE services as part of Marlink's multi-band service portfolio are now ready for customers operating in the Gulf of Mexico available from Marlink Houston. Also situated in Houston is Marlink Group navigation and communications service company, Telemar USA offering sales, service, and maintenance on bridge electronics through its extensive service network. Visitors to the International Workboat Show 2017 in New Orleans can find out more about Tampnet integration with Marlink's Sealink network in booth #3707.

For more information, visit www.marlink.com or www.tampnet.com.





Secretary of the Navy Richard V. Spencer swears in James "Hondo" Geurts as Assistant Secretary of the Navy for Research, Development, and Acquisition.

DEFENSE ACQUISITION NEWS

BY GREG LEATHERMAN, *Ocean News & Technology*

James 'Hondo' Geurts Sworn in as Navy Acquisition Chief Secretary of the Navy

Richard V. Spencer swore in James Geurts on 5 December 2017 to be the new Assistant Secretary of the Navy for Research, Development, and Acquisition.

"We are in challenging times and we need rapid and affordable acquisition. As a career leader in the acquisition field, Hondo has proven he is the right person to usher in the reform and innovation needed in the Department of the Navy," Spencer posted to his Facebook page.

Geurts joins Spencer in the Pentagon's Navy offices after working a similar job for Special Operations Command, where he was an acquisition specialist.

Four of 17 individual awards for excellence in Defense Department acquisition presented on 6 December 2017 went to personnel from U.S. Special Operations Command.

Accountability: Could Future Personnel Changes Impact Defense Acquisition?

Ellen Lord, the undersecretary of defense for acquisition, technology and logistics, told the Senate Armed Services Committee (SASC) on 7 December 2017 that she will demand accountability from program managers if their acquisition program goes away.

On average, Lord said, the department awards 1,800 contracts daily, and 36,000 delivery and task orders. Given that volume, she added, every improvement made has the potential to produce significant results. Lord also said she believes Department of Defense should be able to speed the award of a contract by as much as 50%.

She promised to brief the SASC in a future closed hearing if they required more details and added that she was not allowed to fire anyone for her first 120 days, but that this constraint has now passed. Asked if she thought that meant changes in personnel, she responded in the affirmative.

However, at this hearing, Senator John McCain (AZ), a known proponent of defense acquisition accountability commented that no one has yet been fired.

Referring to the success of Special Operations Command, Lord told the Senate panel. "Our challenge is to take ... these silos of excellence and scale them to the big Army, the big Navy, and the big Air Force."

Screen capture from marinetrack.com with an insert of the bulk carrier Hao Fan 6.



U.N. and U.S. Sanction North Korean Shipping

BY GREG LEATHERMAN, Ocean News and Technology

On 21 November 2017, the U.S. Department of the Treasury's Office of Foreign Assets Control (OFAC) sanctioned one individual, 13 entities, and 20 vessels to disrupt North Korea's (DPRK) illicit funding of its unlawful nuclear and ballistic missile programs. The sanctions target third-country persons with long-standing commercial ties to North Korea as well as the shipping and transportation companies, and their vessels, that facilitate North Korea's trade.

Aside from four Chinese trading companies and one Chinese individual, OFAC designated North Korea's Maritime Administration and its Ministry of Land and Maritime Transportation for sanctions. OFAC also designated six North Korean shipping and trading companies and blocked 20 of their vessels, all of which are DPRK-flagged:

- Korea Rungrado Shipping Company and its vessels PU HUNG 1, RUNG RA DO, and YANG GAK DO;

- Korea Rungrado Ryongak Trading and its vessels RUNG RA 1 and RUNG RA 2;
- Yusong Shipping Company and its vessels WON SAN 2, ZA RYOK 2, 7-28, YU SONG 12, and YU SONG 7;
- Dawn Marine Management Co. Ltd and its vessels JANG GYONG, KUM SONG 3, KUM SONG 5, KUM SONG 7, and KUM UN SAN 3;
- Korea Daebong Shipping Company and its vessel RAK RANG; and
- Korea Kumbyol Trading Company and its vessels KANG SONG 1, KU BONG RYONG, SO BAEK SAN, and RYE SONG GANG 1.

The Treasury Department says that North Korea is known to employ deceptive shipping practices, including ship-to-ship transfers, a practice prohibited by United Nations. They also released aerial photos of what the Treasury Department identified as a vessel transferring oil to evade sanctions on fuel exports to North

Korea. OFAC also designated Korea South-South Cooperation Corporation for the exportation of workers from North Korea, including exportation to generate revenue for the Government of North Korea or the Workers' Party of Korea.

U.N. Blocks North Korean Ships from Entering Any Global Port

On 3 October 2017, the U.N. Security Council Committee designated the following four vessels from the Democratic People's Republic of Korea pursuant to resolution 2375 (2017), which was adopted by the Security Council on 11 September 2017: PETREL 8, IMO: 9562233, HAO FAN 6, IMO: 8628597, TONG SAN 2, IMO: 8937675, and JIE SHUN, IMO: 8518780.

The U.N. stated that member states shall prohibit the entry into their ports of such designated vessels, unless the Committee determines in advance that such entry is required for humanitarian purposes or any other purposes consistent with the objectives of previous resolutions.

JFD SUBMARINE

Rescue Skills Put to the Test

JFD, an underwater capability provider serving the commercial and defense markets, has demonstrated why it is a global leader in submarine rescue after two weeks of intensive exercises at sea off the coast of Western Australia.

In some of the world's most challenging waters, "Black Carillon 2017" showcased JFD Australia's superior ability to save lives in a deep-sea submarine emergency.

As a trusted and proven strategic capability partner of the Royal Australian Navy (RAN,) JFD Australia conducted the annual safety exercise with the support of a robust local supply chain that helped deliver and install critical submarine rescue equipment to the two participating ships, MV BESANT and MV STOKER.

Launching from the deck of MV STOKER, JFD's free-swimming LR5 rescue vehicle with a pilot and two crew, was sent down to depths of 400 meters to locate the underwater target seat and simulate the safe "mating" to the rescue seat of a real submarine.

This is a crucial exercise as it also serves to maintain the submersible's third party certification ensuring that it is ready and fit for its hazardous duty year-round.

"This year threw up some very tough conditions, the weather was closing in and our operations team, engineers, and technicians really needed to put their knowledge and experience to the test," said general manager, JFD Australia, Toff Idrus.

"That makes the success of this operation even more pleasing and shows that the fast, safe, and proven submarine rescue service we have been providing to the Navy for the past decade is still unrivaled."

The fortnight of exercises also included mock rescues in shallower waters of 136 meters, using the RAN submarine, HMAS WALLER.

The LR5 successfully attached or "mated" with the submarine's hatch several times, which, in a real emergency, would see those on board a disabled submarine safely rescued from the seafloor.

"This year's Black Carillon exercise was highly successful and clearly demonstrated that we have a capable and reliable Submarine Rescue Suite that is able to respond to a submarine emergency," said the RAN's Commander of the Submarine Force, Captain Geoff Wadley.

JFD Australia is also soon to deliver a world-class hyperbaric equipment suite to the Australian Government that will offer lifesaving medical and decompression treatment for up to 65 survivors with room for a further 14 chamber operators and medical staff in what is further evidence of JFD's Australian capability and commitment to local jobs and continued growth of its local workforce.

