MARINE TECHNOLOGY REPORTER

May 2015 www.marinetechnologynews.com

Special Report

Norway's Subsea Valley

Subsea Defense

Minehunting with the Norwegian Navy

d'ROP
Bibby Hydromap's Custom ROV

Offshore Wind
Floating LIDAR Helps to Cut Costs

Remote Monitoring
Ocean Measurements from Space

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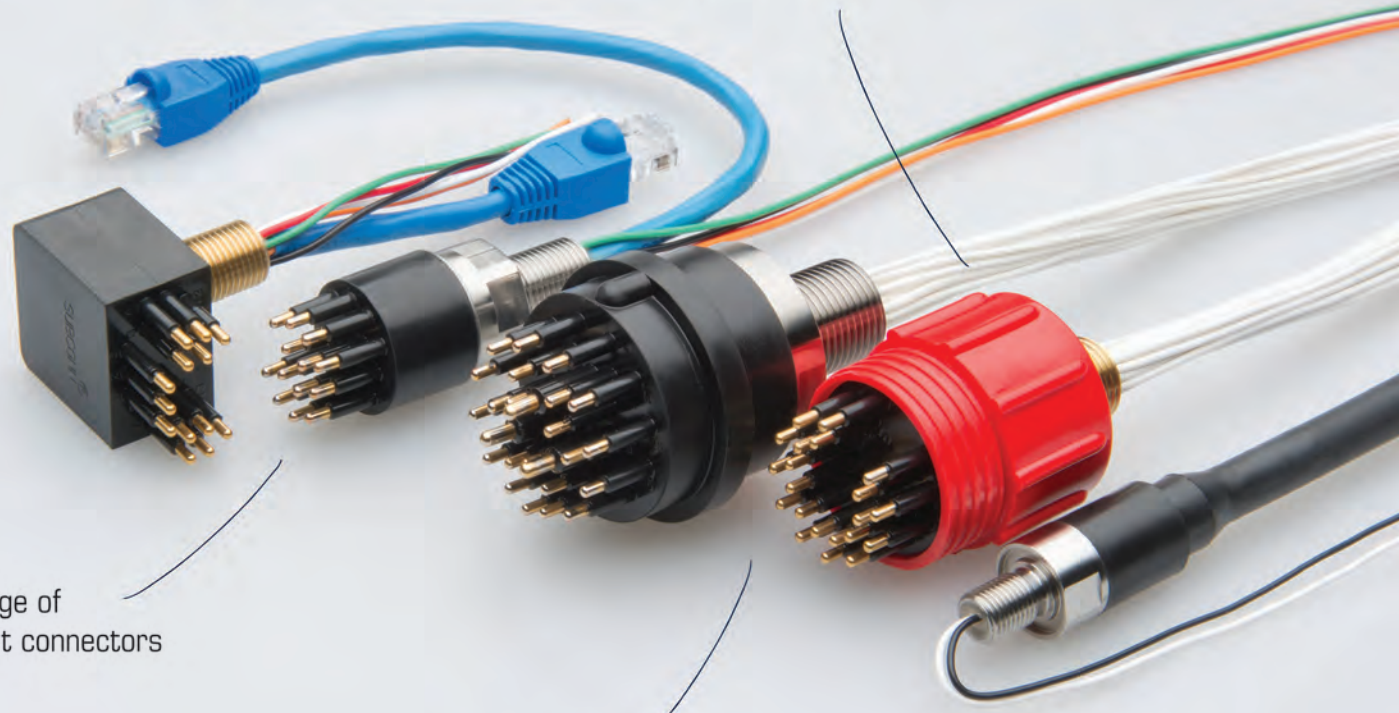

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On the Cover

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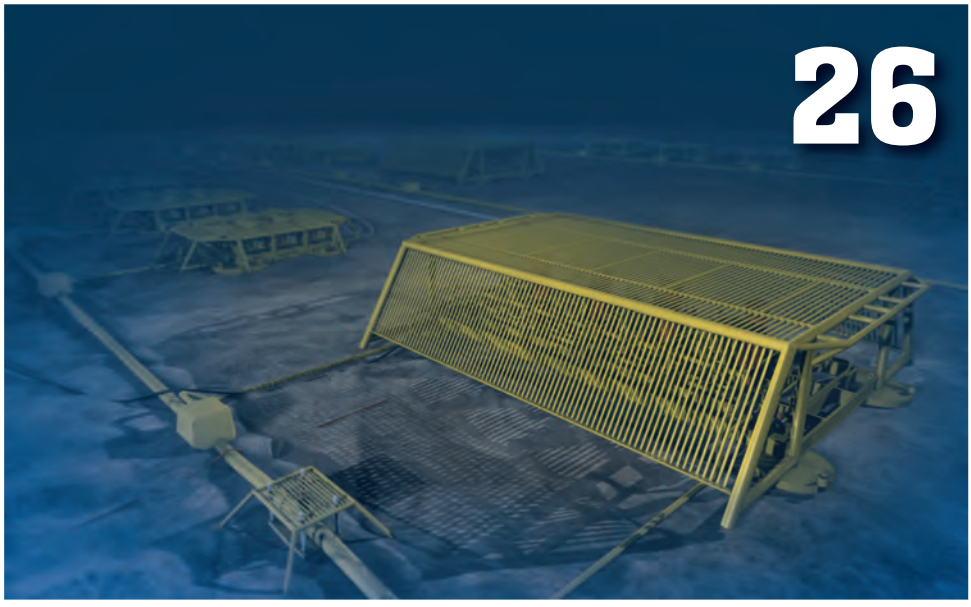
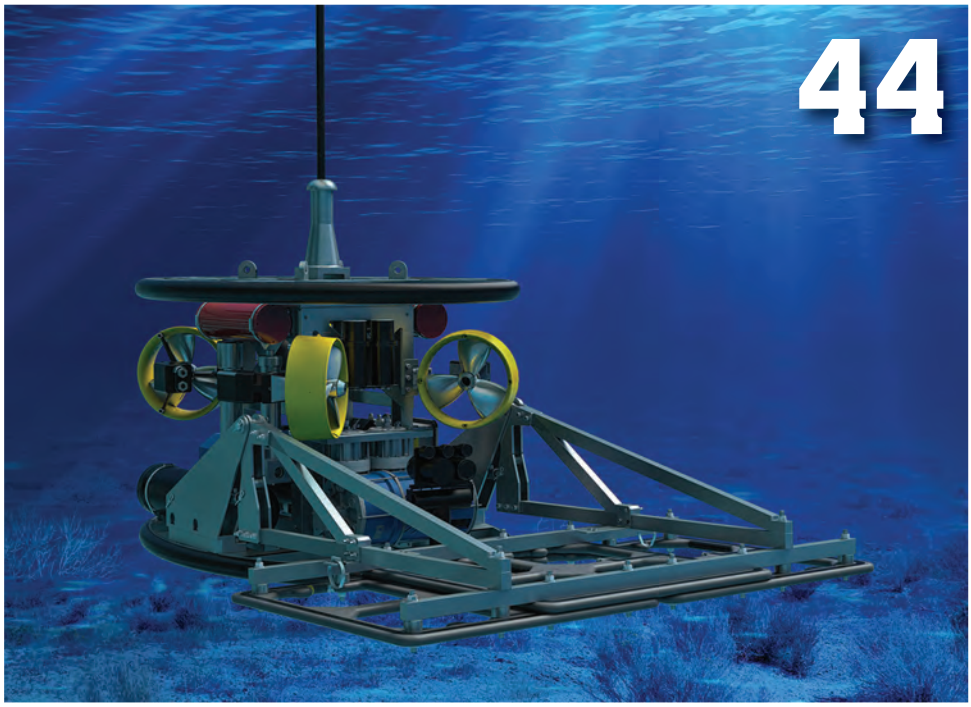


Illustration courtesy FMC Technologies



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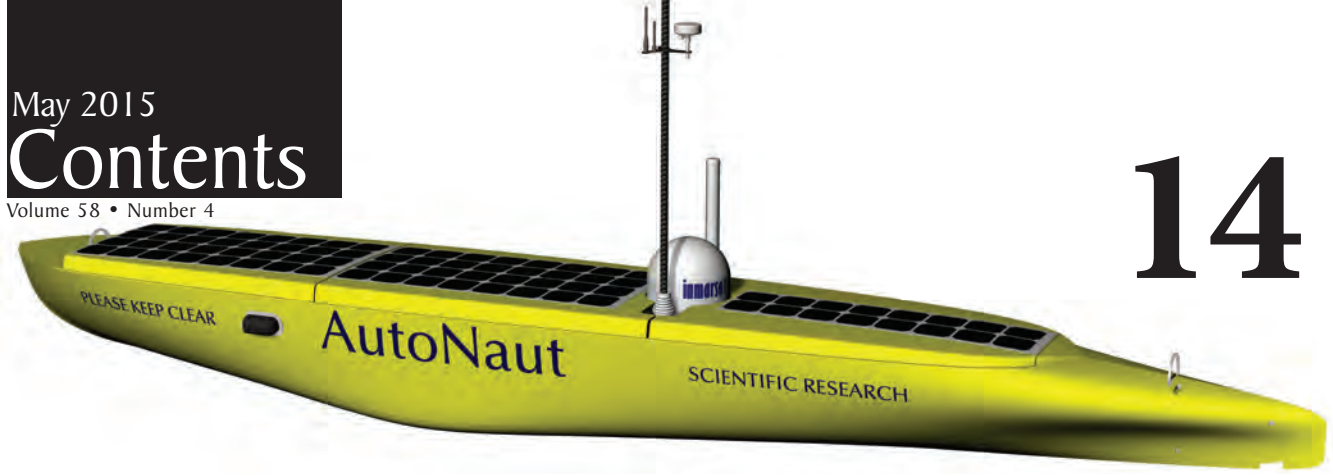

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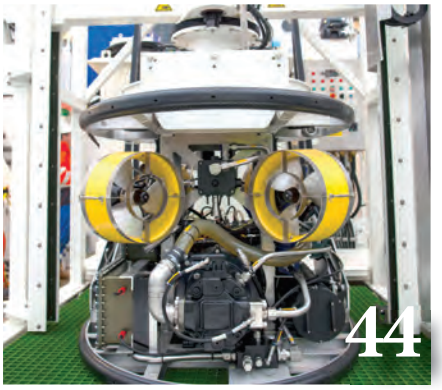
Offshore Wind

Coastal Survey



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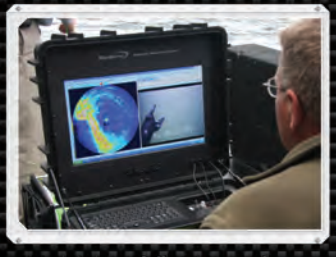

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Just back from Southampton and what proved to be a very busy Ocean Business 2015, and I am happy to report that while the persistent low price-per-barrel for oil has slowed some parts of the industry, it has yet to dampen the innovative spirit that is the very hallmark of the global subsea business. This edition as well as the coming few will be packed with news and features on innovative new products, systems and designs, but without a doubt the proliferation of new subsea and surface vehicle technology was a recurring theme in Southampton.

As is the case with any meeting of this magnitude, it affords us the opportunity to sit with individuals and companies for a more intensive discussion on their activities. One such meeting with Dan Allidis of MOST (Autonomous Vessels) Ltd. led to the feature starting on page 14 on the AutoNaut. While the vehicle is powered by the motion of the ocean and at a glance similar to other competitors in this niche, the Autonaut has some interesting technological wrinkles that are designed to make it not only more efficient, but more survivable in the harsh ocean environment.

If you weren't in Southampton or were there but didn't have the chance to jump onboard Bibby Athena, turn to page 44 for insights on Bibby Hydromap's new custom built ROV – d'ROP – which has been dubbed a 'revolution in coastal ROV survey' by its developers. Grand claims you may think, and while I cannot personally attest to its performance in the field, the concept, vehicle and mission range is impressive to say the least.

Kira Coley once again graces our pages, and has in fact has quickly become one of our 'go to' regular contributors for compelling features on the technology driving the industry forward, faster. This month she reports on "Ocean Measurements from Space" starting on page 32, examining the use of Satellites in monitoring, learning and understanding two-thirds of the planet.

As always, we welcome your thoughts and insights on new and emerging technologies in the subsea sector, as I and the editorial staff are always on the look-out for 'what's next.'

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New GM at Teledyne Bowtech

Simon Beswick has been appointed to the role of General Manager at Teledyne Bowtech Ltd. He was previously Managing Director of Tritech International Ltd. from 2008 having joined as Finance Director in 2007. Prior to joining Tritech, Beswick had spent most of his career in international roles within the specialist chemical industry. He is an engineering graduate and holds an MBA from Oxford University.

Beswich succeeds Steve Bowring who leaves the company at the end of April having led the company since its foundation in 1989. Teledyne Technologies Incorporated acquired Bowtech in February 2015.

Teledyne Seabotix Opens ROV Service Center in Mass.

Teledyne SeaBotix announced the phased opening of a service support and repair facility within its parent organization, Teledyne Marine Systems, located in North Falmouth, MA. "We are pleased to geographically extend our world class service and support to enhance response capability and reduce maintenance and repair turn-around times," said Dr. Thomas Altshuler, Teledyne Marine Systems VP & GM. The SeaBotix service and repair facility will be based at Teledyne Marine Systems main HQ which includes approximately 67,000 sq. ft. of manufacturing, engineering, test, and administration resources.

Planet OS Joins AWS for NOAA's Big Data Project

Planet OS has joined Amazon Web Services (AWS) as a member of its Data Alliance within NOAA's Big Data Project.

(Continued on page 9)

Grasshopper Rides Falcon for 3D View of Dam

A retractable sonar system has been specially designed by underwater engineering services company Subsea Fenix to set atop a Saab Seaeye Falcon ROV. Nicknamed 'The Grasshopper.' the concept has made possible a more detailed inspection of a reservoir dam in central Italy than could otherwise be achieved. Faced with the problem of mounting a BlueView 3D Sonar system high enough above the ROV to gather all-round images and avoid the vehicle's chassis obstructing the scan, Subsea Fenix knew it would be impossible to swim any distance top-loaded in this way. The solution was to create a retractable structure that lowers the topside mass while the Falcon is swimming, then remotely raises it when needed.

With a full inspection package aboard the ROV it has been possible to provide accurate visual 2D and 3D sonar data of inlets and outlets, grids, tunnels and ramps, while also identifying the presence of debris and sediment.

The clarity of both the high-resolution cameras and advanced sonar has given the inspection team a clear and accurate view of the condition of the dam and its operational components.

The Falcon helped uncover critical problems such as rock fall damage to the rail used to lower the massive outflow closure gate, and rock debris blocking the cable wheels that lower the gate. Scans also revealed that a third of the grids clearing the water flow were obstructed by sediment.

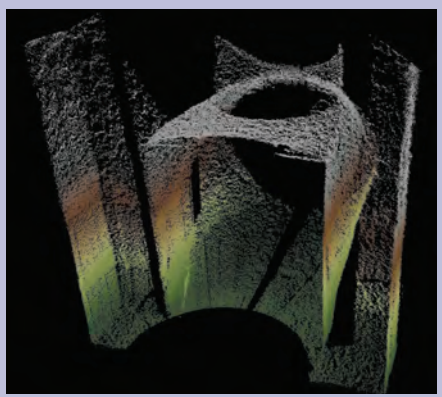
Divers were used for much of the remedial work with the Falcon in support. The 2D sonar aboard the ROV was used to view the underwater horizon and monitor diver activity, while at the same time observing crane movement of a dredging pump. In addition to the top-mounted BlueView sonar system, the total inspection package for the Subsea Fenix Falcon includes a Tritech Super Seaprince scanning sonar, a high-resolution color video camera with 180-degree tilt platform and low-light mono camera.

The Falcon's control architecture makes it easy to add and change such systems as needed.