"JFD Australia has a solid track record in offering a full submarine rescue system from our advanced maintenance and service centre at Bibra Lake, south of Perth that is on standby at all times and ready to respond within 12 hours," said Mr. Idrus.

SeeByte to Extend U.S. Navy Unmanned Capability

SeeByte, a global leader in creating smart software for unmanned maritime systems, has been awarded a Naval Sea Systems Command contract valued at \$22.59 million over five years to provide engineering, technical support, and training services for the MK18 Unmanned Underwater Vehicle (UUV) Family of Systems (FoS). <http://ont.news/2AMDRNK>

Huntington Ingalls Industries' Ingalls Shipbuilding Launches the Midgett

Midgett is the eighth National Security Cutter Ingalls has built for the U.S. Coast Guard. The ship name honors John Allen Midgett, who was awarded the Silver Cup by the U.K. Board of Trade in 1918 for the renowned rescue of 42 British sailors aboard the tanker Mirlo.

<http://ont.news/2C5bdYu>

Northern Challenge 2017: Teledyne Gavia and Teledyne SeaBotix Support NATO's Partnership for Peace

Thirty groups were assigned Explosive Ordnance Disposal (EOD) focused tasks, based on realistic scenarios, using the equipment provided. In support of Icelandic Coast Guard (ICG) EOD teams, a Gavia AUV and a SeaBotix vLBV300 ROV were utilized during the two weeks of exercises, assisting the ICG in identifying potential threats in one of two harbors used for the exercises.

<http://ont.news/2nP4Cy2>

RINA Heading to Australia with Fincantieri

The certification, testing, inspection, and consulting company has been appointed by Fincantieri as technical partner in the risk reduction and design study and prospect Classification Society for the Royal Australian Navy.

<http://ont.news/2Bah5IB>

The Queen Welcomes HMS Queen Elizabeth into the Royal Navy Fleet

Her Majesty The Queen has commissioned the UK's new aircraft carrier HMS Queen Elizabeth into the Royal Navy and spoke at a ceremony in Portsmouth Naval Base.

<http://ont.news/2Avw3TC>



OPEC Helps Oil and Weather Forecasts Hurt Gas Prices

BY G. ALLEN BROOKS

*Author, Musings From the Oil Patch
www.energymusings.com*

In early December, commodity markets struggled to decipher the impacts of recent events on oil and natural gas prices. In the oil trading pits, speculators began breathing again after holding their breaths awaiting the decision of the leaders of the Organization of Petroleum Exporting Countries on whether they would sustain their 1.2 million barrels a day cut in the members' output that has been in place for all of this year. The oil ministers agreed that the production cut would continue by announcing plans for a new agreement extending from January to December of 2018. With the continued assistance of Russia, one of the world's top oil exporters, and a few other non-OPEC producers, who also have cut their output, world oil markets will continue to operate with about 2% less crude oil than it otherwise would have if all these producers elected not to implement production cuts.

So far in 2017, the production cut has shrunk global oil inventories close to their five-year average, which, when coupled with stronger oil consumption worldwide, has the market nearly balanced. As a result, Brent, the world's crude oil benchmark, has risen in price above \$60 per barrel. Beginning this summer, Brent's rise has ultimately pulled down U.S. oil inventories, enabling West Texas Intermediate, the North American oil price benchmark, to climb near \$60 a barrel.

The most recent positive trends happening in the crude oil market have not been mirrored in the natural gas market. Unfortunately, natural gas prices are much more sensitive to weather events than they are to global economic activity, geopolitical developments, and worldwide supply and demand trends. Even though a miniature Arctic Polar Vortex has

brought very cold weather down from Canada into the middle of the United States, as far as the Gulf Coast region, the arrival did not correspondingly lift gas prices. The super-cold temperatures and snow will eventually arrive on the East Coast, reminding gas traders in the Northeast that winter still exists. These traders have been more fixated on the prospects of the climate effects from a weak La Niña weather phenomenon in the South Pacific Ocean moderating the winter forecasts to reflect warmer than normal temperatures. Although the temperatures may be cooler than last winter, the likelihood that they will be warmer than normal means that natural gas consumption for home heating will likely not be as great as in recent colder winters. Another warm winter will be bad news for natural gas producers hoping for gas prices to rise into the \$4-\$5 per thousand cubic feet range.

The key for natural gas demand this winter may be more dependent on increased power generation use as well as growing shipments of liquefied natural gas. Demand from the former is questionable since coal prices have remained low, undercutting natural gas prices and thus gas use. LNG demand, on the other hand, is growing as more terminals begin operating. As a result, any improved outlook for natural gas demand based on stronger LNG shipments will be offset by the prospect of reduced winter fuel consumption and less utility use.

The mixed outlooks for crude oil and natural gas in the U.S. are reflected in the recent price actions of the two commodities. In early December, crude oil prices rose as the demonstrated discipline of OPEC members and their non-OPEC supporters convinced traders that higher oil prices were destined by the near-term trajectory of global oil inventories. Analysts tracking weekly

oil inventory changes became convinced that crude oil prices were heading higher. With demand growing faster than anticipated and oil supply constrained by the OPEC agreement, meaning the oil market would reach balance quickly and possibly even become undersupplied, the traders pushed oil prices sharply higher. Prospects were that the price trajectory could lift prices into the \$70s a barrel range, or possibly even as high as \$80. At that point, psychology would shift to focusing on the demand and supply responses that would send prices back into a more reasonable price range.

If you compare oil and gas prices throughout 2017 with those that existed since 2000, one sees a remarkably different pattern. With respect to crude oil, although current oil prices are sharply lower than the first 14 years of this century, the recent rise in prices in response to the rebalancing of the world's oil market undertaken by OPEC and its non-OPEC supporters suggests that oil exporters will be earning more revenue in 2018. That may reduce the pressure for them to push additional oil volumes into the market to increase their incomes and offset the impact of low oil prices. While many of these countries will earn more in 2018, and certainly need that additional income, it will not stop some of them from cheating on their production quotas in order to earn even more revenue. Cheating in 2018 by OPEC members will be a topic of high interest for the oil market.

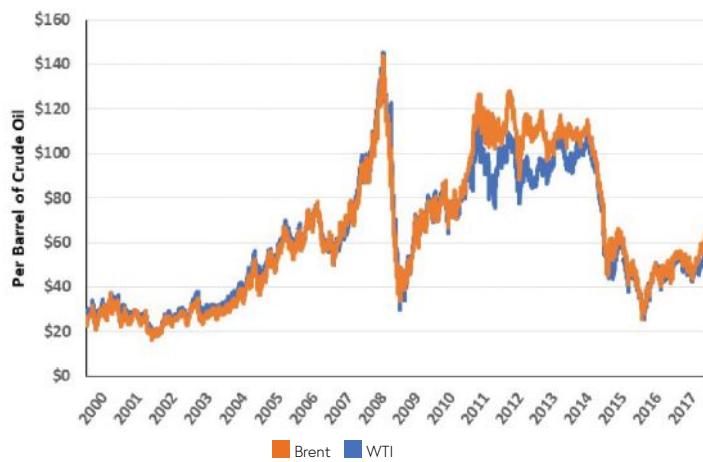
Should crude oil prices rise into the \$70s a barrel in the first half of 2018 due to the market's rebalancing, then prices will have recovered half of the peak price prior to the financial crisis of 2008. The unanswered question for oil market participants is whether the actions taken to help lift oil prices can be sustained?