Although small enough to be manhandled, even from a small boat, its five powerful thrusters make the Falcon highly maneuverable and able to hold steady in moving water while filming or undertaking various missions. Subsea Fenix's future plans include using the Falcon at the same Lake for a deep tunnel inspection to an interconnected lake.

Left:
Subsea Fenix team with their 'Grasshopper' - the Falcon with the retractable system lowered.

Below:
3D portion of turbine inlet channel deep inside dam wall.



(Continued from page 7)

The company will work together with The Weather Company and ESRI under the Cooperative Research and Development Agreement (CRADA) to research and test solutions for bringing NOAA's vast information to the cloud where both the public and industry can easily and equally access, explore, and create new products from it, thus fostering new ideas and spurring economic growth.

Applied Acoustics Wins Queen's Award

Applied Acoustic Engineering Ltd. won the Queen's Award for Enterprise in the International Trade category for a second time.

The award is recognition of its achievement in boosting export revenues over three years of continuous growth. This performance has been made possible through technical innovation and the sustained support of a strong network of overseas representatives. Applied Acoustics designs and manufactures underwater acoustic positioning, tracking and survey equipment sold mainly to the commercial offshore energy market but increasingly sales have been secured with oceanographic research institutions and naval defense industries. The company exported to more than 61 different countries over the past three years, including significant orders received from Japan, USA and Germany. New agency agreements have been established in Turkey, Mexico, Brazil and Australia.

Adam Darling

(Photo: Applied Acoustic Engineering)

Offshore Mooring Replacement Completed

InterMoor finished replacing components in an FPU mooring system offshore Equatorial Guinea on schedule, enabling the prime contractor, Boskalis, to expand the InterMoor work scope. The original contract covered replacing old mooring chains and wire ropes for eight of the 12 mooring lines along with two drag anchors on Mobil Equatorial Guinea Inc.'s (MEGI's) Zafiro Producer floating production unit. During the operation, Boskalis contracted InterMoor to replace an additional mooring line.

The engineering work began in Oc-

Photo courtesy of InterMoor

tober 2014 in Houston and the Netherlands, where the Norwegian anchor handling and construction (AHC) vessel Olympic Zeus was mobilized. InterMoor completed the installation work on location 64 kilometers west of Malabo, offshore Equatorial Guinea, from the Olympic Zeus.

During the installation, InterMoor inspected all the mooring lines as they were being disconnected from the floating production unit to determine which portion of the line required replacement with new chain and connectors. The company also documented the installation to ensure the client had accurate, as-built information on the mooring system.

The offshore installation was completed in March 2015 to MEGI's satisfaction and the project will be finalized with all documentation delivered in April 2015. InterMoor had previously worked for MEGI in country, but this was the company's first time working in conjunction with Boskalis.

Fugro Set for Southwest Pacific Survey

Fugro commissioned an additional airborne laser bathymetry system to underpin its position in the development and application of bathymetric LiDAR technology. The combined Fugro LADS Mk 3 and Riegl VQ-820-G systems provide measurements and mapping of nearshore and shallow water environments. The increased capability will enable Fugro to deliver simultaneous topographic and bathymetric surveys in multiple geographical areas. With continued operations across the Middle East during 2015, Fugro will also begin a South West Pacific ALB survey campaign following the award of projects in multiple locations to support nautical charting, coastal engineering, scientific assessments, coastal management, benthic habitat mapping and climate change initiatives.

GROW Funding Nurtures New Subsea Tech

Offshore Marine Management (OMM) has secured GROW:OffshoreWind funding to build a subsea tool designed to reduce project costs and improve health and safety offshore. The subsea tool, which is currently being constructed by Darlington-based Subsea Innovation, will see improvements during the installation phase by removing the need for deep sea divers and separate work class ROVs. It is expected to be in operation from June 2015 following sea trials.

New 64-bit Software Version of "Teledyne PDS"

Teledyne Marine introduced the Teledyne PDS software suite, a new software package with enhanced capabilities over the former PDS2000. Teledyne PDS is now a 64-bit Windows version offering faster performance, optimized memory management and better feature utilization. Teledyne PDS is a multipurpose software platform and supports a wide range of tasks within Hydrography, Dredge Guidance, Construction Support, Search & Recovery Operations and Port Entrance Monitoring.

Teledyne PDS is of-the-shelf software and developed to solve the variety of challenges that arise from each specific task in the main business segments served by Teledyne Marine. It interfaces with a wide range of survey instruments such as Lidar, Multibeam and Singlebeam Echosounders, and is an optimal tool for interfacing to a variety of periphery sensors, including dredge and construction sensors, sound velocity measurements, positioning, motion systems and most other devices that output data.

Osiris: Key ROV and Cable Pull-in Solution

Osiris, part of James Fisher and Sons plc, completed a long-term project started in spring 2014, carrying out a wide-range of services with cross-trained personnel on the 219MW wind farm, Humber Gateway, based 8km off the Holderness coast in East Yorkshire. Osiris provided a Cougar-XT ROV to conduct seabed inspection work and transition piece cable pull-in teams. The teams mobilized from its shoreside support base in Grimsby using a moored, large multi-cat vessel and the ROV conducted around 30 dives in free swimming mode. The subsequent initial success led to an in-

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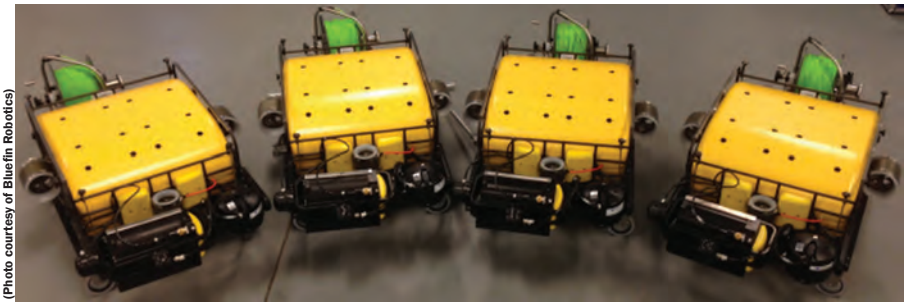
vitation to extend its role on the Humber Gateway and complete unfinished cable pull-ins through an externally positioned J-Tube.

Hull Inspection Systems for U.S. Navy

Bluefin Robotics delivered new vehicles to the U.S. Navy to increase the Navy's capability to remotely search and investigate ship hulls, harbor sea floors and underwater infrastructure. The Navy accepted delivery of Bluefin's ship hull inspection systems 4 and 5 under the "Explosive Ordnance Disposal, Hull Unmanned Underwater Vehicle Localization System" (EOD HULS) Program of Record. Each System (known as MK19), consists of two vehicles and associated support equipment. Bluefin's third-generation Hovering Autonomous Underwater Vehicle (HAUV-3), used in the MK19 system, was developed under Office of Naval Research and the EOD Program Office (PMS 408). The vehicle allows detection of IEDs and limpet mines on ship hulls, piers, pilings and quay walls for harbor and force protection. "The MK19 vehicle operates by hull-relative navigation and control and provides very detailed acoustic images of a ship hull with 100% sonar coverage, without prior knowledge about the ship," said Jerome Vaganay, Bluefin's Director of Inspection Systems. "Although it looks like an ROV with its six thrusters and its fiber optic data tether, the vehicle is powered by an onboard battery and operates primarily autonomously with the ability for the operator to take manual control to investigate contacts."



(Photo courtesy of Bluefin Robotics)

Gondan Lays Keel for IMR Oceanographic Vessel

Gondan Shipyard celebrated the keel laying ceremony of the new Oceanographic Research Vessel for the Institute of Marine Research (IMR) of Bergen, Norway. At the ceremony, held at Gondan's facilities in Figueras, were several representatives from the Norwegian Ministry of Foreign Affairs, NORAD (Norwegian Agency for Development Cooperation), IMR (Institute of Marine Research) and FAO (Food and Agriculture Organization of the United Nations), as well as representatives of the shipyard management. The contract of this oceanographic vessel was signed in March last year. This ship was awarded to Gondan Shipyard through an international tender, in which it competed with eight Norwegian and a Spanish shipyard, and in March the project was finally awarded to it.

Designed by Skipsteknisk, it will be 74.5 x 17.4 m. Cutting edge technology has been used to develop the vessel, which will allow her to perform oceanographic tasks – such as studying the bottom of the sea – hydrographic, marine biology, biomass analysis, and geology works, launching and recovery of buoys for data collection, ROV and AUV operations, as well as logistic and cargo handling operations, and student training. Delivery is expected for September 2016

New Subsea Dredger

Trials of a new subsea dredging system, which can move one ton of rocks on the seabed per minute, reportedly exceeded all expectations in terms of efficiency and performance. The Predator Subsea Dredger, a new concept, underwent a number of trials while fitted to the Triton XL26 work class ROV used for training and trials at The Underwater Center's Loch Linnhe site in Fort William.

Nine tons of 50-60 mm rocks were placed on areas of the seabed to recreate a range of terrains typical of the offshore subsea environment to be dredged during the trial, and the task was completed in between eight and nine minutes. Further trials designed to test the integrity of the system, including the dredging of 100-130mm rocks in an attempt to break the machine and to identify any weak spots, highlighted the robustness of the product. A final test of the agitator system, which shoots out jets of water at the suction head end directly onto the seabed, breaking up the peat at the bottom of Loch Linnhe and dredging it at the same time, worked exceptionally well and did not affect the performance of the dredger. It can also be reconfigured subsea, with the use of a second work class ROV or diver. The Predator Subsea Dredger was designed by Subsea Tooling Services (STS), based in Oldmeldrum, Aberdeenshire, which offers a diverse range of subsea equipment.

STS Business Development Manager Billy Milne said the main objective was to prove that it was as efficient, if not more so, than other dredgers currently on the market. "We wanted to prove the dredger's capabilities to our clients, as well confirm our development tests by filming it in action in conditions close to those it will be used in offshore."

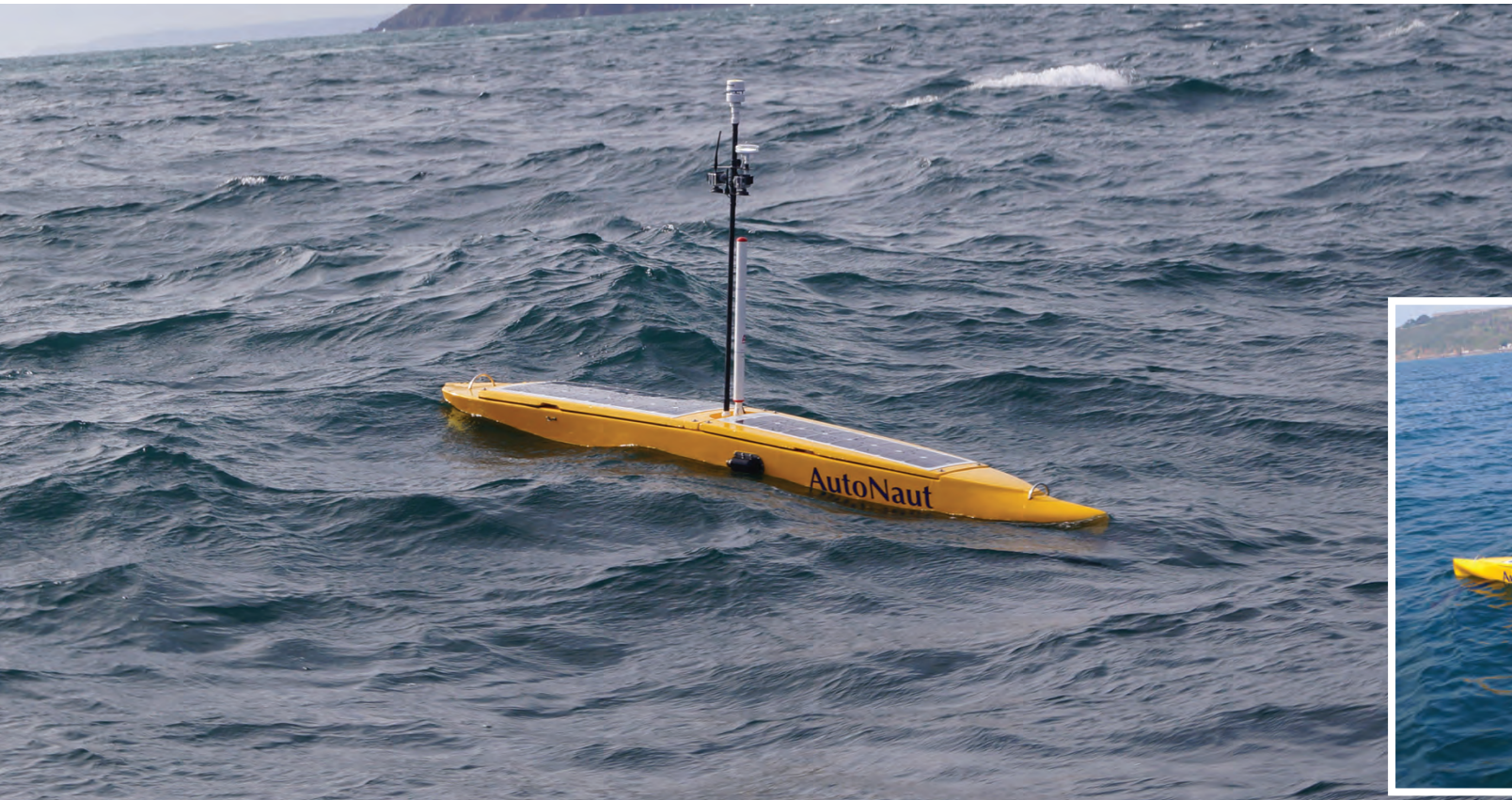
Meet the *AutoNaut*

Exhibitions are fertile grounds to discover new technologies, and Ocean Business 2015 in Southampton, U.K. last month did not disappoint. Here MTR speaks with Dan Alldis, Naval Architect at MOST (Autonomous Vessels) Ltd. regarding his companies new offering to the subsea market.

By Greg Trauthwein

For readers not familiar, describe MOST.

MOST (AV) Ltd. is a micro start up based on the South coast of the United Kingdom. At the waterside office in Chichester, the team are responsible for the R&D, project management and the build of their product, AutoNaut. Plymouth is their base for sea trials, deployments and customer demonstrations. Trading since late 2012, the team has developed an Unmanned Surface Vessel (USV) called AutoNaut. Wave propelled, silent, persistent and cost efficient, it is a revolutionary data gathering platform designed for tasks which are inherently dull, dirty, dangerous and deep (long range). With boats in service with



3.5m AutoNaut on deployment off the South Devon Coast.

academic institutions in the U.K. and the U.S., MOST (AV) Ltd. are working hard on developing the next generation of AutoNaut vessels and marketing this revolutionary platform across a range of industry sectors.

Provide, in details, the vehicle.

AutoNaut is primarily wave propelled; harvesting the energy from the 'motion in the ocean' to propel the vessel forwards, the product of some 30 years of experimentation by company Director, Mike Poole. Over the last two years, the engineers at MOST (AV) Ltd. have been working hard to develop the efficiency and robustness of the system and prepare the product for the conditions expected on persistent, offshore data collection missions.

AutoNaut is available in two sizes, 3.5m and 5m but the technology is scalable and unmanned boats up to 10m are possible (this limit in size reflects likely maritime operating regulations). The 3.5m vessel is easily car-topped or

3.5m AutoNaut towing the J+S Narcine Array (blue tube running over the stern)

trailored and can be launched with just one person.

AutoNaut can be remotely driven away from a slipway or towed to a release point using a small support boat. For recovery, AutoNaut can be sent back to a waypoint just offshore and escorted back in with a support boat or can be recovered by a ship at sea using a crane or davit.

The wave propulsion will offer 2 – 3 knots vessel speed with a 3.5m hull and 3 – 4 knots with a 5m hull. In the case of calm weather or in an area with strong tidal streams, an electric propulsion pod is available to provide 1 – 2 knots speed; this is also useful when maneuvering away from a slip.

Photovoltaic panels trickle charge the vessel's lead gel batteries during daylight hours, powering the command and control system and sensors. In low sunlight areas and for high power sensors, a methanol fuel cell can be added to the fully autonomous power supply to charge the batteries.

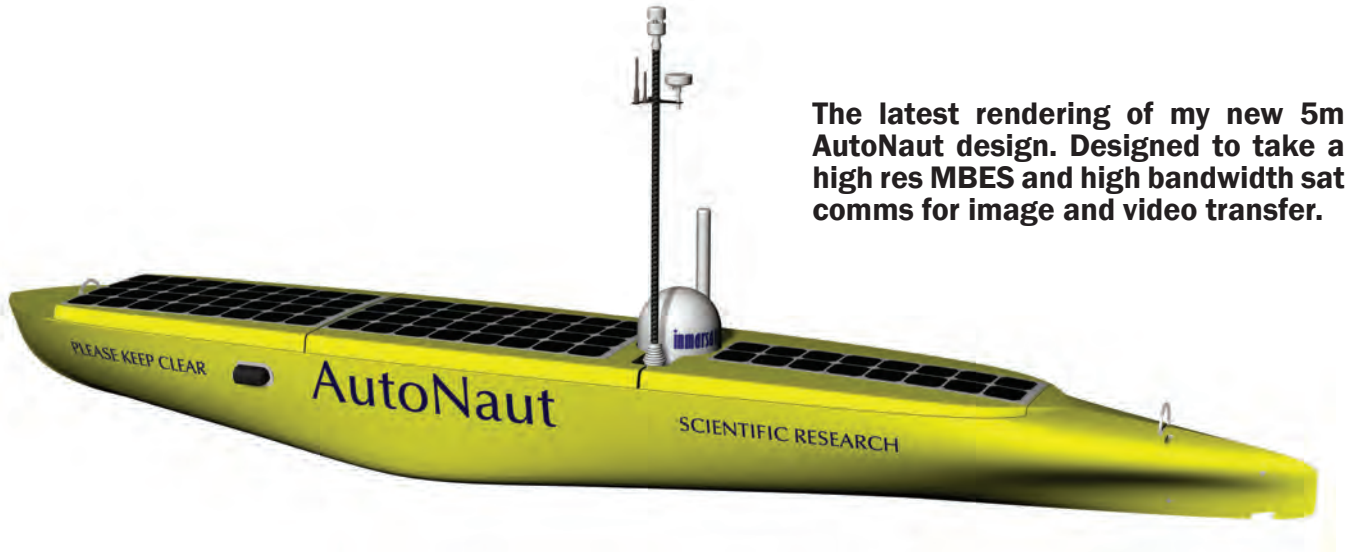
AutoNaut can be controlled using local UHF or WiFi comms, or an Iridium Satellite link. Waypoints, tracks and missions can be sent to the vessel by the pilot at any time and easily amended dependent on weather conditions or mission requirements. With AIS collision avoidance enabled, AutoNaut will assess all AIS targets within a 4km range and avoid any which are on a collision course. Radar transceivers are an option most customers chose, as a failsafe to alert those around of the vessel in their proximity.

AutoNaut is fully configurable to any customer's requirements. A wide range of sensors can be fitted through the hull, on a mast and / or towed behind the vessel. ADCPs (Acoustic Doppler Current Profilers), CTDs (Conductivity Temperature Depth), weather stations and Passive Acoustic Monitoring arrays have all been integrated and trialed in AutoNauts to great effect. The 5m hull design is optimized to operate high resolution Multi Beam Echo Sounders.

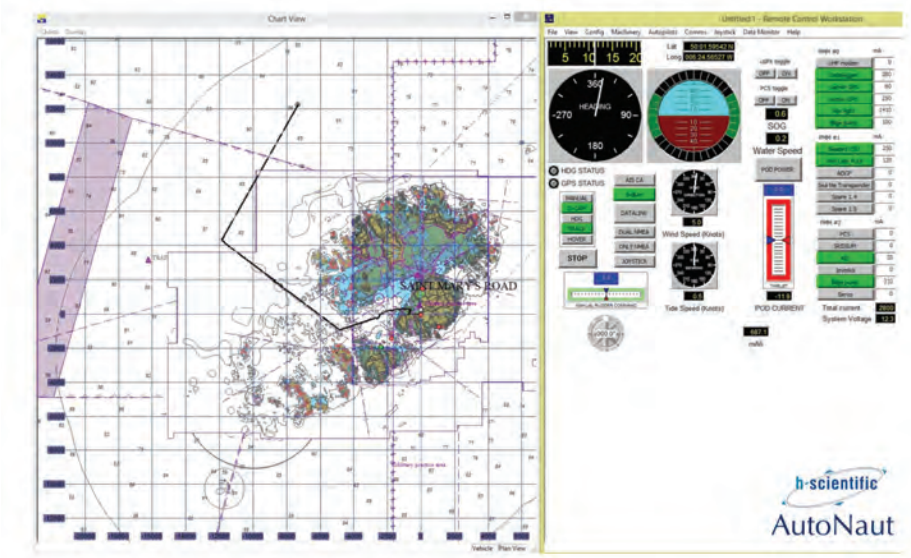
In brief, walk us through the rationale to design this vessel ... what problem(s) was it developed to solve?

Operating any manned ship for data collection is expensive. Salaries

3.5m AutoNaut and Plymouth Ferry.
AutoNaut can be controlled using local UHF or WiFi comms, or an Iridium Satellite link.



The latest rendering of my new 5m AutoNaut design. Designed to take a high res MBES and high bandwidth sat comms for image and video transfer.



The H-Scientific Ltd RCW graphic user interface. This is a screen grab of the vessel leaving the Isles of Scilly for the MASSMO mission last October.

must be paid, food, fuel, maintenance is costly and often range and sea conditions limit the areas in which data can be gathered. With an unmanned surface vessel, data can be collected 24/7 in a much wider range of weather conditions, for much longer periods and more cost effectively.

The patented wave propulsion system further increases the persistence of AutoNaut. In theory she could propel herself at two knots indefinitely collecting data across the oceans. In principle the limiting factor on mission length will be biofouling, barnacles and marine growth etc., which will slow the vessel down and impact sensor performance.

The ability to launch and recover the AutoNaut easily from a slipway or a ship is beneficial. A route can be pre-programmed from a launch site from where she can make her own way out to the survey area, complete her mission, send data back in real time and drive herself back for recovery with all the raw data safely logged onboard.

AutoNaut can replicate what a wave buoy can do, except there are no expensive moorings which are prone to breaking, she can deploy herself without the need for a ship and she can recover herself. AutoNaut is also capable of sampling across a range of sites, autonomously and under her own power.

In short, AutoNaut is a cost effective, low man-power data collection platform. Zero emission, extreme persistence and capable of surviving extreme weather conditions.

Specifically, how is your vessel designed to work, and what differentiates it from other vessels on the market?

Other wave propelled vessels are already being used in a number of offshore industries, but AutoNaut is the only vessel on the market which uses pitch and roll to propel herself forwards. The monohull has a draft of less than half a meter which reduces fouling and entanglement and increases efficiency; sensors mounted through the hull also have an uninterrupted view of the water column below. The hull is carefully designed so that in the event of capsize, she rights herself and carries on with her mission.

The wave propulsion is silent, which means an acoustic array is able to record a full 360º without interference from a propulsion system. AutoNaut is a 'storm-proven' unmanned surface vessel technology, weathering Storm Force 10 winds and 7m significant wave heights in the Atlantic Ocean in October 2014.

Are there any new or innovative use technologies on our vessel that we won't see on others? Please be specific.

As mentioned above, the wave propulsion system has been developed into a simple, elegant solution offering silent, persistent and cost effective operation. While wave propulsion technology is used on other craft, AutoNaut is a unique monohull vessel. This technology is not new. Back in 1895, Herman Linden build his Autonaut using a system with some similarities to the MOST (AV) Ltd AutoNaut. Company director Mike Poole picked up on the idea during his research in the 1980's and began developing his own version of the system in his free time. Mike even built a 25m wave tank at the bottom of his garden in Devon to test his designs (much to the dismay of his neighbours downhill!). In 2012, Mike was introduced to David Maclean, a retired Royal Navy Commodore running MOST Ltd. (Marine One Stop Technologies); David loved the idea and began working with Mike to engineer the system for production.

Since 2013 the company has grown organically and has now built four AutoNauts while developing the systems to improve reliability and efficiency.

AutoNaut has a revolutionary command and control system

developed and built by H-Scientific Ltd., in Waterlooville, U.K. The Micro-Spectre system provides all the autopilot, powering and sensor control systems onboard, allowing pilots to remotely operate AutoNauts from anywhere with an internet connection.

The system is custom built and runs without an operating system (Windows / Linux etc.) which means the current draw is extremely low. The whole system runs on H-Scientific's RCW (Remote Control Workstation), an innovative front end package which gives pilots access to AutoNaut's systems 24/7. Power consumption, sensor sampling and mission control are all manageable easily from the intuitive program.

Sensor data is captured and stored in 'raw' form on the AutoNaut's data logger. The platform control system can analyze the data and compress into packets which are sent over the satellite communications network at intervals set by the pilot. This is an extremely valuable tool which allows an operator to evaluate the data being captured, change settings or alter the mission profile to track specific features or phenomena.

In looking at your vessel and its capabilities, rank the top three markets/niches you see it serving best, with short descriptions of why.

There are a number of different markets which AutoNaut will become invaluable within.

• Scientific Data Gathering

AutoNaut is already being used in the U.K. and U.S. to gather scientific data; from CTD and water content analysis to current profiling and meteorological data collection. The National Oceanography Center in Southampton have been a major partner with MOST (AV) with ajoint SBRI project with dstl, which provided funding to develop the prototype AutoNauts. NOC (Southampton) purchased their own AutoNaut, 'Gordon,' which has already been used on a deployment in the U.K., tracking Oceanic Fronts off the Isles of Scilly and tagged fish off the Plymouth Coast in Devon, United Kingdom. Texas A&M University have bought an AutoNaut for use in the Gulf of Mexico. It will use an ADCP and CTD to monitor the loop

currents typical around the Gulf as well as providing a comms link between other university assets.

• Oil, Gas & Renewables

With oil prices down and oil majors looking for ways of reducing their costs, unmanned systems are a real option for service providers in the Offshore O, G & R sector. AutoNauts can complete MBES survey on assets underwater, monitor hydrocarbon slippage from surface assets and transfer platforms, provide marine mammal monitoring around piling and drilling sites and offer security and surveillance possibilities to an operator. These tasks can be completed by manned ships, but within strict weather and sea condition windows often with a high premium. An AutoNaut can carry on sampling autonomously for extended periods at a fraction of the cost.

• Defence and Security

AutoNaut's silence, persistence and minimal visual and radar profile makes it a valuable asset for a number of defense operations. The ability to autonomously track assets both on and under water for extended periods is extremely valuable. Unmanned systems are often used for the 4 D's; Dull, Dirty, Dangerous & Deep (long distance). AutoNauts can operate in 'swarms', collecting oceanographic data and still and video images eg for border security, among many other applications.

In overview, what did you see in the autonomous vessel market that told you that this was a good time to invest in a new system.

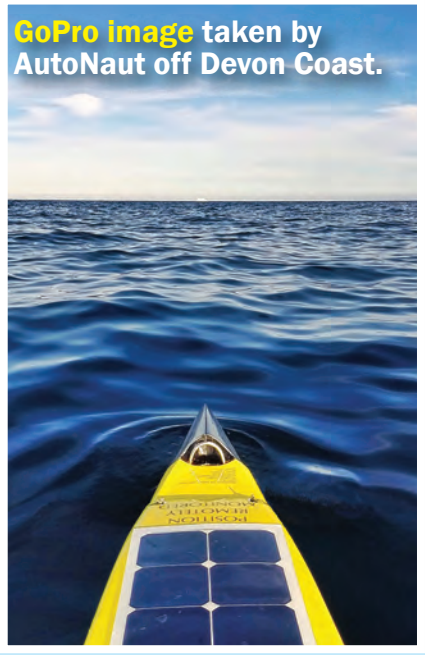
The ability to offer 24/7 data capture at a fraction of the price of a manned asset is extremely valuable to many people. Autonomous systems have been outlined by the UK Government as one of the 'Eight Great Technologies'. The First Sea Lord, Admiral Sir George Zambellas has said "The Royal Navy will lead – and win – through the innovative and robust exploitation of Marine Autonomous Systems. They open up a new world of possibilities".

The riverene and lake survey market is flooded with small Autonomous Surface Vessels but very few are proven inshore and offshore in extreme conditions; this is where AutoNaut excels.

What was the greatest challenge in bringing this vehicle from a concept to reality?

As an engineer, I must always think about the conditions in which the vessel will operate. The biggest challenge

AutoNaut in the Field


GoPro image taken by AutoNaut off Devon Coast.

In 2014, The National Oceanography Center in Southampton began planning the MASSMO mission, which was to take place in October/November 2014. This first part of the mission was to deploy multiple unmanned vehicles in a 'fleet' to track Oceanographic Fronts from the Isles of Scilly in South West England and out towards the continental shelf in the Celtic Sea. The second part of the mission was to be just off the coast of Plymouth, England and this was to track ~85 fish tagged by the Marine Biological Association. AutoNaut was selected to be part of the fleet, and a boat was commissioned by NOC to join its MARS (Marine Autonomous Robotic Systems) Fleet. For phase one of the mission, it was to be fitted with AirMar weather station, Solar Insolation sensor, a WetLabs Triplet PUC and to tow the J+S Narcine Array, a passive acoustic array for marine mammal monitoring. For phase two of the MASSMO project, she swapped the acoustic array for a VEMCO VR2C acoustic modem which was to monitor the 'pings' produced by trackers attached to fish released off Plymouth Breakwater. During both phases, she was fitted with two powered GoPro cameras. Phase One saw AutoNaut successfully weather a Force 10 Atlantic storm with 7m+ significant wave height. AutoNaut self-righted and carried on with little damage. After 13 days at sea, she was sent back to a waypoint just North of the Isles of Scilly and met by the recovery team in a RIB which towed her back to the harbor for recovery up the beach.

Phase Two saw AutoNaut launched from Plymouth Harbour and towed clear of the breakwater where she was released and sent for calibration on the 'range' set up by the MBA. During this mission AutoNaut successfully tracked a number of fish which were tagged and released up to 3 months earlier. The data captured and sent back in real time over Iridium was analyzed by the staff at the MBA and NOC and partner companies and proved to be extremely useful.

we have faced is how we engineer the systems to withstand the harsh offshore environment, while keeping an eye on weight, cost and manufacture. We are always completing research and feasibility studies on the new technologies and materials available to us. Our hulls are a composite of Glass and Kevlar Fibers giving us excellent impact and structural strength; almost literally bullet proof! We have used SLS (Selective Laser Sintering) 3D printing to create intricate parts quickly and to extremely high tolerance which have been used in the production vessels to great effect.

Putting electronics in saline environments has proved tricky, and we have had to design sub-sea housings to encase electronic components and assemblies to 'proof' them in the case of submersion. The offshore environment will quickly find any design or manufacturing weakness and we are always looking for improvements to our resilience.

What do you envision will be the greatest challenge in bringing this vehicle from reality to market success?

There are two hurdles to jump over when bringing AutoNaut to market:

• **Proving the concept and reliability:** Our technology sometimes seems 'too good to be true', a boat that needs no engine, can weather any storm and collect data at a fraction of the cost of a manned ship. The way to prove this is to have the vessels out there collecting real data for as long as possible. As a small, startup company this can be demanding and expensive, but we now have two 12+ day missions under our belts and an Atlantic storm which AutoNaut weathered almost unscathed. Now that we have AutoNauts with our customers, we should see them racking up the nautical miles pretty quickly.