When we turn to the natural gas market, current pricing reflects a dramatically different environment than existed for most of recent history. In fact, although current prices are slightly below \$3 per thousand cubic feet of natural gas, they are about 50% above the worst prices experienced periodically during the past 17 years. Current gas prices are being pushed (held) down by both the warmer near-term weather outlook and the continuing surge in supply. The shale gas supply revolution that commenced in the early 2000s, driving gas prices from double-digits down to about \$2 per thousand cubic feet, is being augmented by the shale oil boom. In several leading shale oil basins, such as the Permian and Bakken, increased gas output is coming along with the increased shale oil production, adding to the nation's gas production growth.

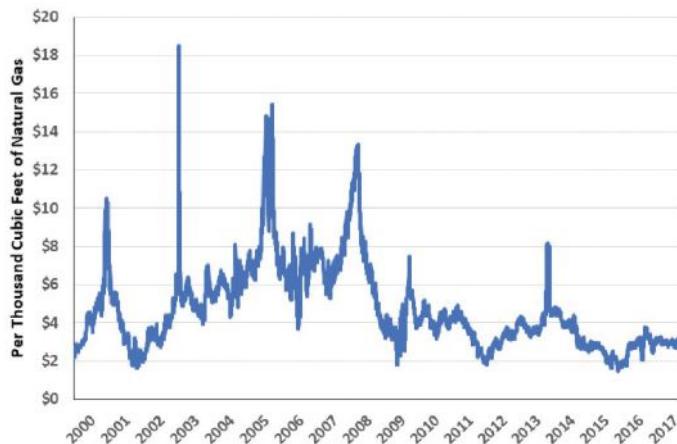
At the same time that domestic natural gas supplies are rising, gas consumption is struggling to grow. The lack of gas demand growth is attributed to the combination of warmer weather, which is limiting heating-related consumption growth. Low coal prices have muscled out gas use in the electric power generation market. Industrial gas demand is growing, but more slowly than hoped for. The only source of notable gas consumption growth is LNG, which is being helped by the start-up of new export terminals. Gas export demand is being assisted by increased gas pipeline shipments to Canada and Mexico. Without the surge in gas exports, domestic storage would be full and gas prices would be under severe pressure. One would expect lower gas prices would boost electric generation use of the fuel, but the amount would depend on how low gas prices went. In the interim, however, gas producers would suffer financially.

Domestic energy producers are challenged by the divergent environment in which crude oil prices are rising and natural gas prices remain weak. Should they focus on growing their oil output rather than increasing natural gas production? Maybe the commodity relationships are soon going to reverse their positions of today. Is that possible given the recent history of greater gas volumes being associated with new shale oil wells? Will these divergent supply and price trends mean that the U.S. will play a significantly greater role in the world's energy market, and, if so, what does this mean for energy producers? Lots of questions with few immediate answers. Watch the price trends for answers.

WTI & BRENT
CRUDE OIL
PRICES
FOR THIS
CENTURY



HENRY
HUB SPOT
GAS PRICES
FOR THIS
CENTURY



“The key for natural gas demand this winter may be more dependent on increased power generation use, as well as growing shipments of liquefied natural gas.”

CRUDE & NATURAL GAS Spot Prices

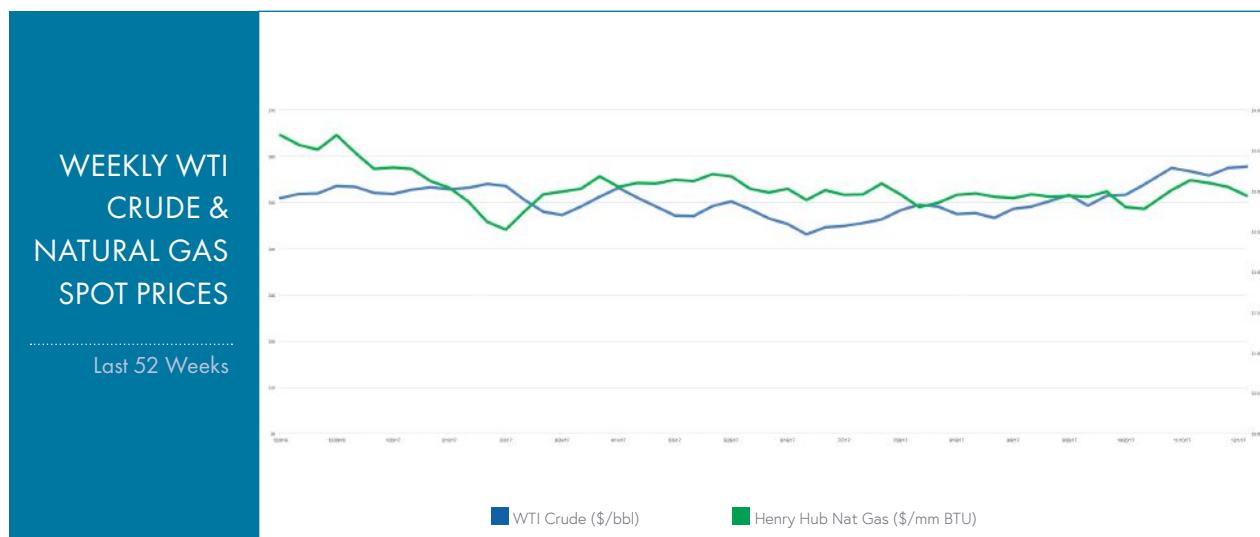
PRICES IN US DOLLARS AS OF DECEMBER 11, 2017

The December 11 news that the Forties Pipeline System (FPS) in the North Sea would be shut down for an extended period of time for emergency repairs led to immediate increases in oil and gas prices in the UK, although the full extent of the increases were not evident as of press time. Prior to the news of

the pipeline closure, energy prices were moving upward at a modest pace, with WTI Crude nearing the \$58/bbl mark. Other factors impacting oil prices include increased demand for oil by China and indications that OPEC will continue its production cuts through 2018.

Henry Hub natural gas spot prices dropped back below the \$3.00 mark to reach \$2.94 mm BTU in early December; however, the FPS pipeline situation could drive up prices. The United States Energy Information Agency (EIA) released its prediction for natural gas prices in 2018, expecting them to average

\$3.10 mm BTU for the year, up from an average of \$3.10 mm BTU for 2017.



\$57.81
+\$0.04 previous month



TRENDING UP



**Cushing, OK
WTI Spot Price**

\$2.94

-\$0.19 previous month



TRENDING DOWN



**Henry Hub
Spot Price**

KEY EQUITY Indexes

PRICES IN US DOLLARS AS OF DECEMBER 11, 2017

U.S. EQUITY MARKETS

continued their advance since last month's report on strong job reports, a jump in oil prices and indications that President Trump's tax cut plan is moving closer to becoming law.

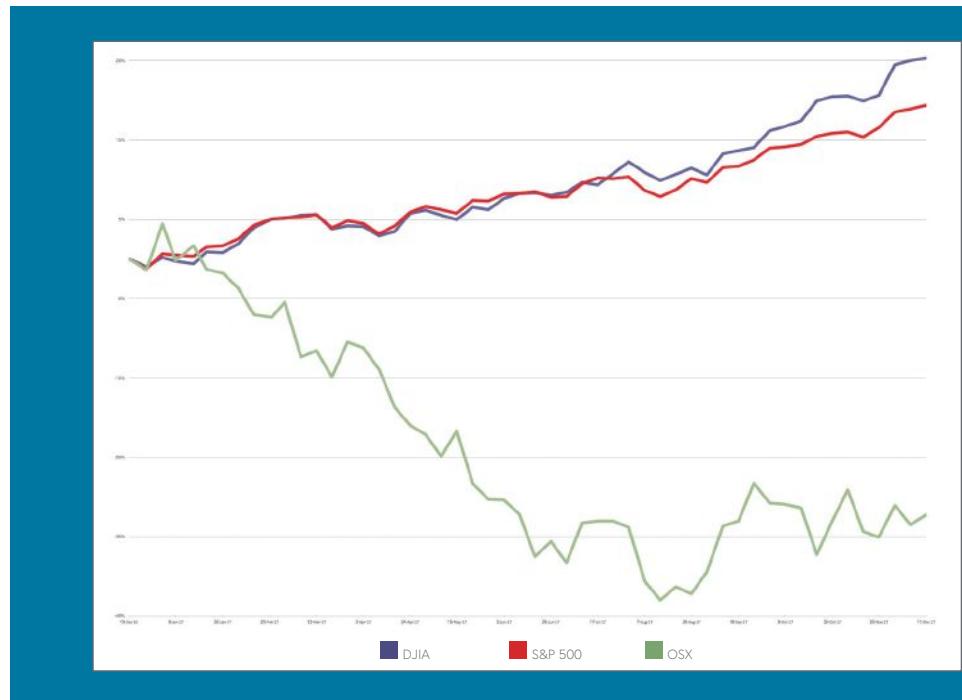
The DJIA reached a high of 24,348 on December 11, driven largely by technology and energy stocks.

The S&P 500 crossed the 2,600-point mark in late November and continued to reach record highs in early December on the jobs report, with telecom and health care leading the way.

The Philadelphia Oilfield Services Index (OSX) remained flat, closing at 135.98 on December 13.

SELECTED EQUITY INDEXES

Cumulative Percentage Change Last 52 Weeks



24,386.03

+946.33 from previous month



TRENDING UP

DJIA

2,659.99

+81.12 from previous month



TRENDING UP

S&P 500

136.05

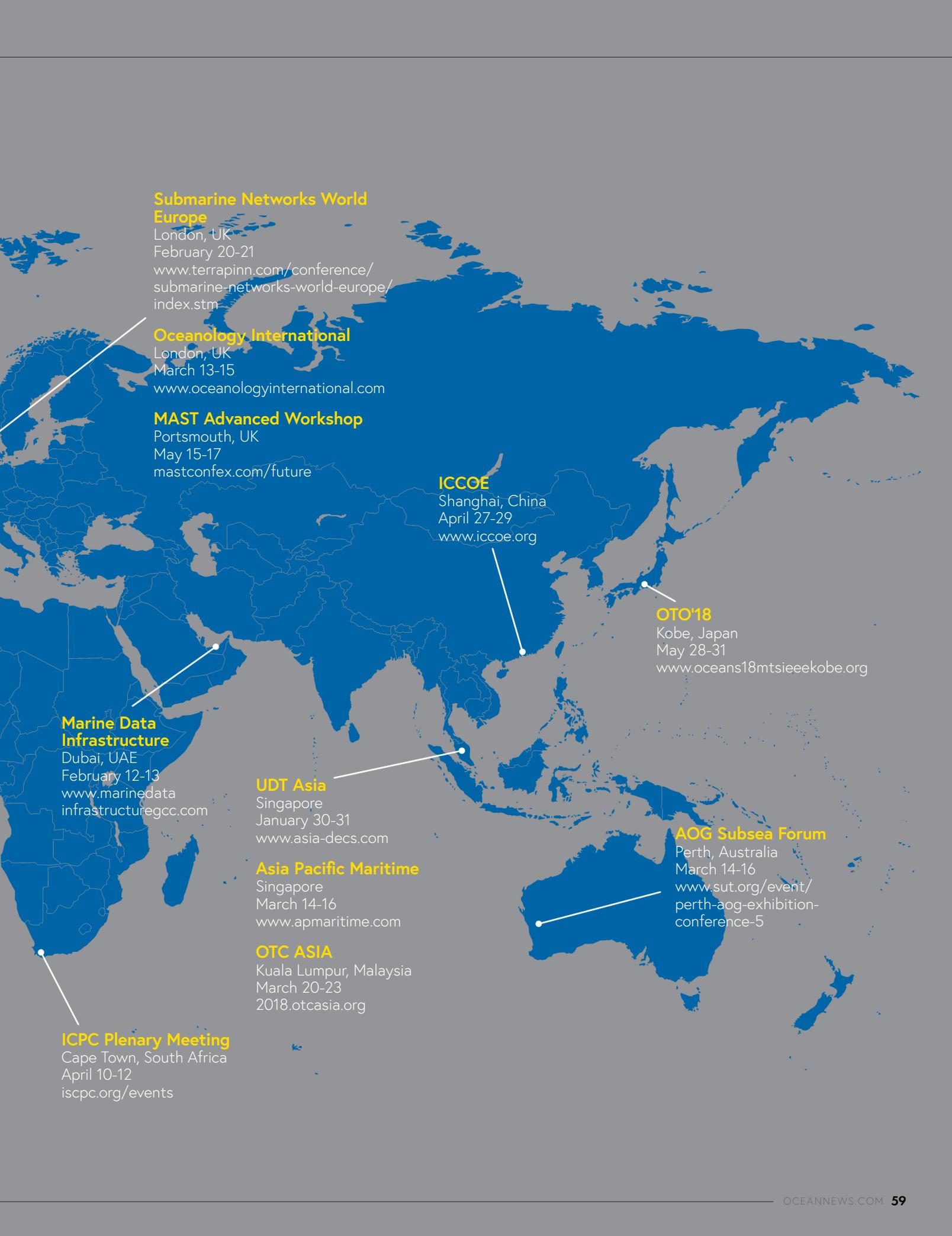
-3.23 from previous month



TRENDING DOWN

OSX





2018 EDITORIAL CALENDAR

CALENDAR

JANUARY

- EDITORIAL: Underwater Navigation; Manned Submersibles; Deepwater Pipeline/Repair/Maintenance
- FOCUS: Multibeam and Side Scan Sonar; Oil Spill Prevention and Clean-Up Services

FEBRUARY

- EDITORIAL: Oceanology; Maritime Security
- FOCUS: Buoys and Monitoring Instrumentation; Diver Detection Systems; Training & Safety

MARCH

- EDITORIAL: Offshore Technology; Subsea Fiber Optic Networks
- FOCUS: Connectors, Cables & Umbilicals; Environmental Monitoring/Testing Services