• **Convincing customers that breaking the mold could save them a lot of money:** We are slowly seeing many companies coming round to using unmanned systems, with many trials and tenders available for the feasibility of using USV/UUV's for data gathering. However as the technology is so new, most big companies are reluctant to commit to buying unmanned systems, because of the potential risk. AutoNaut has been branded a 'game changer' which is both good and bad, because it really can improve data capture efficiency, and productivity.

Offshore Wind

WindSentinel Floating LIDAR Helps Cut Costs

WindSentinel buoy deployed next to the ORE Catapult met mast in the North Sea for a one-month validation & research study.

The WindSentinel Floating LiDAR solution developed by AXYS Technologies is a wind resource assessment buoy capable of accurately gathering data on wind speed and wind direction offshore at turbine hub-height and across the blade span. The data enables developers to understand how strong the winds are at the heights of wind turbines, provides a clear picture of how much power can be generated at specific sites, and helps to validate wind predictions from computer models.

By Graham Howe, AXYS

WindSentinel – What is it designed to do?

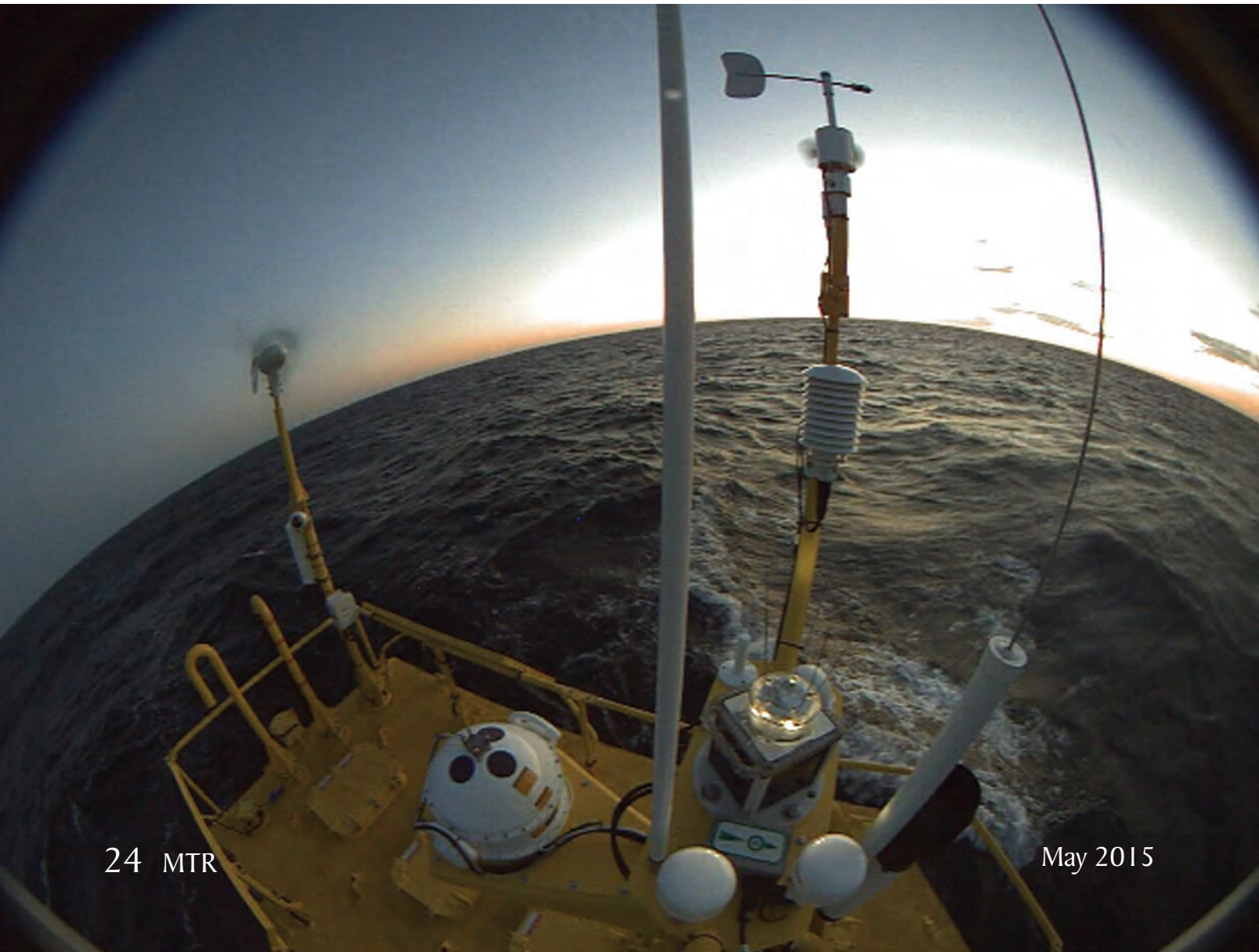
The WindSentinel Floating LiDAR solution developed by AXYS Technologies is a wind resource assessment buoy capable of accurately gathering data on wind speed and wind direction offshore at turbine hub-height and across the blade span. The data enables developers to understand how strong the winds are at the heights of wind turbines, provides a clear picture of how much power can be generated at specific sites, and helps to validate wind predictions from computer models. Meteorological and ocean measurements also help scientists understand air-sea interactions. The WindSentinel facilitates cost effective, accurate monitoring of many key parameters required by offshore wind farm developers to determine if their proposed project will pass financial investment decision (FID) and gain the financial support needed from their project funders.

AXYS equips a 6m NOMAD buoy with relevant sensors such as dual-LIDAR systems, current sensors, wave sensors and is also able to install other sensors required by our clients. To support the WindSentinel, AXYS gives clients access to real-time data through our AXYS-APS portal. AXYS works with clients to understand their measurement campaign data needs so that we can enable early analysis and quality control as soon as data is transmitted.

Value in the Renewable Energy Sector

Prior to wind farm construction, a series of environmental monitoring campaigns are required to understand local wind resource, bird and fish populations and sea states. The current solution to measuring local wind conditions is to install a rather costly meteorological mast (10m Euro) equipped with anemometers and extrapolate those measurements across the length of the wind farm. To measure sea states, wave buoys and weather forecasting models are used. Standards for moni-

The EDPi WindSentinel is equipped with two cameras, one on the bow and one on the stern, that continuously monitor the system and the surrounding environment.



toring bird and fish populations are still being developed, but may include use of observers and sophisticated radar systems. The WindSentinel floating LiDAR eliminates the need to construct a meteorological mast and provides all the required data from a moveable and low environmental-impact buoy. Floating LiDAR decreases the overall cost and time to market of offshore wind developments.

Design Drivers

The WindSentinel was designed to use the proven metocean NOMAD buoy and a LiDAR capable of measuring wind from a floating platform. In selecting the NOMAD hull as the optimal platform, AXYS focused on the following key criteria:

- The hull needed to be well known and reliable
- The hull needed to have the capacity to support the necessary sensor payload
- The hull needed to be able to support a power supply which could be deployed for up to a year between services

AXYS has 25 years of experience of working with the NOMAD hull, which has an extensive history as a platform for offshore sensors. The NOMAD hull was originally designed in the 1940s for the US Navy's offshore data collection program and was later adapted and used by the National Data Buoy Center (NDBC) and Environment Canada as part of the national networks of permanent buoy stations providing weather forecasting.

The WindSentinel was also designed to be flexible enough to accommodate virtually any sensor and telemetry while being easy to modify as project requirements evolve. As part of ongoing improvements to our technology, AXYS has recently begun developing WindSentinel buoys with dual-LiDAR in order to increase total data availability and to reduce the level of risk of data outage during extreme weather conditions often expected during wind assessment campaigns. This redundant dual-LiDAR configuration is the first in the world to be designed and deployed and reflects AXYS' commitment to fund research & development to further reduce the overall cost of offshore wind development.

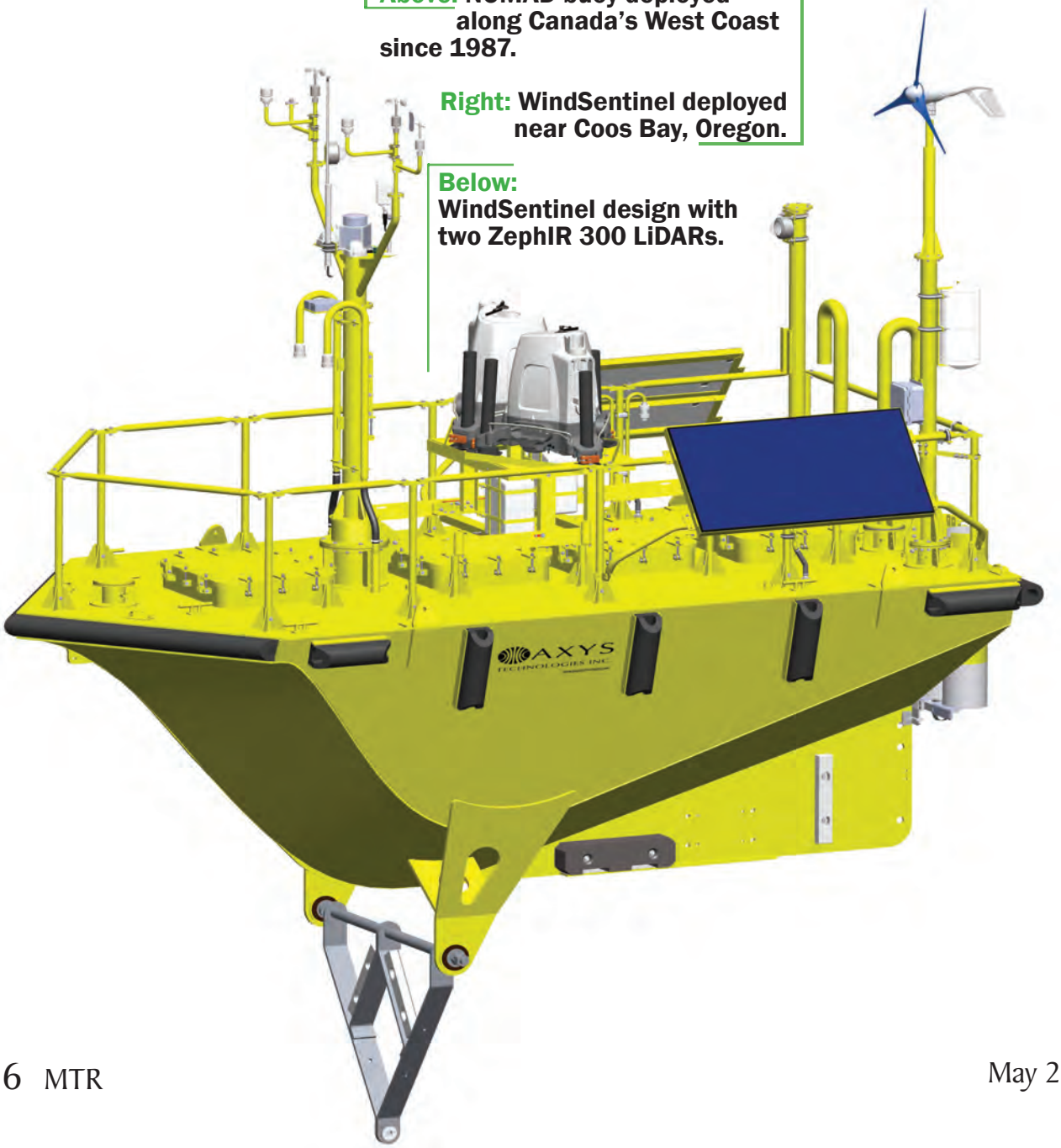
Case Studies

AXYS has sold 11 WindSentinels to projects in the United States, Portugal, France, and Taiwan. Here are three case stud-

Above: NOMAD buoy deployed along Canada's West Coast since 1987.

Right: WindSentinel deployed near Coos Bay, Oregon.

Below: WindSentinel design with two ZephIR 300 LiDARs.



ies that illustrate those projects. Grand Valley State University (GVSU) Michigan Alternative Renewable Energy Center (MAREC) was tasked with the objectives to select and demonstrate the technical viability and economic performance of renewable and alternative energy technologies. Their goal was to implement a comprehensive wind assessment review on Lake Michigan and the project featured LiDAR based extended season wind assessment and related environmental studies. The AXYS WindSentinel was selected and deployed in the fall of 2011 for a three-year study. The study concluded in 2014 and GVSU and its partner scientists learned that the quantity and quality of the Lake Michigan winds are favourable for offshore generation of electricity with commercial wind turbines. On October 30th, 2012, Hurricane Sandy reached the GVSU WindSentinel deployed at the center of Lake Michigan, 36 miles offshore. Sandy produced 26 m/s (58 mph) winds, a gale force storm on the Beaufort Scale, and 10m waves with an average wave period of 8.3 seconds. The WindSentinel recorded wind and Metocean data for the entire event. EDP Inovação (EDPi) under the European funded project, DemoWFloat, deployed a WindSentinel off the coast of Portugal near Viana do Castelo in July 2014. EDPi are using it to test and monitor the performance of their prototype floating wind turbine and contribute for the development of new methodologies for deep offshore resource assessment, and also refine the wind estimate for this location. This WindSentinel survived a major storm that ravaged the coast of Portgual near Viana do Castelo on October 16, 2014. Enduring gale force winds with gusts of over 90 km/hr and waves the size of three-story buildings (10 metres high), the WindSentinel remained on-station, fully operational with 100% data availability.

Pacific Northwest National Laboratory (PNNL) on behalf of the U.S. Department of Energy (DoE) contracted AXYS to supply two WindSentinel floating LiDAR systems. The systems are managed by PNNL to support research and development to help advance the U.S. offshore wind industry. Starting in November 2014, they are deployed for up to a year at two offshore wind demonstration projects: one near Coos Bay, Oregon, and another near Virginia Beach, Virginia.

The buoys carry a multitude of advanced instruments, including LiDAR to measure wind speed and direction at multiple heights above the ocean. Other onboard instruments will record air and sea surface temperature, barometric pressure, relative humidity, wave height and period, and water conductivity. Subsurface ocean currents will also be measured with acoustic Doppler sensors. All of these measurements will help scientists and developers better understand air-sea interactions and their impact on how much wind energy a turbine could capture at particular offshore sites. The data will also help validate the wind predictions derived from computer models, which have thus far relied on extremely limited real-world information.

Getting Defensive

By Greg Trauthwein

The trend toward automation in all branches of military are pronounced and increasingly well established. To discuss progress in the maritime sector, Marine Technology Reporter reached out to Richard Mills, Product Sales Manager AUV, Kongsberg Maritime, for insights.

Though the Kongsberg brand is well known, can you give a brief overview of your company?

With an extensive portfolio of cutting-edge hydroacoustic survey equipment including sonar, single- and multibeam echo sounders, positioning technology and sophisticated underwater vehicles to data analysis tools and subsea cameras, sensors and instruments, Kongsberg Maritime Subsea is an established technology provider for the oil & gas exploration, scientific research and maritime engineering sectors. Kongsberg Maritime Subsea also works closely with leading research institutes and organizations to create advances in the fields of hydrography and underwater positioning for scientific and commercial applications. Kongsberg Maritime Subsea solutions cover all aspects of technology on the seabed, in the water, and on a wide variety of vessels involved in hydrographic and seismic survey, offshore support applications and maritime construction.

Put in perspective the importance of the military market to your company in terms of percentage of sales.

Sales to military operators and defense research organizations have always been an integral part of our business. As the HUGIN product has evolved, more and more of our vehicles have been adopted by defense operators around the world for various tasks including Mine Counter Measures (MCM), Rapid Environmental Assessment (REA) and hydrography. Our AUV sales have grown over the last few years. Within this growth, the defence sector has been relatively steady.

What are your offerings to the defense sectors?

Within Kongsberg Maritime we have two groups that deliver cruising AUVs to defense customers. The HUGIN AUV System from Kongsberg Maritime has been adopted

company, produces REMUS AUV systems for the U.S. Navy, The Royal Navy in the UK and many others.

Can you provide details on specific vehicle(s) for the global military markets?

The HUGIN AUV System is available for defense customers equipped with a myriad of sensors including HISAS 1030/1032, EM040 Multibeam Echo sounder, camera and more. When equipped with HISAS and automated target recognition software, during a single mission it can detect, process and classify mine-like objects in near real-time. This information is then fed into the mission controller to re-plan the route to collect photographs, thereby formally identifying the targets with no user input. The REMUS 600 is the most popular MCM vehicle by number. It is a modular system, easily transportable yet it does not sacrifice performance. Capable of carrying HISAS and the associated target recognition algorithms the REMUS 600 packs a strong punch in a smaller body.

In your opinion, what are the drivers for autonomous vehicles in military use today?

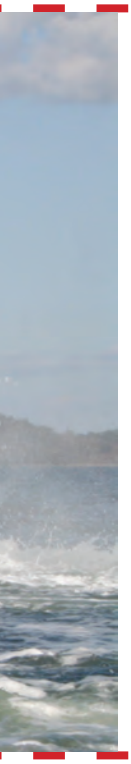
The biggest drivers for military operators today are associated with increasing capability of the system as a whole. That includes the vehicle technology and behavior, sensor resolution, endurance, launch and recovery right through to data encryption and processing. One of the areas where a large performance change has been realized is in how the data is handled prior to the vehicle being recovered. We have taken great steps in on-board real-time processing capability and the ability to make the vehicle react to what it has detected. This enables operators to maintain a greater stand-off than previously. The majority of Kongsberg's AUVs, including both HUGIN and REMUS platforms are supplied with highly accurate navigation and positioning systems, often exceeding IHO standards. When combined with a package of sensors on the vehicle, it provides users with a platform capable of performing many different missions without reconfiguring the vehicle.

In comparing military markets to commercial or scientific clients, what are the chief differences between vehicle supplied to the military versus other uses?

Two of the main differences we see between the equipment supplied to defense and commercial operators are the sensors and real-time processing. The defense community is ahead of the commercial market with regard to processing real-time high resolution data in-mission and making the vehicle respond to it. The commercial market is catching up as we manipulate the technology to make it suit alternative applications such as responding to a gas leak from a pipe detected in real-time. On the other hand, commercial operators demand a more comprehensive sensor suite than most military users. However, there are common elements required by both market segments, notably reliability, robustness and support.

"The defense community is ahead of the commercial market with regard to processing real-time high resolution data in-mission and making the vehicle respond to it."

Richard Mills, Kongsberg Maritime



Mine Hunting with the Royal Norwegian Navy

RNoN MCM-capability today exists with three Minesweepers and three Mine hunters. The main MCM-tool on the mine hunters is the HUGIN AUV, specially designed for MCM-operations. The minehunters are fitted for HUGIN AUVs, but in addition the Navy has containers designed for HUGIN operations; which means the containers with HUGIN can be used from vessels of opportunity and shipped world-wide.

The concept of the MCM-operations is to send HUGIN into a danger area (keeping the vessel outside this area) searching for mines. This operation is fully autonomous, as this is done covertly. During the mission HUGIN will process all data and when recovered the operator will have access to data for possible localized, classified and identified mine like objects. Positions of objects of interest will then be transferred to the one-shot system (Mine sniper), which then are sent out to the actual position to destroy the objects.

The RNoN is presently (as many other nations) looking at a future MCM-capability, and a trend we foresee is more autonomy. So one solution could be unmanned surface platforms launching and recovering AUVs.

Ocean measurements from space

Satellite Monitoring

By Kira Coley

Since the beginning of the Industrial Revolution, billions of metric tons of carbon dioxide (CO2) have been emitted into the Earth's atmosphere each year. The ocean absorbs about 25% of these global emissions annually, causing fundamental changes in seawater chemistry throughout the world's oceans. For more than 50 years, measurements from space have given scientists a worldwide prospective of the Earth's climate and more recently, ocean topography. The continued advancement of satellite technology is expanding the range of ocean parameters which can be measured. The recent addition of salinity, pioneering techniques and sustained funding are set to revolutionize the way that marine and climate scientists study the ocean, hailing the start of a new era of ocean monitoring.

Source: ESA/AOES Medialab

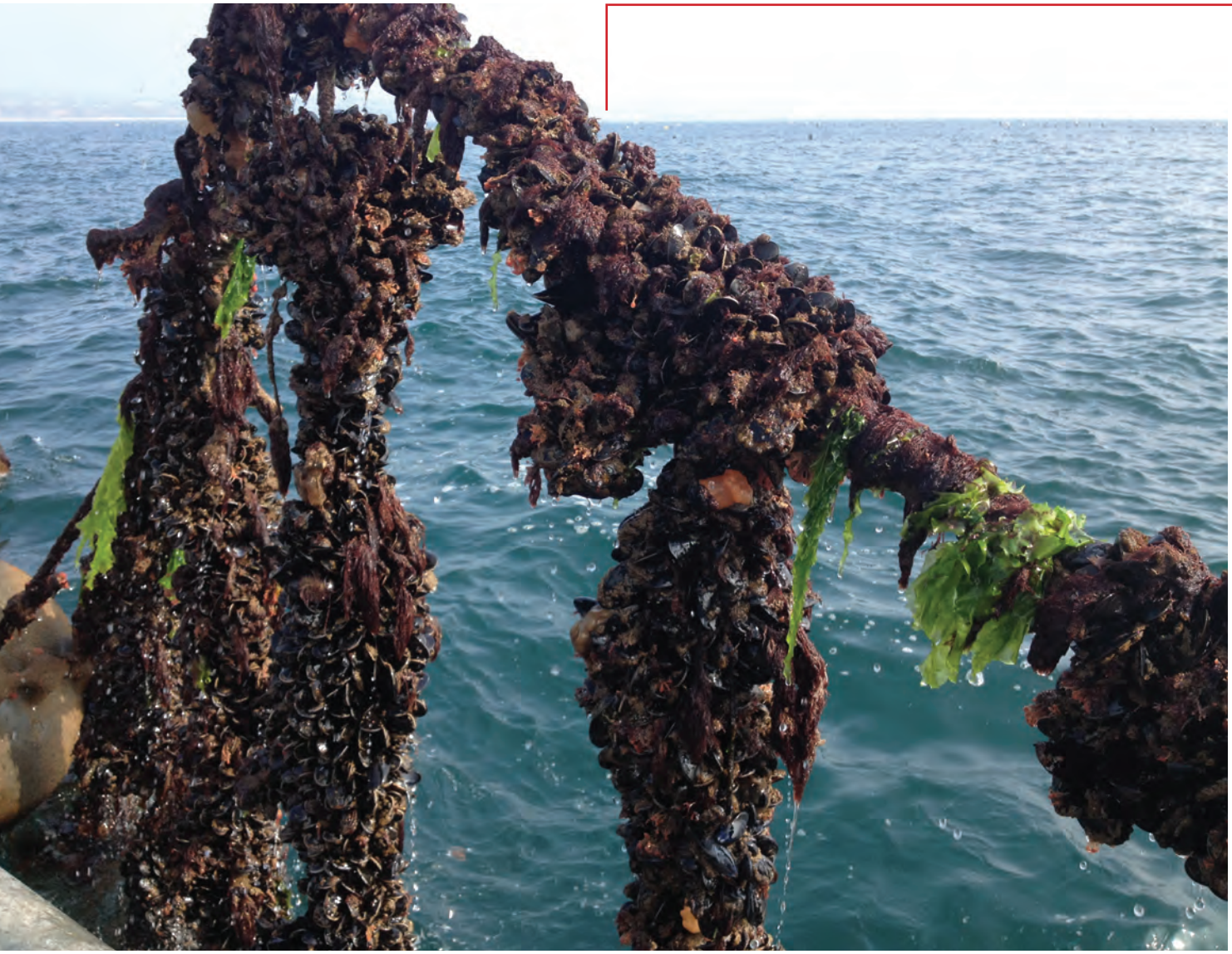
Artistic impression of the The Soil Moisture and Ocean Salinity (SMOS) satellite in orbit around the Earth. The SMOS satellite and its sensor have been monitoring the Earth's soil and oceans since late 2009 and the salinity data are now beginning to be used for supporting ocean carbonate research.

Ocean acidification (OA) is a relatively new field of research. While this area has gained considerable attention over the last decade, there are many challenges in acquiring high quality datasets which can be used to better predict the implications of decreasing pH in the oceans. As the ocean covers approximately 360 million sq. km. of the Earth's surface, difficulties surveying this enormous range confines studies to individual sites.

In 2012, the Global Ocean Acidification Observing Network (GOA-ON) was formed with the aims to improve global observations and expertise. Monitoring efforts are currently dominated by in situ measurements taken from research vessels, moorings and other platforms. While these methods are vital for OA research, challenging and remote regions can be difficult to access, causing low spatial and temporal resolution in global datasets.

The resulting accumulation of in situ data over the last decade allows for the advancement and testing of satellite-derived products for ocean monitoring. In a paper published in Environmental Science & Technology, researchers suggest that the relatively new ability to observe salinity using satellites was the missing piece to monitoring OA parameters.

"In situ data is key to OA research, but in situ measurements will always be sparse in time and space. This is because they are point data and so it's expensive, time consuming and often difficult and dangerous to monitor spatially large areas using in situ methods. The combination of in situ models and satellite Earth observation, provides us with a good combination of spatial and temporal coverage. It is only by using all three of these methods that we will be able to efficiently monitor our Earth," said Dr. Jamie Shutler, an oceanographer and former



European Space Agency (ESA) fellow, now specializing in atmosphere-ocean gas exchange at the University of Exeter.

Dr. Shutler is part of an international team of researchers based at the University of Exeter, Plymouth Marine Laboratory, Institut français de recherche pour l'exploitation de la mer (Ifremer), the European Space Agency and other collaborators, highlighting the potential role of satellites in OA research.

Measuring a Complex Carbonate System

Many ocean variables can now be observed using satellite Earth observations. These include sea surface temperature, sea state (waves, wind speed and direction), optical color (called ocean color) and more recently, salinity. These variables are derived from observations of different parts of the electromagnetic spectrum, from ultra-violet visible wavelengths through to near-infra and microwaves.

The carbonate system can be studied using four parameters: dissolved inorganic carbon (DIC), total alkalinity (TA), partial pressure of CO2 (pCO2) and pH. None of which can currently be directly observed using satellites.

The solubility of CO2 in Water is mostly controlled by temperature, so seasonal changes in sea temperature can be important for driving changes in pCO2 and consequently, DIC and pH. Salinity a ects the coe cients of the carbonate system equations. Therefore, in order to characterize the carbonate system, two of these four parameters are required, together with temperature and salinity. The recent addition of salinity to the parameters measurable from space unlocks the potential to measuring the other carbonate variables used in OA observations.

Dr. Shutler explains, "While we can make salinity observations from space, the technology and methods are continually being improved and enhanced. The precision and accuracy of the salinity measurements are continuing to improve as our knowledge develops. The Arctic regions are particularly dif-

Mussels being grown on ropes in waters off the coast of Cornwall, UK. Mussels are a popular source of food enjoyed by millions of people around the world. Ocean acidification, caused by the oceanic uptake of carbon dioxide, is thought to reduce the ability of mussels to attach to their host surface. Suggesting that in the future, as carbon dioxide levels continue to rise, it may become more difficult to cultivate them.

ficult as the sensitivity of the salinity measurements reduces in lower temperature waters."

Biological activity is also an important factor for the removal or addition of CO2. Plankton photosynthesis or respiration can be a significant component of seasonal variation. Additional factors, such as nutrients and light conditions, can also drive regional changes in biological activity. The ability to measure chlorophyll, a proxy for biomass, as well as oxygen concentration, can be valuable for interpreting the biological part of the carbonate system.

Potential of Space-based Measurements

While the use of remote technology to detect changes in ocean pH directly has proven difficult, satellites can measure sea surface temperature and salinity (SST and SSS), as well as surface chlorophyll-a. These measurements, used in combination with empirical relationships derived from in situ data, allows the estimation of carbonate system parameters.

Satellite Earth observations will usually be limited to the top few meters of the ocean. In the case of salinity, measurements are derived from the top few centimeters of the water, so are truly 'surface' measurements. In some regions where there is an upwelling of water, surface measurements will actually represent the conditions at depth.

"Questions asking if these surface measurements are enough to monitor OA, could also be asked of in situ data. In situ data are collected at one depth and a single location – so, are these in situ data points any use for determining the carbonate system conditions 1-5 meters, or further, away from the sampling position? In some cases they might be, and in others they won't. All methods of observation have limitations. The important thing is to fully understand the limitations," said Dr. Shutler.

As air-sea interactions and changes in carbonate chemistry

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occur at the ocean surface first, these observations are particularly important for OA. This means that although satellites are mostly limited to surface observations, they have great potential as a tool for assessing changes in carbonate chemistry. Of the four parameters, only pCO2 and pH are routinely monitored in situ. DIC and TA measurements are usually made in laboratories, both at sea and on land. The accuracy obtained in laboratory conditions will far outcompete that which can be achieved from satellites and in situ methods. However, as research vessels are expensive and limited in coverage, autonomous in situ instruments are also deployed. Although autonomous vehicles can generally provide greater spatial coverage than research ships, shallow or enclosed seas remain unobserved due to difficulties accessing these areas.

While important for advancing ocean monitoring capabilities, satellite Earth observation will by no means replace in situ observations as they are needed to evaluate satellite data. Equally, satellite Earth observation often exploits advancements and knowledge gained through in situ data studies, therefore the two methods of observations complement each other.

"Satellite Earth observation is key to monitoring the health of our oceans. The global oceans cover about 71% of the Earth's surface. So arguably, the only way to efficiently and economically monitor this vast amount of water is to use satellite Earth observation. No other efficient method to monitor the vast oceans exists. Their size and often inhospitable nature means that we cannot solely rely on in situ observations," said Dr. Shutler. "However, satellite Earth observation is not the 'golden solution' for monitoring OA, it is just one piece of the puzzle. The combination of satellite observations along with in situ measurements and models will, together, provide an excellent capability for monitoring OA."

Future Developments

It is an important time for satellite ocean monitoring. The Copernicus program, a European flagship initiative worth more than $7 billion, launched the Sentinel-1A in 2014. This long term (15-20 year) program aims to provide an operational satellite monitoring capability and related services for the environment and security. These satellites will provide unmatched spatial and temporal coverage for both chlorophyll-a and SST observations.

Another satellite mission launched in 2014 was the NASA Orbiting Carbon Observatory (OCO-2). While its primary objective is to observe atmospheric CO2 concentrations, its potential for marine carbon cycle and OA is likely to be a focus of future research. The data from all of these satellites and their sensors will give scientists new insights into how OA may be influencing our oceans and marine life. However, these programs are still in their infancy and further developments are required to improve the accuracy and quality of satellite derived observations.

The advancement of the satellite-based technology and the ability to monitor ocean salinity will shape the development of future satellite sensors. These satellite observations, used in conjunction with in situ measurements and models, will become a key element in understanding and assessing OA.

"We are entering an exciting time for satellite Earth observation. The start of the EU Copernicus program heralds a new era in satellite monitoring. This large long term program will provide environmental monitoring via a fleet of satellites for the next 15 or more years at unprecedented temporal and spatial scales," said Dr. Shutler.

Acknowledgement

Dr. Jamie Shutler, Centre for Geography, Environment and Society, University of Exeter.

Land, P.E., Shutler J.D., Findlay H.S., et. al. (2015) Salinity from Space Unlocks Satellite-Based Assessment of Ocean Acidification. Environ. Sci. Technol., 49 (4), pp 1987–1994 DOI: 10.1021/es504849s.