APRIL

- EDITORIAL: Meteorology; Ocean Mapping & Survey; Decommissioning & Abandonment
- FOCUS: Subsea Tools & Manipulators; Data Acquisition Products; Seismic Imaging

MAY

- EDITORIAL: Ocean and Coastal Engineering, Infrastructure, and Construction; Bathymetric Mapping
- FOCUS: Cranes, Winches & Control Systems; Water Dredges and Airlifts

JUNE

- EDITORIAL: UW Imaging and Processing; UW Archaeology
- FOCUS: UW Imaging and Processing; Tracking and Positioning Systems; Magnetometers

JULY

BUYER'S GUIDE

AUGUST

- EDITORIAL: ROV and AUV Technology
- FOCUS: Cameras, Lights and Imaging Sonars; Vehicle Sensor Suites

SEPTEMBER

- EDITORIAL: Offshore Wind Installation and Maintenance; Offshore Supply & Emergency Vehicles
- FOCUS: Offshore Support; Turbines; Offshore Wind Inspection Services

OCTOBER

- EDITORIAL: Offshore Communications; Subsea Telecom; Subsea Inspection, Monitoring, Repair & Maintenance
- FOCUS: Marine Communications; Cable Installation Services

NOVEMBER/DECEMBER

- EDITORIAL: Year in Review; Commercial Diving and Salvage; Ocean Observing Systems; Ocean Science & Exploration
- FOCUS: Acoustic Modems, Releases and Transponders; Diving Equipment and Services; Salvage; Buoyancy Materials

SHOW DISTRIBUTION

JANUARY

- GoM Oil Spill & Ecosystem - February 5-8
- Underwater Intervention - February 6-8
- Subsea Expo - February 7-9
- Decomm & Abandonment Summit - February 20-21

FEBRUARY

- Oceanology International - March 13-15
- Asia Pacific Maritime - March 14-16 ^*
- CUCF - March 25-27 *

MARCH

- Int'l Offshore Wind Forum - April 3-6
- ICCOE - April 27-29 ^*
- OTC - April 30 - May 3
- Int'l Telecoms Week - May 6-9 ^

APRIL

TBD

MAY

- Int'l Conf on Ocean Energy - June 12-14 ^
- Clean Pacific - June 19-21 ^
- Int'l Conf on Coastal Engineering - July 30-Aug 3 ^

JUNE

- UDT - June 26-28 ^

JULY

TBD

AUGUST

- SMM - September 4-7 ^*
- OCEANS '18 - October 22-25 ^
- Submarine Networks World - TBD *
- MTS Dynamic Positioning - TBD

SEPTEMBER

- WindEnergy Hamburg - September 25-28 ^
- AWEA Offshore Wind - October 16-17 ^
- Pacific Marine Expo - TBD
- Offshore Energy - TBD

OCTOBER

- Clean Gulf - TBD
- Offshore Well Intervention GoM - TBD

NOVEMBER/DECEMBER

TBD

* Digital Distribution

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Aquatica Submarines	24	Marine Pollution Control.....	24
www.aquaticasubmarines.com		www.marinepollutioncontrol.com	
CSA Ocean Science Inc.	3	MTS MUV Committee.....	24
www.csaocean.com		www.mtsmuv.org	
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www.deepsea.com		www.oceannews.com/uv-buyers-guide	
ECO Magazine.....	62	Oceangate	24
www.ecomagazine.com		www.oceangate.com	
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www.edgetech.com		www.oceanologyinternational.com	
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www.evologics.de		www.outlandtech.com	
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www.farsounder.com		www.riptideas.com	
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www.gryphonmediastategies.com		www.rowetechinc.com	
Hawx Open Ocean	24	SEAmagine	24
www.Hawxopenocean.com		www.seagine.com	
HURL – Hawaii Univ.....	24	Shark Marine Technologies, Inc.....	48
www.soest.hawaii.edu/HURL		www.sharkmarine.com	
Hydrospace Group.....	24	SubCtech GmbH.....	46
www.hydrospacegroup.com		www.subCtech.com	
Ictineu Submarins.....	24	Subsalve USA.....	19
www.ictineu.net		www.subsalve.com	
INNERSPACE Corp.....	24	Teledyne Marine.....	4
www.innerspacethrusters.com		www.teledynemarine.com	
iXBlue SAS.....	9	Thorsborg Institute	24
www.ixblue.com		www.thorsborg.com	
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Website: www.seaconworldwide.com



The SEACON Group are world leaders in underwater connector technology and provide an extensive and diverse range of electrical, optical and hybrid connector assemblies, submersible switches and cable system solutions for many applications within the Oceanographic, Defense, Oil and Gas and Environmental markets. With locations in California and Texas, USA, Mexico, Brazil, the United Kingdom and Norway and a worldwide network of agencies and representatives, SEACON is able to supply very quick solutions to any requirements across the globe.

CONNECTORS (cont.)

TELEDYNE MARINE
INTERCONNECT SOLUTIONS
1026 N. Williamson Blvd.
Daytona Beach, FL 32114
Tel: 386-236-0880
E-mail: TeledyneMIS@teledyne.com
Website: www.teledynemarine.com



Teledyne Marine Interconnect Solutions integrates the resources of ODI, DGO, Impulse, and Cable Solutions into a single organization that supplies innovative, high-performance solutions for harsh environment interconnect. Solutions for these harsh environments include wet-mate, splash-mate and dry-mate connectors, pressure boundary penetrators, cable assemblies, cable terminations, and custom-engineered encapsulation and molding. TMIS contains a broad portfolio of field-proven, time-tested electrical, optical, and hybrid interconnect capabilities optimized for applications where performance and reliability are imperative. Products are available as stand-alone items, or as complex solutions that integrate technologies into advanced, value-added systems.

DESIGN & ENGINEERING

HYDRO LEDUC NA, INC.
19416 Park Row, Ste. 170
Houston, TX 77084
Tel: 281-679-9654
E-mail bogden@hydroleduc.com
Website: www.hydroleduc.com



Hydro Leduc is a specialist in the design and manufacture of hydraulic piston pumps, hydraulic motors, hydro pneumatic accumulators, and customized hydraulic components satisfying customer needs with reliable products from a reliable source. As the leader in micro hydraulics, it is feasible to obtain several tons of force from a minimal power source within a restricted space envelope. The techniques of micro hydraulics allow simple solutions to problems that are often beyond the limits of traditional mechanical options. Hydro Leduc's expertise is at your service in varied applications such as oil service tools, oceanographic instrumentation, aeronautics, and any extreme working condition of temperature, pressure, medium, and environment.

EQUIPMENT RENTAL

OKEANUS SCIENCE & TECHNOLOGY, LLC
2261 Denley Road
Houma, LA 70363
Tel: 985-346-4666
Fax: 985-346-8444
E-mail: Bleblanc@oceanus.com
Website: www.oceanus.com
Contact: Benton LeBlanc



Okeanus is the premier rental provider for oceanographic and marine scientific research equipment utilized in nearshore and offshore projects around the world. Focused on providing industry-leading customer service, Okeanus offers advanced, high-quality technology coupled with knowledgeable and experienced staff that can deliver dedicated support regardless of a project's location.