Take a dive into Norway's

Subsea Valley

By William Stoichevski

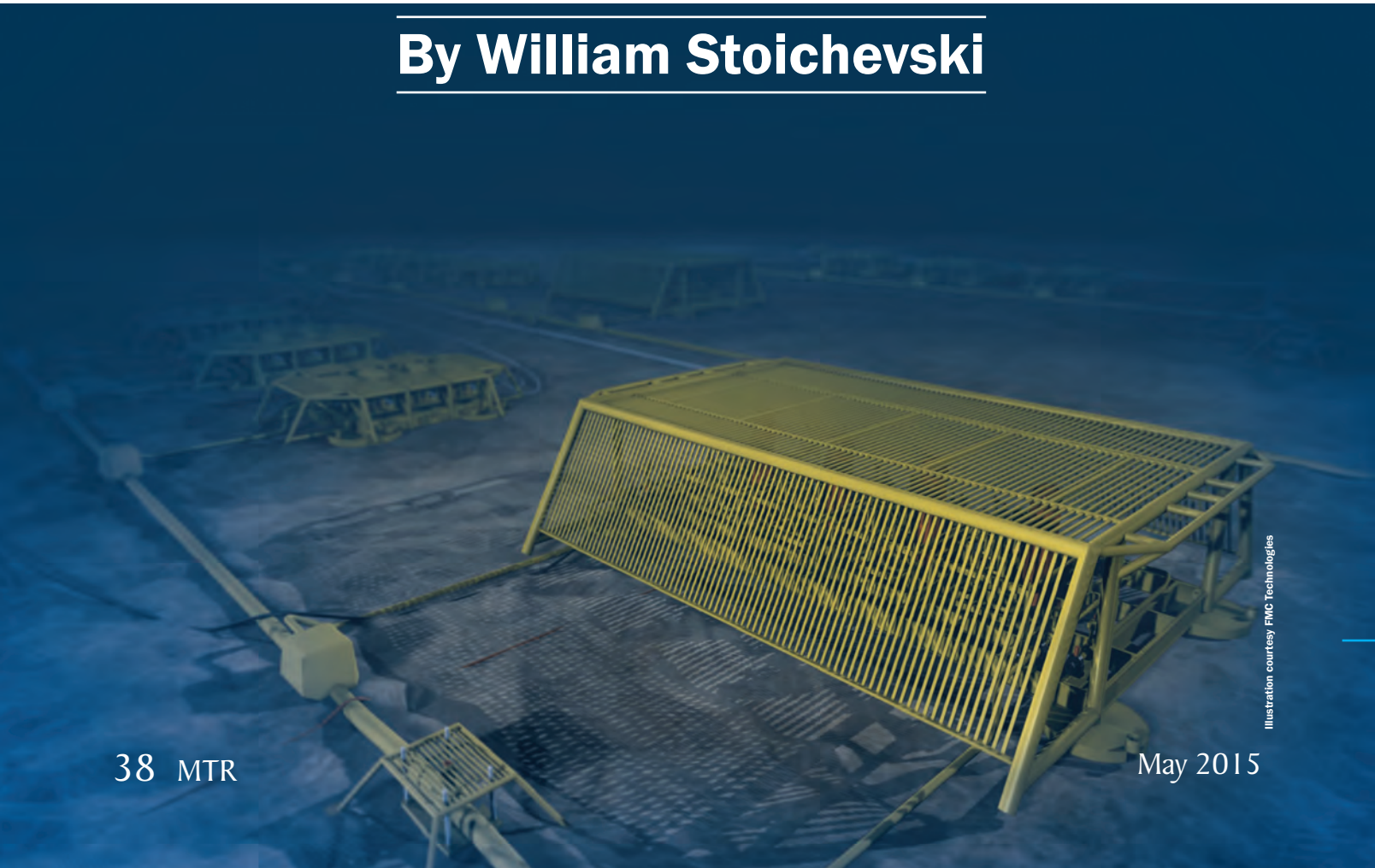


Illustration courtesy FMC Technologies

Preben Stroem,
Subsea Valley
Managing Director

It took three years for Subsea Valley to carve out a tradeshow and conference in a crowded market and then to proudly declare the existence of a powerful industrial grouping along the highway corridor between Kongsberg — home to the subsea juggernaut of the same name — and Oslo, the forgotten Norwegian capital. Driven mostly by the needs of its larger members, Subsea Valley the multidisciplinary cluster is addressing stated industry needs while growing its member list to 90.

Subsea Expertise
A field study with gas-compression.

The corridor, or "valley", controls much of the world's offshore cable production and a goodly slice of offshore rubber hose production. The world's fastest-growing classification society is here. Most of all, the Subsea Valley industrial cluster could be the world's most dominant collection of subsea suppliers. For the first time, they aim to collaborate and share to stay competitive.

They've moved quickly and opened an industrial park "for small companies". Statoil, Oslo and Kongsberg have helped purchase commercial property for the enterprise. Already, certain "programs" (or seminar streams) — in offshore safety, quality assurance and "competence" — are making a name for the organization beyond focused subsea conferences.

Preben Stroem, managing director of Subsea Valley, says Subsea Valley found its impetus when it was realized there was no vehicle for technology transfer akin to what the European Space Agency program (or Boston's medical cluster or Silicon Valley have). Well-connected to Houston's large Norwegian community, Stroem reveals a U.S. government grant to the University of Houston for the study of subsea issues will be unveiled at OTC in Houston.

Another unsavory realization, although few talk about it, is a brain train — real and perceived — to other sectors. The perennial worry about the offshore oil and gas industry's average engineer age has helped make the need to develop "competence" a Subsea Valley driver.

"We think you'll see a high number of early pensioned people because the average age in the industry is so high," says Stroem, adding that recruitment, too, has become challenging.

"We will not have the best and brightest in five years' time," he says, pointing to a 35-percent drop in sciences enrollment over the past five years in and around oil town Stavanger. Then there's recent layoffs and other worrying company moves: GE Oil & Gas recently shunted its headquarters out of Norway and across the North Sea to the U.K. The GE departure removed 250 jobs to an oil province in a more advanced state of decline.

Stroem says the industry isn't too concerned but it knows its strengths. He points to a survey by engineer advocacy Tekna which suggests 75 percent of engineers in the energy sector say they're confident their skills transfer well to other industries.

Kongsberg Cluster Project

Cluster champ Kongsberg is also at the focus of efforts to build skills, reverse or stop any brain drain and become a vehicle for technology transfer between Oslo and this tiny

Cable Dominance

Part of Nexan Norway's subsea cable factory.

Photo: Copyright Nexans Norway

ski-center town. Already called "the industrial capital of Norway", the Kongsberg Cluster Project is seemingly at odds with Subsea Valley but is instead a major member.

While, Subsea Valley anchor Oslo might boast Aker Solutions, Nexans Norway, ABB (not a member) and other big names, Kongsberg's dynamic positioning, subsea, power-generation and autonomous vehicles have earned it accolades as a Norwegian Centre of Excellence (NCE) in Systems Engineering.

Speaking to journalists, NCE director, Torkil Bjornson, links "regional cooperation" with bringing in talent. It becomes apparent Oslo-Kongsberg is competing for skills with Western Norway, home of Norway's offshore shipping cluster and Stavanger, the oilfield services hub. Bjornson announces a new Norwegian Systems Engineering master's degree, although it isn't clear whether he means the "collegial" British fast-track, the "Stanford" type (his words) or the streamlined Norwegian version. One-year "professorship" tenures will also be offered at a Kongsberg campus with an emphasis on those able to teach "lean product development and knowledge management".

"There's a lot of mobility between the industries," Bjornson asserts. He says the cluster will help provide gravity for local, high-level expertise. During the last (oil-price crisis in 2008) crisis, "people moved around".

Subsea matchmaker

Although its membership is the Who's Who of the subsea world, it's clear Subsea Valley itself aims to be the added value in this cluster. Stroem has already teamed up with classification giant DNV GL by representing sub-suppliers at the table in a Joint Industry Project, or JIP, on subsea documentation. The program seeks standard documents on quality safeguards and supply chain qualification.

Another program on health, safety and environmental leadership has aimed to help suppliers "prequalify" for work with, among others, Statoil. The "Introductory Program" in May 2014 seemed more conference than course, but the focus on realizing Statoil's subsea factory concept for remote seabed operations apparently brought out the "teacher" in TESS founder Erik Jolberg; a Statoil subsea process engineer; an actor-producer known for live theatre; a Kongsberg digital signature expert and a business college instructor among many others.

Photo: William Stoichevski

Health and Safety focus

Subsea Valley hopes to retain local health and safety expertise

Subsea Driver:

The Oslo headquarters of stately deep-water player, Statoil

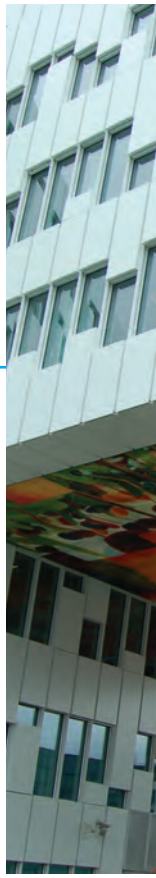


Photo: William Stoichevski

Seeing opportunity

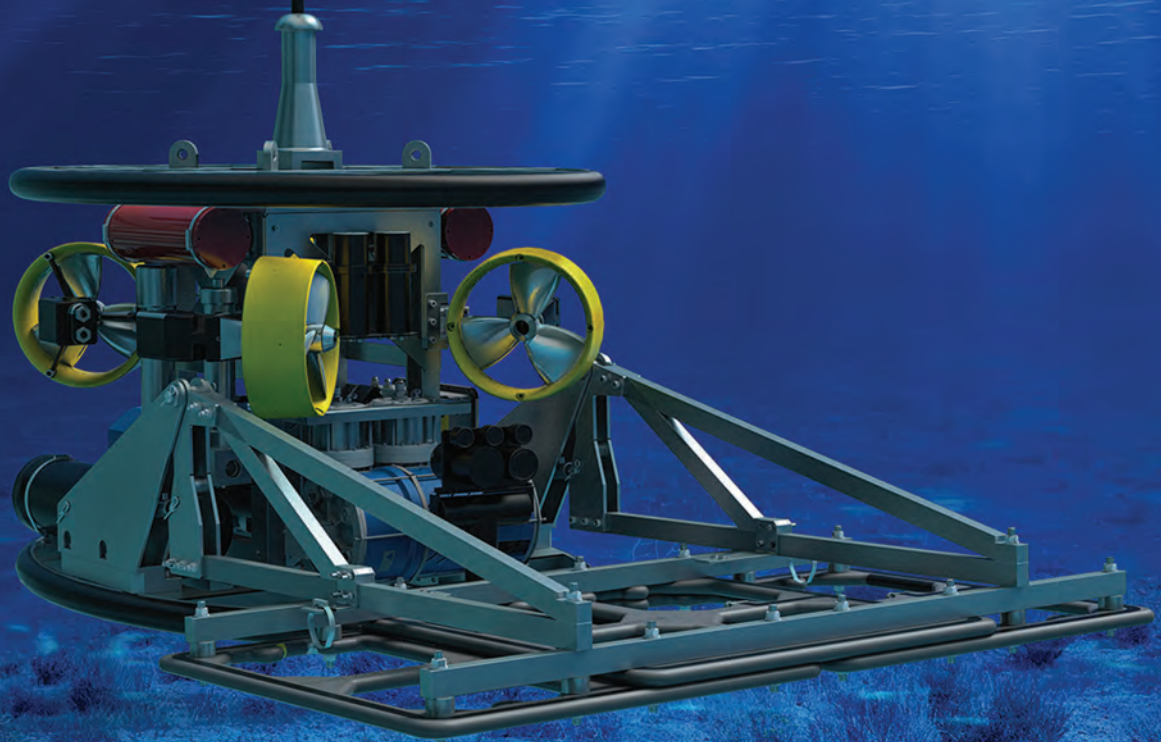
To the regular observer, it seems Subsea Valley's long-out-of-the-spotlight Oslo-to-Kongsberg membership at last have their own forum in a cluster, conference, tradeshow and links to south-Norwegian training facilities. The bonds ought to help local industry turn current trendy thinking into learning and practice. Stroem's conference and cluster show the capital region and industrial pockets lining the highway to Kongsberg can get on the same page faster.

"Low oil prices are opportunity," says Stroem, adding, "We've never before seen such momentum to actually change an industry."

Stroem has the support of townships from Oslo to Kongsberg, including Baerum, a well-to-do Oslo suburb with the highest high school science grades in the country. Its mayor, Lisbeth Hammer, says they're also "first in subsea employment". "We're famous for our engineering expertise," she says, adding that there are 20,000 subsea-related jobs in her town alone. They're a major contributor to the $26-billion-a-year in Norwegian offshore oil and gas exports.

Norway will send three mayors from its Subsea Valley corridor to OTC in Houston.

d'ROP



Bibby' Hydromap's Custom-built ROV

By Greg Trauthwein

Self-dubbed a 'revolution in coastal ROV survey,' Bibby HydroMap unveiled its d'ROP system onboard its new survey vessel, Bibby Athena, a the National Oceanographic Center in Southampton, UK. MTR spoke with Andrew McLeay, Managing Director of Bibby HydroMap, for details.

In an industry where innovation is common, Bibby HydroMap's d'ROP system truly stood out at an active Ocean Business last month in Southampton. d'ROP is a custom developed solution by the company, touted to be a revolution in coastal ROV survey with particular productivity gains in shallow water survey and inspection. d'ROP was showcased onboard the new 27.5m purpose built semi-swath coastal survey vessel Bibby Athena, and was set to embark on its first commercial mission immediately after the exhibition.

In a market teeming with advanced ROV platforms and options, the first natural question for McLeay is: Why custom design this yourself?

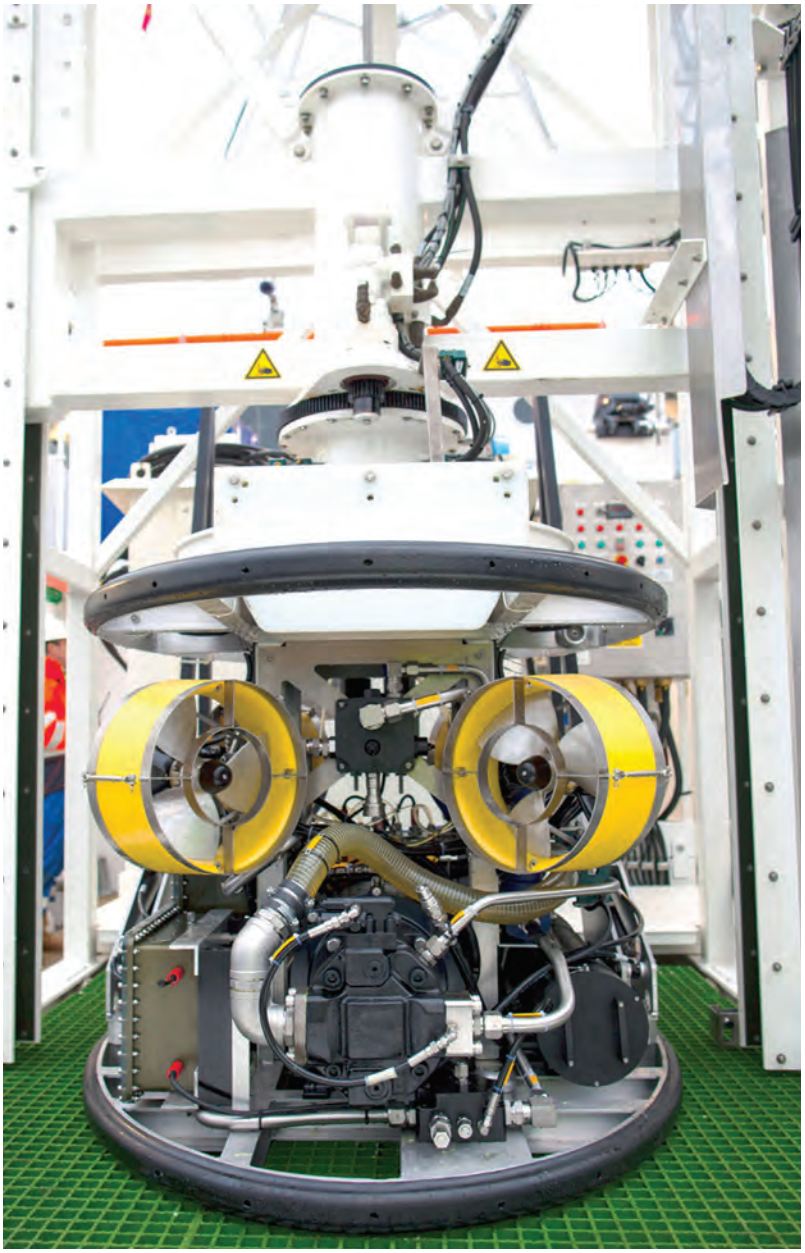
"The decision was taken to develop the d'ROP as we have a set of very specific survey tasks that lie beyond the capabilities of existing observation class ROVs and require the dynamic capabilities of a powerful work class vehicle, said McLeay. "We obviously cannot accommodate a work class ROV spread aboard our own vessels due to size and weight limitations. We also need the ability to be able to deploy in shallow water, something that is not usually associated with a work class ROV, and especially not with an offshore support vessel. Much of our work is in coastal areas with strong tides and being able to work through an entire tidal cycle is a major advantage."

While d'ROP surely does not look like any other vehicle in the field, there are some classic markers – namely four massive, powerful thrusters – that link it with its brethren.

"What we have effectively done is to take the basic components of a powerful work class ROV, strip off all the peripherals and redundant systems that we don't need and have created a compact but exceptionally stable and powerful platform focused entirely on deploying survey sensors at the optimum geometry for maximum resolution and data quality," said McLeay. " In reality there was no existing single ROV product that could address our specific requirements.

Developing d'ROP

The d'ROP is based upon a concept conceived in-house within Bibby Hy-



Bibby Athena

Builder	Socarenam Boulogne, France
Designer	Bureau Mauric
Length x Beam x Draft	27.5 x 10 x 3.5 m
Tonnage	145 gt
Class	Lloyd's Register 100A1SSC Catamaran, G6
Flag	UK
Main engines	2 x Cummins KTA19 M3
Gears	Twin Disc MG516C
Survey Propulsion	2 x Schottel SPJ57 azimuth pumps jets
Bow thrusters	2 x Schottel SPJ15 azimuth pump jets
Speed	12 knots
Survey speed	6 knots
Endurance	10 days
Fuel Consumption, transit	2.5 cu.m./day
Fuel Consumption, survey speed	1.2 cu.m./day
Fuel Consumption, DP	1.8 cu.m./day
Generators	2 x Scania DI13-074M
Tank capacity, gas oil	24 cu. m.
Tank capacity, fresh water	8 cu. m.
Tank capacity, water maker	2 cu. m./day
Crane	Palfinger
Max. lift	5450kg @ 4.2m
Moonpool	2.05 x 2.3m
A-Frame	Hydrualic 8000kg SWL with 6.5m deck clearance
Sonar winch	MacArtney Cormac 4
Radar, AID, Echosounder, Navtex, Satcom	Furuno
Autopilot	Navico
ECDIS	Navmaster
dGPS	C&C Tech
Heading	iXBlue Quadrans
Heading2	iXBlue Hydrins
Speed log	Skipper
VHF	Icom
DP1 System	Sirehna EasyDP

d'ROP

Manufacturer	Hydrobotics (under license from Bibby Marine Survey Services, patent pending)
Dimensions	1.8 x 1.2 x 1 m
Weight	460 kg in seawater, 500 kg in air
Depth rating	300 m
Max thrust, Forward	848 kgf
Max thrust, Reverse	760 kgf
Max thrust, Lateral	804 kgf
Hydraulic Power	75kW (100SHP), nominal 3000V AC
Auto functions	Heading, depth, altitude, track follow
Base equipment	Fiber optic gyro, gyro, altimeter, depth sounder, color camera, mono low light camera, LED lighting, USBL beacons
Optional equipment	DVL, Sonar, MRU
Survey Capability	TSS350, TSS440, TSS Dual Track, Multi-beam echo sounder, side scan sonar, gradiometer, 3D imaging sonar
Deployment	Through moon-pool or over-side/cantilever
SWL	4100 kg on bottom layer
Average line speed	>30m/min
Lift umbilical	Double armored, lift, 16 conductors plus fiber optic link
Diameter	27.2mm
Breaking strength	38038 kgf
LARS	Passive cursor with latch box and umbilical sheaves on a 20 ft. ISO skid
SWL	4100 kg
Power unit	Hydraulic integrated into umbilical winch
Output	37.5kW
Power requirements	1x400v/350A and 1 x 400v/75A

Sir Michael Bibby, MD, Bibby Line Group and Andrew McLeay, MD, Bibby HydroMap on board Bibby Athena to mark the rebrand of Osiris Projects to Bibby HydroMap.

droMap, and started with a desk top study to look at the potential options to turn the concept into reality. "A partnership was formed with a small company called HydroBotics which provide ROV engineering consultancy and project management services," said McLeay. "Hydrobotics were then contracted to manage the build, commission and deliver the system. Bibby Marine Survey Services own the patent for the concept."

Why d'ROP

d'ROP is a dynamic Remotely Operated Survey Platform that borrows and combines technology and operating principles from ROVs, ROTVs and modern dredging systems.

"The main operational advantages are the ability to maintain track or station in high current environments, automated launch and recovery, reduced number of support staff as a conventional pilot is not required, bringing work class capability to shallow water and providing a highly adaptable platform with high payload capability of up to 500kg," said McLeay.

It is deployed vertically beneath the support vessel, getting vertical position from a heave-compensated winch and combined LARS, with its thrusters maintaining heading and altitude in relation to a survey line. Courtesy of its massive thrusters, it is designed to be able to hold station and remain stationary, operate at very slow speed for depth of burial surveying or track at up to four knots for acoustic survey. "The high power propulsion is to give the platform the ability to maintain position in strong cross tides as well as operate at up to 4 knots in acoustic survey mode."

While it has numerous advantages, there is a drawback according to McLeay: "It has limited excursion ability and operates directly beneath the vessel only and is limited in depth capability by the available length of lift umbilical cable."

Following its unveiling in Southampton, the unit was scheduled to be deployed on its first live contract surveying an AC power cable and measuring depth of burial on one of the North West England wind farm sites.

According to McLeay, the decision on whether to hold this technology close or commercialize has yet to be taken. "Initially the platform was developed to service an in-house requirement although the level of interest in the system may prompt us to explore the possibility of producing multiple units for wider use."

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Soundnine Inc.

Soundnine (S9) launched two products at Ocean Business 2015, the Enduro APT Recorder and Ulti-modem inductive modem, designed to provide new capability and value in ocean observing. The Enduro APT Recorder is a small, robust instrument that measures Acceleration, Pressure and Temperature, logs internally and transmits data in real time over plastic-jacketed wire rope commonly used on moorings. S9's dual mode inductive technology is compatible with the prevailing inductive telemetry (Sea-Bird), and also offers a fast transmit mode when communicating with an Ulti-modem.

The size and power requirements of the Enduro were reduced by using electronic technology also found in cell phones, enabling a more compact mechanical design with low manufacturing cost, and allowed more design detail to be devoted to solving problems experienced using other moored sensors. The Enduro is easily held in one hand during mooring assembly and installs concentrically on the mooring wire in seconds using a cordless driver. Its tapered shape reduces dynamic stress on the mooring and fends off fishing lines or debris that might otherwise snag the instrument.

The modem used in the Enduro is also built into the Ulti-modem, a clamp-on-the-wire companion module that adapts most instruments having a serial interface to real-time inductive telemetry. The Ulti-modem is also used with S9s DANTE Buoy Controller or common data loggers to communicate with other Ulti-modems, Enduro APT Recorders or Sea-Bird inductive modems on the same mooring wire.

Perhaps most intriguing are the possibilities for new research yet to be conducted with the Enduro APT Recorder and Ulti-modem. It's now possible to obtain real-time profiles of the upper few hundred meters of the ocean from a small boat towing a string of inexpensive sensors on ordinary jacketed wire rope, sampling temperature, pressure and tilt at 12 or more times per second. Moorings will be able to send data about the frequency and intensity of strumming, and indicate anchor movements that may impact the safety of the mooring. With this advance warning, researchers may be able to intervene, preventing huge losses in equipment and data.

www.soundnine.com

MacArtney Launches NEXUS MK VII MultiPlexer

At Ocean Business MacArtney launched the NEXUS MK VII multiplexer, while other recent MacArtney developments, such as the LUXUS wide angle LED, will also be on display. Moreover, stand visitors had the chance learn about the MacArtney range of advanced hydrostatic pressure testing vessels and examine a 3D scale model MERMAC foldable A-Frame representing the company's new series of cutting-edge LARS solutions.

The star of the show on stand B1 was the MacArtney NEXUS MK VII - a highly versatile HD and standard video, Ethernet, serial and multibeam sonar multiplexer based on Moog Focal 907 telemetric technology. The NEXUS MK VII represents the most advanced MacArtney telemetry system to date. Power switching is software controlled via PC software or using a tablet which is online via LAN or WiFi. Sensor power status, telemetry link, leak alarm etc. is also continuously monitored by the software. Advanced features include programmable fuses and software enabled interface selection. Moreover, the NEXUS MK VII carries all signals over one single mode optical fiber via coarse wavelength division multiplexing, hereby providing a highly efficient link between surface and seabed.

www.macartney.com

EvoLogics Launches High-speed Mini-modem

EvoLogics GmbH announced the S2CM-HS - a high-speed "mini" modem that offers rates up to 62.5 kbps for short-range data transmissions. EvoLogics S2CM-HS is an addition to the S2CM range of "mini" modems, boasting the company's patented S2C technology in a light and compact design. EvoLogics further tackles speed, size- and weight-sensitive applications, supporting the industry trend for smaller and power-efficient solutions. S2CM-HS will be available with a cable-mounted trans-

ducer, offering more options for system integration, for example, into diver communication systems. The M-series is fully compatible with the company's standard S2C R and S2C R USBL series that rely on the patented broadband communication technology, overcoming the challenges of dynamic underwater environment to deliver a great performance in various subsea conditions. M-modems are smaller and lighter than the standard EvoLogics R-series devices, but offer an uncompromised performance of the full-sized product line.

www.evologics.de

Kongsberg's New Marine Motion Sensor

Kongsberg Maritime introduced a new member in its family of Motion Monitoring Units at Ocean Business 2015. As the new flagship unit, the MRU 5+ MK-II is part of a range of MRUs that offers reliable performance in attitude determination for diverse marine applications including motion compensation of multibeam echo sounders, high speed craft motion control and damping systems, heave compensation of offshore cranes, dynamic positioning, hydro acoustic positioning, ship motion monitoring, ocean wave measurements and antenna motion compensation and stabilization.

The MRU 5+ MK-II offers performance through the use of a new sensing element (Coriolis force resonator) in the new design of integrated MEMS gyros. With less than 0.002° angle noise, and Angle Random Walk 0.006°/√h, the MRU is on par with fibre optic and ring laser gyros.

www.kongsberg.com

Diver6 System

The Diver6 System is a new maritime tracking technology, designed to enhance diving command, control, and safety. As a supplemental resource, Diver6 assists Dive Supervisors in monitoring and tracking divers. Diver information is transmitted via an underwater modem to a receiving unit deployed on the surface, and then to a monitoring computer that records, calculates, and

displays various parameters such as diver air pressure, depth, water temperature, and position using a 2D and 3D tracking display. Diver6 communicates with divers up to 100 meters in depth and 1,000 meters in range from the topside receiving unit (Topside Modem).

Dive logs are created for each dive with divers having access to electronic and hard copy data history.

The data logs are recorded each time the modems connect with the software. The extensive Diver6 is designed to provide up-to-date information on divers allowing the Dive Supervisor to make faster, safer, and more accurate decisions with significantly enhanced situational awareness.

Nautronix Deploys NASNet

Nautronix said that the NASNet array in Statoil's Aasta Hansteen field is fully operational and awaiting first field construction. Last year Nautronix secured an order with Subsea 7 to supply 16 NASNet stations along with a wet-stored spare station and three additional MTrx beacons to provide QC capabilities.

Subsea 7 collected the full equipment spread in February, over three weeks earlier than scheduled, and the Subsea 7 construction vessel Havila Subsea was mobilized in Sandnessjøen, Norway on February 25 in preparation for the offshore installation. Despite challenging weather conditions in the Aasta Hansteen field, all 17 stations were successfully deployed to the seabed, tested and boxed-in (calibrated for position). The actual average installation time per station was less than six hours, which included calibration and testing.

www.nautronix.com

Applanix' Expanded Marine Product Portfolio

Applanix introduced an expanded portfolio of Marine georeferencing and motion compensation solutions designed to deliver performance at a variety of price points. The new line-up offers high-performance solutions to a broader cross-section of the hydrographic survey industry. All Applanix Marine products benefit from the optimal integration of GNSS and Inertial observables, with access to Trimble GNSS technology. At the entry-level of the expanded product portfolio, Applanix introduced the new POS MV SurfMaster. Incorporating Applanix's proprietary SmartCal inertial cali-

bration techniques, POS MV SurfMaster delivers robust georeferencing for small platforms, both manned and unmanned. SurfMaster is fully supported by Applanix' post processing software POSPac MMS, and can deliver roll and pitch accuracy to 0.03 degrees, regardless of latitude or rate of vessel motion.

www.applanix.com

Falmouth Scientific's New Chirp Transceiver

Falmouth Scientific, Inc. (FSI) announced a new addition to its sub-bottom systems product line – a true 24-bit CHIRP sub-bottom profiling transceiver. The FSI HMS-622 CHIRPceiver and its associated transducers and arrays can fill a wide range of survey needs. The HMS-622 is available in dual and single frequency configurations, and supports three frequency bands: standard LF (1KHz-10KHz), as well as optional ULF (200Hz-2KHz) and HF (8KHz-23KHz). A direct A/D input is available for the FSI Bubble Gun or other seismic systems, and it has an industry-standard Ethernet interface for data and control signals.

The HMS-622 CHIRPceiver rounds out the FSI sub-bottom system product line which includes the Bubble Gun Family of portable seismic systems, hull mounted transducers, arrays, and preamplifiers for deep water survey applications, and other customizable solutions.

www.falmouth.com

Teledyne TSS Launches Powertrack Subsea Cable Tracker

The new Powertrack subsea power cable tracker was launched by Teledyne TSS at Ocean Business to close a gap in the offshore survey industry's inventory of marine detection technology. The company's research department has now overcome the problem of tracking live power cables by developing a system that is capable of detecting the harmonics of AC tones in all AC and DC utility cables whether they are three or single phase and the same system can detect them regardless of whether they are carrying power or not. Unlike pipelines, cables have a much smaller metallic profile which makes them considerably harder to detect. This problem is overcome by the TSS 350 which can monitor a detectable tone that has been injected into the cable. However this is not an option if the cable is in use delivering electrical power so Powertrack has been designed as an enhanced version of the TSS 350 that is able to operate over a wider range of frequencies.

The new system has been developed so that it can now cover the higher-order harmonics of the grid frequency. This frequency delivers increased capability for detecting the harmonics of AC tones in all powered and unpowered three-phase and single-phase AC and DC utility cables. This detection capability takes advantage of the inherent embedded power transmission characteristics of the installation. The complete Powertrack assembly weighs 17 kg in air and is depth rated to 3000-m where it is capable of detecting a cable at a vertical range of up to 10m and within a total horizontal swath width, centered on the coil array, of 20m.

www.teledyne-tss.co.uk

Valeport's SWIFT SVP

Valeport is using Ocean Business as the launch platform for a new sound velocity profiler, which will be on show for the first time at the show. Valeport's latest addition to its portfolio of sound velocity sensors and profilers is the SWIFT SVP. This new compact unit will feature high accuracy SV, pressure and temperature, plus integral GPS to geo-located every profile. Data can be easily and quickly downloaded, reviewed and translated to common SVP formats wirelessly via Bluetooth Smart using the free SWIFT APP on iOS devices. The data can also be instantly shared via FTP, email and cloud services. With a battery endurance of up to a week and easy charging via USB, the SWIFT SVP is intended for coastal, harbor and inland hydrographic survey use and is designed to offer the highest quality sound velocity profiles in a compact, robust and portable package.