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Stuart, FL 34997
Tel: +1 772 219 3000
Fax: +1 772 219 3010
Email: contact@oceanspecialists.com
Website: www.oceanspecialists.com



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

GYRO COMPASSES

KONGSBERG SEATEX AS
Pircenteret
N-7462 Trondheim, Norway
Tel: +47 73 54 55 00
Fax: +47 73 51 50 20
E-mail: km.seatex@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at finn.otto.sanne@kongsberg.com



KONGSBERG

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

LIQUID STORAGE

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Tel: +1 201 825 1400
Fax: +1 201 825 1962
E-mail: atl@atlinc.com
Website: www.atlinc.com
Contact: David Dack



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

MARINE ENVIRONMENTAL CONSULTING SERVICES

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Tel: +1 772 219 3000
Fax: +1 772 219 3010
E-mail: gstevens@conshelf.com
Website: www.csaocean.com
Contact: Gordon Stevens



CSA Ocean Sciences Inc. (CSA) is a marine environmental consulting firm specializing in multidisciplinary projects concerning potential environmental impacts of activities throughout the world. With extensive experience in environmental sciences and technical field operations, CSA is staffed and equipped to offer a complete range of services for projects in offshore, nearshore, estuarine, wetland, and freshwater environments.

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Fax: +47 73 51 50 20
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Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at finn.otto.sanne@kongsberg.com



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NAVIGATION & POSITIONING SYSTEMS

ADVANCED NAVIGATION

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New South Wales, Australia
Tel: +61 2 9099 3800
E-mail: sales@advancednavigation.com.au
Website: www.advancednavigation.com.au



Advanced Navigation is a privately owned Australian company that specialises in the development and manufacturing of navigation technologies and robotics. The company has a focus on generating products of the highest quality standard, both in terms of hardware and software. Advanced Navigation has specialised expertise across a broad range of fields including sensors, GNSS, inertial navigation, RF technologies, acoustics, robotics, AI and algorithms. Advanced Navigation is an ISO 9001 certified company and maintains a strict quality control system across the two research facilities and three manufacturing facilities that they operate in Australia. Advanced Navigation is a carbon neutral company, offsetting all emissions due to energy use through the planting of trees.

EVOLOGICS GMBH

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13355 Berlin, Germany
Tel: +49 (0) 30 4679 862-0
Fax: +49 (0) 30 4679 862-01
E-mail: sales@ealogics.de
Website: www.ealogics.de



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

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Tel: +47 73 54 55 00
Fax: +47 73 51 50 20
E-mail: km.seatex@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at
finn.otto.sanne@kongsberg.com



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NETWORK & DATA COMS

KONGSBERG SEATEX AS

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Fax: +47 73 51 50 20
E-mail: km.seatex@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at
finn.otto.sanne@kongsberg.com



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OCEANOGRAPHIC INSTRUMENTS/SERVICES

ASL ENVIRONMENTAL SCIENCES, INC.

Victoria, BC, Canada
Tel: +1-250-656-0177
E-mail: asl@aslenv.com
Website: www.aslenv.com



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- Consulting: Field work, data collection, analyses, numerical modelling, acoustics, remote sensing, oceanographic mooring design and system integration.
- Manufacturer's Representative: Teledyne RD Instruments, Teledyne Oceanscience, Teledyne Benthos, WERA Northern Radar.

NKE INSTRUMENTATION

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- Intelligent network: environmental parameters (meteorologic and oceanographic), Ecosystems Approach to Fisheries (EAF - Voluntary fishing vessels), Webdata application. Contact: Valérie Le Pen - vlepen@nke.fr or Goulven Prud'homme - gprudhomme@nke.fr
- Provor and Arvor profiling subsurface floats (ARGO project): CTD, dissolved oxygen, BGC, deep; Argos and Iridium transmission.
- Drifting surface buoys with temperature and GPS receiver for Surface velocity project. Contact: Nathalie Le Bris - nlebris@nke.fr or Jérôme Sagot - jsagot@nke.fr

RBR

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Fax: +1 613 599 8929
E-mail: info@rbr-global.com
Website: www.rbr-global.com



RBR creates instruments to measure the blue planet. From the ocean abyss to the polar ice caps, our sensors track water parameters – temperature, depth, salinity, dissolved gases, pH, and many others. With design and manufacturing centrally located in Ottawa, Canada, our team works in a fast-paced, dynamic atmosphere to serve customers all over the globe.

ROMOR OCEAN SOLUTIONS

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B0N 1Z0
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Fax. +1 (902) 466-4880
E-mail: Sales@romor.ca
Website: www.romor.ca
Contact: Darrin Verge, President & CEO



ROMOR Ocean Solutions provides instrumentation solutions for the geophysical, oceanographic, defense, security, oil & gas, and renewable energy industries. By partnering with world renowned manufacturers, ROMOR is able to offer technical knowledge, value added services, logistics expertise, and the most reliable instrumentation on the market.

OCEANOGRAPHIC INSTRUMENTS/SERVICES (cont)

SEA-BIRD SCIENTIFIC

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Tel: +1 425 643 9866
Fax: +1 425 643 9954
E-mail: info@sea-birdscientific.com
Website: www.sea-birdscientific.com
Contact: Calvin Lwin, Sales



Sea-Bird Scientific combines the capabilities of Sea-Bird Electronics, WET Labs, and Satlantic to provide best-of-class sensors and systems for oceanographic research and environmental water quality monitoring of physical and biogeochemical properties. Sea-Bird Scientific is the leader in accurate, stable ocean instruments for measuring conductivity (salinity), temperature, pressure, oxygen, pH, chlorophyll, CDOM, turbidity, beam attenuation, irradiance, radiance, PAR, nitrate, and phosphate. Our CTD profilers, water samplers, moored CT recorders, wave/tide recorders, DO sensors, and optical sensors are used by research institutes, ocean observing programs, government agencies, and navies globally.

STAR-ODDI

Skeidaras 12, 210
Gardabaer, Iceland
Tel: +354 533 6060
Fax: +354 533 6069
E-mail: baldur@star-oddi.com
Website: www.star-oddi.com
Contact: Baldur Sigurgeirsson



A manufacturer of miniature data loggers with sensors as temperature, depth/pressure, salinity, tilt/acceleration, compass direction/magnetometer, light levels, acoustic receiving/transmitting. The loggers are used for various researches, including oceanography, fishing gear studies, equipment behavioral monitoring and fish tagging.

SMART TELEMETRY

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Fax : +44 (0) 872 115 0560
Email : info@oceanwise.eu
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Website: www.edgetech.com
Contact: Amy LaRose



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

MARINE SONIC TECHNOLOGY

120 Newsome Dr. Suite H, PO Box 1309
Yorktown VA 23692-1309
Toll Free: +1 800 447 4804
E-mail: Regan.Lipinski@na-atlas.com
Website: www.marinesonic.com



MARINE SONIC TECHNOLOGY
A brand of ATLAS NORTH AMERICA

Marine Sonic Technology builds high quality, high resolution side scan sonar systems.

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Laksevag, Norway
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Fax: +47 56 11 30 69
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Website: www.saivas.no
Contact: Gunnar Sagstad



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

SUBSEA FABRICATION

NEW INDUSTRIES

6032 Railroad Avenue
Morgan City, LA 70380
Tel: +1 985 385 6789
E-mail: bill.new@newindustries.com
Website: www.newindustries.com
Contact: Bill New



New Industries provides quality fabrication services to the offshore oil & gas and marine industries focusing on large diameter pressure vessels, suction piles, DNV buildings and deepwater subsea production equipment such as jumpers, PLETs, PLEM and manifolds.

SUBSEA TECHNOLOGY

KONGSBERG MARITIME AS – SUBSEA DIVISION (DIVISION OF KONGSBERG GROUP)

Strandpromenaden 50
NO-3183 Horten
Norway
Tel: +47 33 03 41 00
Website: www.km.kongsberg.com



Kongsberg Maritime is a marine technology company providing innovative solutions for all marine industry sectors including merchant, offshore, subsea, naval and fisheries. The company delivers systems that cover diverse maritime applications. Within subsea, Kongsberg Maritime's sonars, Sub-bottom profilers, multibeam and single beam echo sounders, cameras, positioning and underwater communication & monitoring systems, instruments, software and Marine Robotics are used in survey and inspection operations worldwide. Working closely with customers to develop technology that pushes the limits in subsea applications, Kongsberg Maritime is also dedicated to developing innovative environmental monitoring solutions such as the K-Lander system in addition to cutting-edge Marine Robotic platforms such as the futuristic Eelume vehicle.

UNDERWATER VEHICLES/AUVS

GENERAL DYNAMICS MISSION SYSTEMS
BLUEFIN ROBOTICS PRODUCTS

553 South Street
Quincy, MA 02169
Tel: +1 617 715 7000
E-mail: adam.mara@gd-ms.com
Website: gdmissionsystems.com/
underwater-vehicles/bluefin-robotics
Contact: Adam Mara

General Dynamics Mission Systems' Bluefin Robotics products provide undersea capabilities for defense, scientific and maritime customers worldwide. Bluefin Robotics products offer a range of systems and configurations that can operate in the open ocean and in constrained waterways. Our core autonomous product line includes Bluefin SandShark, Bluefin-9, Bluefin-12, and Bluefin-21, Hovering Autonomous Underwater Vehicle (HAUV), and Subsea Power technologies.

The Bluefin Robotics AUV family shares a free-flooded, modular, and open architecture backbone that has enabled the integration of 70+ sensors. We have developed and delivered AUVS worldwide to research institutes and industry and have provided AUVS to the United States' and International Navies.

HYDROID, INC.
A SUBSIDIARY OF KONGSBERG MARITIME

1 Henry Drive
Pocasset, MA 02559
Tel: +1 508 563 6565
Fax: +1 508 563 3445
E-mail: sales@hydroid.com
Website: www.hydroid.com
Contact: Hydroid Sales Department

Located in the U.S. and a subsidiary of Kongsberg Maritime, Hydroid is the world's most trusted manufacturer of advanced Autonomous Underwater Vehicles (AUVs). Our Marine Robotics systems provide innovative and reliable full-picture solutions for the marine research, defense, hydrographic and offshore/energy markets. Our products represent the most advanced, diversified and field-proven family of AUVs and AUV support systems in the world.

Developed by a veteran team of engineers, the innovations of Hydroid and Kongsberg Maritime provide a safe and reliable answer to the challenges that have hampered ocean exploration and security. For more information on REMUS technology, please visit www.hydroid.com.



L3 OCEANSERVER TECHNOLOGY, INC.

151 Martine Street
Fall River, MA 02723 USA
Tel: +1 508 678 0550
Fax: +1 508 678 0552
E-mail: sales@ocean-server.com
Website: www.iver-auv.com
Contact: Jim Kirk

L3 OceanServer Technology, Inc. is a leading provider of man-portable Autonomous Underwater Vehicles (AUVs) with over 250 AUVs deployed worldwide. The Iver AUV is an affordable, commercial vehicle used for general survey and sub-surface security work, and serves as a research platform for autonomy, behavioral and sensor development studies at universities and navy research facilities.



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UNDERWATER VEHICLES/ROVS

DEEP OCEAN ENGINEERING INC.
2403 Qume Dr, San Jose, CA 95131 USA
Tel: +1 408 436 1102
Fax: +1 408 436 1108
E-mail: sales@deepocean.com
Website: www.deepocean.com
Contact: Mike Takeda



Deep Ocean Engineering, Inc. provides remotely operated and unmanned surface vehicle (ROV / USV) solutions which are used by a broad range of industry applications - security, military, nuclear and hydroelectric power plants, inshore dams and lakes, oil and gas, scientific research, fisheries, salvage, search / recovery, and pipeline inspections.

OUTLAND TECHNOLOGY

38190 Commercial Ct.
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Fax: 985-847-1106
E-mail: jeff@outlandtech.com
Website: www.outlandtech.com
Contact: Jeff Mayfield



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

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Fax: +1 619 450 4001
E-mail: SeaBotixInfo@Teledyne.com
Website: www.SeaBotix.com
Contact: Alasdair Murrie



Teledyne SeaBotix is a world leading manufacturer of capable underwater MiniROVs that perform a multitude of tasks including maritime security, search and recovery, hull and pipeline inspection, hazardous environment intervention, aquaculture, sensor deployment and oceanographic research. The Little Benthic Vehicle systems have become the benchmark in compact ROVs around the world and ROV equipment for over 30 years. We recognize that no two jobs are the same and specialize in products that are customizable for your specific applications.



UNDERWATER VEHICLES/ROVs (cont.)

VIDEORAY

212 East High Street
Pottstown, PA 19464
Tel: +1 610 458 3000
Fax: +1 610 458 3010
E-mail: sales@videoray.com
Website: www.videoray.com
Contact: Chris Gibson



With more than 3,700 ROVs in service around the world, VideoRay is the global leader in Observation ROV technology. VideoRay's underwater robot systems are extremely versatile, portable, affordable, and reliable solution for underwater operations including surveys, offshore inspections, search & recovery, homeland & port security, science & research, aquaculture, and many other underwater applications. The latest Mission Specialist systems provide solutions for particularly difficult underwater challenges. VideoRay is available on the General Services Administration (GSA) Schedule.

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Fax: +44 (0) 1224 791002
E-mail: admin@alloceans.co.uk
Website: www.alloceans.co.uk
Contact: Brian Abel

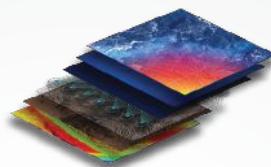


MECHANICAL HANDLING UNDERWATER

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Website: www.oceanus.com
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Sea Shepherd Launches New Anti-Poaching Vessel M/V Sharpie

Sea Shepherd Conservation Society, the direct-action marine organization, unveiled the M/V Sharpie at a press conference on 11 December in Miami, Florida. Captain Sandy Yawn will guide the vessel on its inaugural mission to the Gulf of California where it joins the M/V Farley Mowat and the M/V John Paul DeJoria in a campaign to save the critically endangered vaquita porpoise. All three ships are 110-foot Island-class patrol boats.

<http://ont.news/2kptYhh>



M² Subsea Appoints New Business Development Manager to European Team

M² Subsea, a global independent provider of ROV services, has bolstered its European business development team with the appointment of David Sinclair as business development manager – renewables and decommissioning.

<http://ont.news/2iXIxtf>



VIKING Welcomes New Country Director

Omur Izgili will take over as VIKING's new country director for Turkey, Greece, Bulgaria, Romania, and Lebanon on January 1, 2018. He is succeeding Yasin Kasa, who has been appointed senior commercial director for VIKING Asia based out of Singapore. Mr. Kasa will remain an active member of the VIKING Turkey board of directors.

<http://bit.ly/2yhOPrv>

Acteon Group Acquires Viking Seatech Group

Subsea services group Acteon has enhanced its moorings capabilities by purchasing the Viking Seatech Group. The announcement follows regulatory approval for Acteon to acquire Viking Seatech while selling Mirage Machines to Actuant, a U.S. corporation. Viking Seatech's services will complement those of InterMoor, the global leader in mooring services and a specialist in foundation solutions and offshore installations, whilst extending Acteon's global reach for clients and adding capabilities in rental and engineering as well as chain inspection and survey in Australia.

<http://ont.news/2BGQuNH>



Ashtead Technology and Forum Energy Technologies in Joint Venture

Ashtead Technology and Forum Energy Technologies, Inc. have agreed to form a joint venture, creating the industry's leading provider of subsea survey and ROV equipment rental and associated services. Forum will contribute its subsea rentals business, currently trading as Forum Subsea Rentals. The combined group, with a rental fleet of 19,000 assets valued in excess of #139 million U.S. dollars will service all major subsea hubs from its bases in Aberdeen, Singapore, Abu Dhabi, London, and Houston.

The business, which will trade as Ashtead Technology, will provide an independent one-stop shop for customers' equipment requirements. The joint venture is anticipated to complete during the first quarter of 2018.

<http://ont.news/2nRvcXn>



Greensea Names Marybeth Gilliam Chief Operating Officer

Gilliam will be responsible for operations, services, and sales as well as for ensuring continued sales growth while improving efficiencies and profitability.

<http://ont.news/2jzg8wp>

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- low power consumption for autonomous operations
- advanced data delivery algorithms, addressing and networking, remotely configurable settings
- extendable platform with multiple configuration options: power-saving Wake Up module, acoustic releaser, additional sensors, custom solutions, OEM versions available

USBL POSITIONING SYSTEMS

simultaneous positioning and communication - no need to switch between positioning mode and modem mode

- flexible SiNAPS positioning software
- reliable data transmissions
- range: up to 8000 m
- accuracy: up to 0.04 degrees

UNDERWATER ACOUSTIC MODEMS

reliable data transmissions even in adverse conditions, customizable R-series modems, light and compact M-series "mini" modems, **new S2CM-HS high-speed modem**, special editions for developers, S2C communication and positioning emulator - remote access or standalone device

- range: up to 8000 m
- depth: up to 6000 m
- data rate: up to 62.5 kbps

LBL POSITIONING SYSTEMS

highly accurate, precise and stable performance, simultaneous positioning and data transmissions

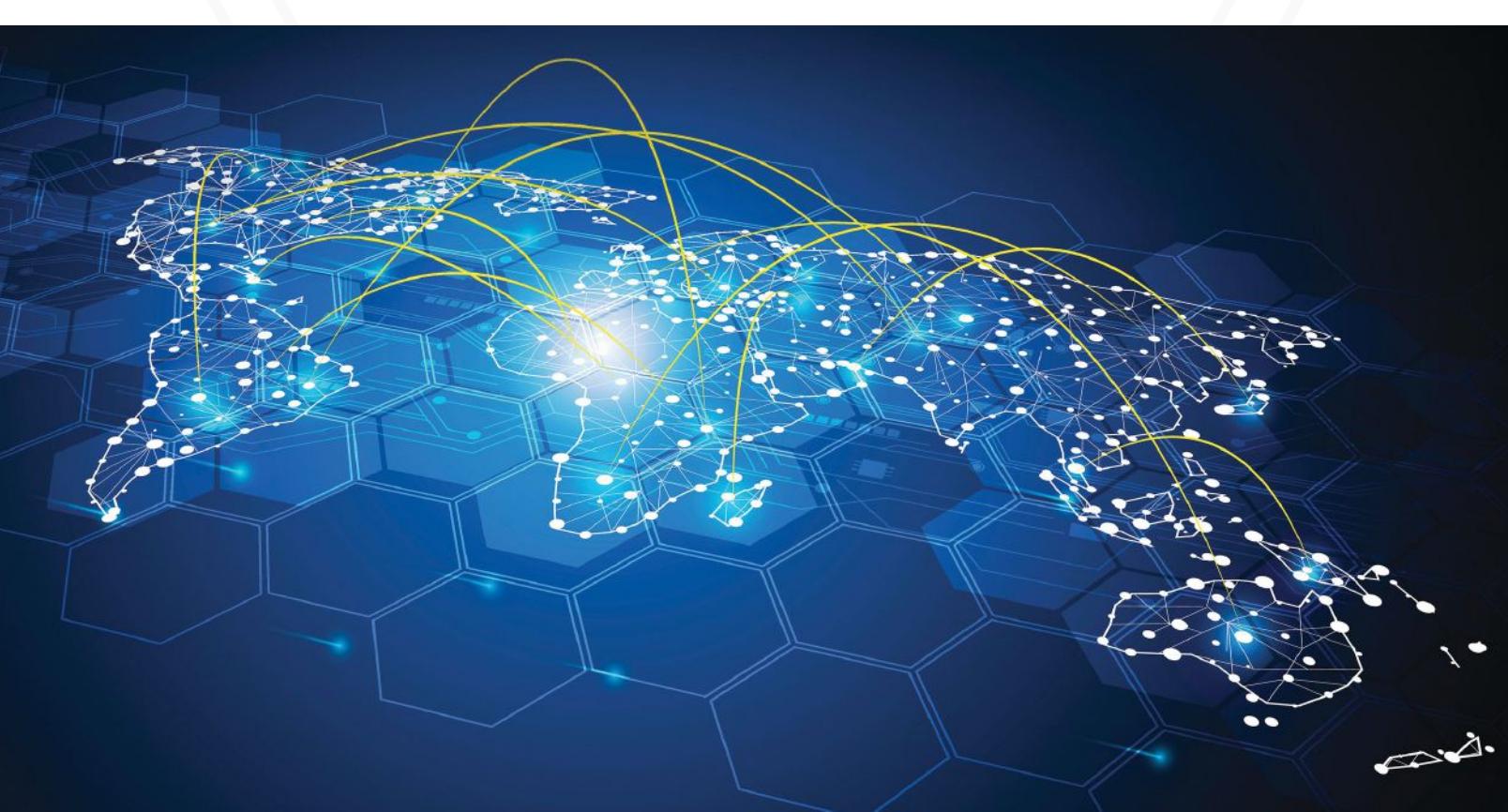
- flexible SiNAPS positioning software
- reliable data transmissions
- range: up to 8000 m
- accuracy: better than 0.01 m

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