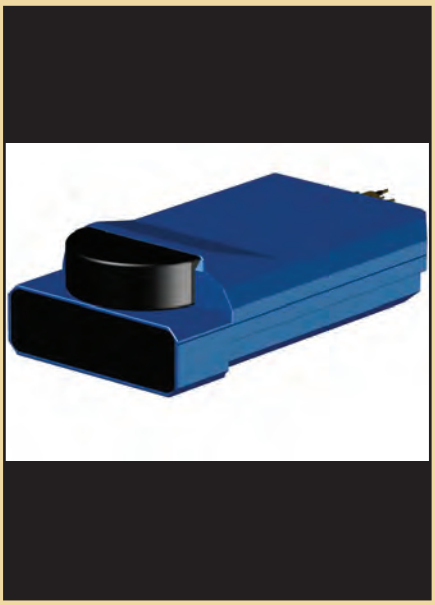
Valeport also showcased:

- **Ultra Sensors** – the new ultraSV and ultraP are the next generation of sound velocity and pressure sensors from Valeport.
- **Hyperion Fluorometers** – The new range of optical sensors with the launch of a Fluorometer for measurement of Chlorophyll and Fluoresceine.
- **miniCTD Fast Profiler** – An evolution of Valeport's miniCTD, the Fast Profiler has been designed to deliver the highest quality CTD casts at rapid drop rates.

www.valeport.co.uk

Dolphin Sea View 2D Sonar

A new 2D sonar that provides high frequency real time imagery has been developed for use on the smallest AUVs and ROVs by Marine Electronics Ltd. The Dolphin Sea View offers a 720 kHz operating frequency which gives it a range setting availability from 100m down to 0.2m. It also provides AUV designers with an Ethernet over power option that enables connectivity to be established using just a two core cable. With a sonar head measuring 228mm x 130mm x 70mm the Dolphin Sea View is designed to provide real-time continuous scanning at 30 frames per second over a 120 degree field of view. The unit includes a nine-axis MEMS motion sensor which supports a composite array of 192 beams. This has a vertical band width of 20 degrees and it consumes less than 15 watts of power. The entire unit has an in-water weight of 1.5 kg and is depth rated to 500m as standard with a 3000m option available for deep water operations.



www.marine-electronics.co.uk

Fifth-Generation OCTANS

iXBlue unveiled its fifth-generation OCTANS for survey-grade navigation. The new OCTANS is an all-in-one gyrocompass and motion sensor (attitude and heading reference system, AHRS) and brings in new and enhanced features, including IMO/IMO-HSC certification and inertial navigation system (INS) product upgrade-path. The fifth-generation OCTANS gives marine customers more product variant choices, expanding its surface and subsea product range. OCTANS is built on iXBlue's strap-down fiber-optic gyroscope (FOG) technology. Fifth-generation OCTANS customers will benefit from a new offer of 5 year warranty.

www.ixblue.com

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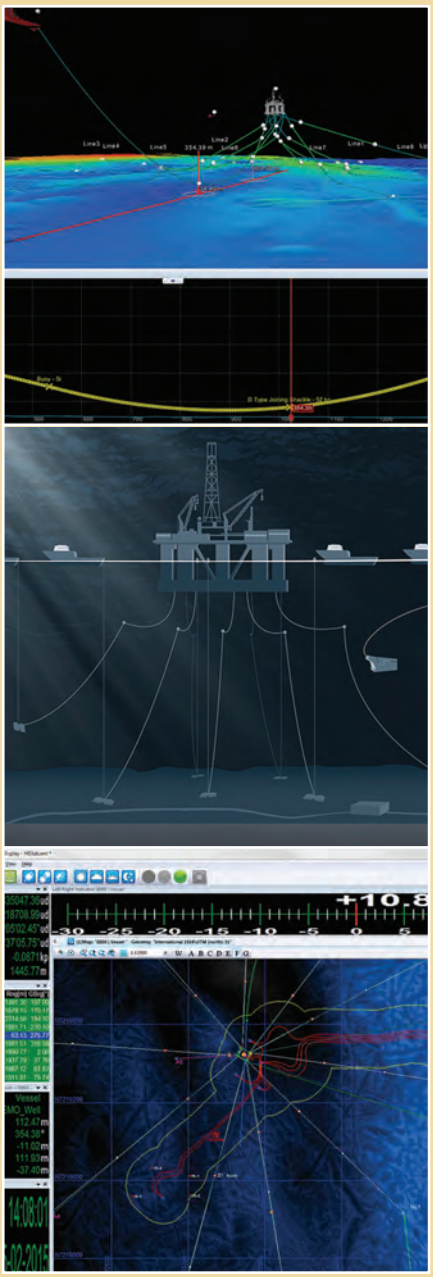
www.oceans15mtsieeewashington.org



New Software from EIVA

The EIVA NaviSuite software suite now includes a dedicated solution for anchor handling operations that offers advanced catenary simulation. This ensures users data they can trust and a complete picture of the entire operation. NaviSuite Beka is designed to be a versatile, scalable and user-friendly software solution that increases the efficiency and safety of anchor handling

New Sonardyne 'Syrinx' Doppler Velocity Log

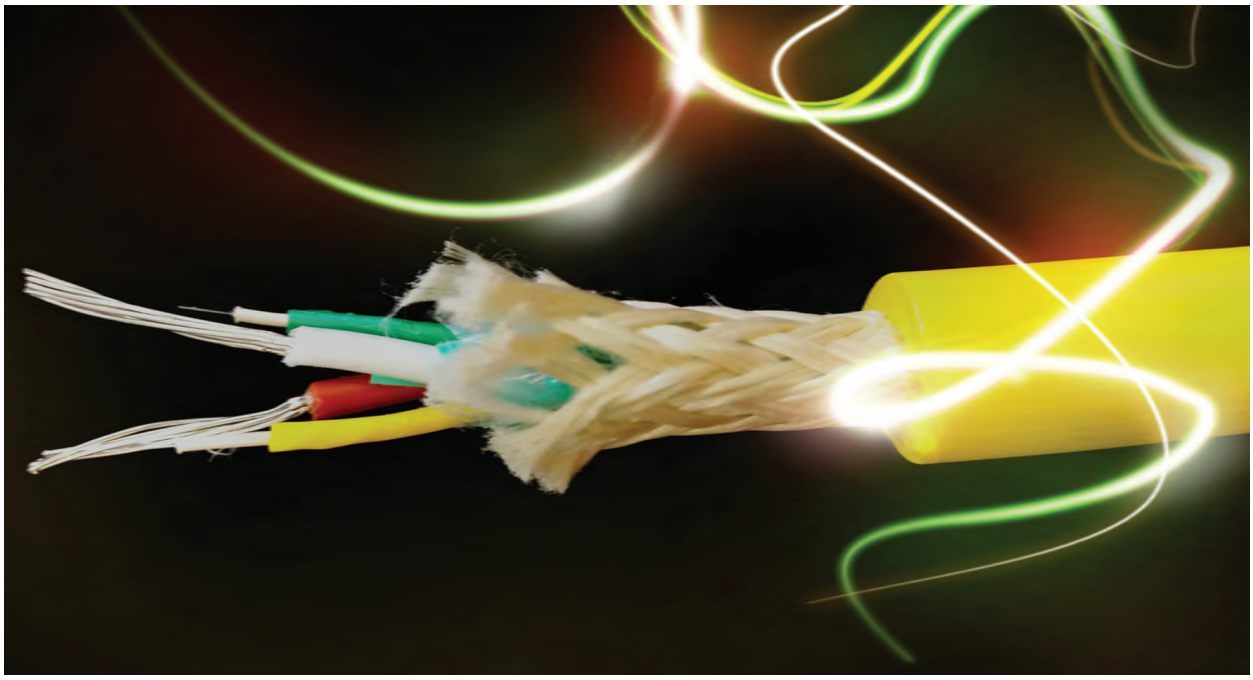
Sonardyne introduced its first ever Doppler Velocity Log, called Syrinx, developed to meet the needs of surface and subsea vehicles that require high integrity, high performance navigation aiding over a wide range of water depths and seabed type.

The Syrinx DVL employs full linear signal processing to provide very low noise, high precision velocity measurements over a wide range of seabed bottom types and altitudes. During extensive testing, Syrinx has demonstrated its ability to achieve consistent and reliable 'bottom lock' at high altitudes comparable to a 300 kHz DVL, with the high resolution performance of a 1200 kHz DVL.

Syrinx can be used as a standalone DVL, as part of an integrated navigation system, or perform both functions at once due to concurrent Ethernet and serial output capability at ping rates of up to 10 Hz. Its dual output capability also now means that only one DVL instrument is required on a vehicle as both pilots and survey teams can simultaneously share the output from Syrinx. This offers valuable savings, both in terms of cost and vehicle payload space.

The Syrinx DVL has also been designed to be easy to install, set up and use and can be fitted to existing instrument mounting brackets. This makes it straightforward for users to equip their vehicles with Syrinx without any modification. A 4,000 metre depth rated titanium version is available to meet the requirements of modern Work-Class ROVs, with 3,000 m and 6,000 m models also available.

www.sonardyne.com



Linden Photonics

Linden Photonics introduces hybrid cables to its expanding product line. Building upon its STFOCcables whose pedigree comes from a long history and variety of underwater uses - from munitions tethers to ROV controls to littoral water sensing. Linden's Hybrid cables combine copper and fiber elements in a lightweight, yet strong and robust tether cable. Linden can customize your size, buoyancy and strength; from neutrally buoyant designs to extremely thin cables with various conductor offerings and fiber types available. Linden's patented cable jacket construction is designed to protect the fiber in the harsh subsea environment. Our cables are compact and rugged; flexible and strong.

www.lindenphotonics.com

operations during rig move and barge management projects.

The solution combines anchor handling and catenary data acquisition, ROV inspection, and reporting in a single tool that covers both operation planning and execution, designed to simplify the work process and reduces the risk of calculation errors that comes with using multiple software tools.

The advanced catenary algorithm behind the catenary feature of NaviSuite Beka offers high-performance, virtually instant anchor chain catenary simulation. The algorithm computes the physical behaviour of the defined anchor chains taking into account material weight, drag, buoyancy, elasticity, etc. Also, as it is a 3D algorithm, it takes into account water currents, among others.

www.eiva.com

STR Unveils Rechargeable Battery Pack & Charger System

Subsea Technology and Rentals (STR) unveiled its new subsea rechargeable battery pack (SeaCell) and charger system (SeaCharge) to complement their existing portfolio of specialist equipment. Ahead of the launch, the R&D team at STR's Head Office in Great Yarmouth have invested in a substantial development program to generate a battery pack and charger capable of delivering a reliable, high power so-

lution for underwater systems. The STR battery pack employs environmentally acceptable NiMH technology and takes full advantage of Microcontroller technology to ensure reliable performance throughout the service life of the pack.

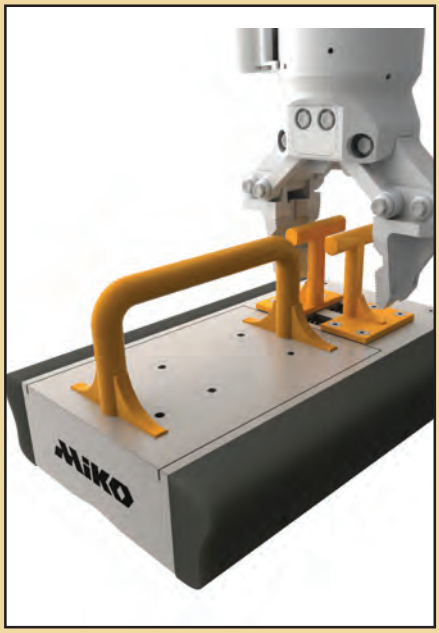
www.str-subsea.com

New Switchable Magnet Launched as Tool for ROVs

Norway's Miko Marine AS has developed a powerful magnet to be used as a practical and versatile tool for ROV operators. Incorporating patented technology that increases its performance, the magnet has been designed so that it can be switched-on and off by an ROV manipulator and used for a wide range of applications underwater. The new magnet can be applied instantly to any steel structure where it is capable of holding weights up to 750 kg and it can significantly reduce the amount of time required for an ROV to undertake a task.

The Miko ROV Magnet functions completely mechanically without the need for cables or wires and permits gentle contact with painted surfaces on subsea structures or when used while working on fragile wrecks or other objects vulnerable to damage. It is compatible with all common types of manipulator claw (parallel, three-finger or four-finger) and is supplied with an interchangeable fixing bracket.

mikomarine.com



AML CTDs with UV-Xchange Chosen by Ocean Networks Canada for Smart Oceans Project

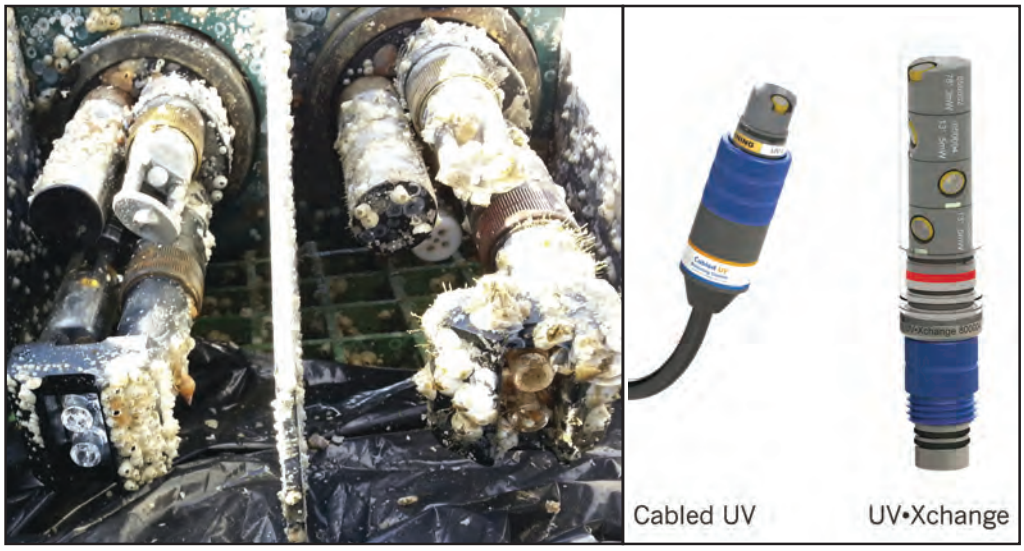


Photo: Adrian Round, Dir. of Observatory Operations, ONC

A sample comparison of two identical sensor configurations: On the left is an AML Metrec-X instrument with UV-Xchange installed to protect all four sensors. On the right is identical instrumentation without UV-Xchange. Note the glass tubes of the C-Xchange protected by UV-Xchange are crystal clear after nine months in-situ at ONC's Folger Pinnacle observatory."

AML Oceanographic has been selected to supply CTDs for Ocean Networks Canada's Smart Oceans program. AML Metrec-X instruments will be deployed on cabled observatory platforms off Canadian coasts to provide data imperative to improving environmental monitoring and marine safety. AML's award-winning UV-Xchange and Cabled UV will prevent biofouling of Xchange and other environmental sensors on each CTD, in addition to other critical surfaces of the platform. The prevention of fouling-induced drift will allow the sensors to provide accurate data for the duration of the in-situ deployments. Scott McLean, Director of Ocean Networks Canada Innovation Centre, stated, "With the incredible results of the AML Oceanographic CTD and UV anti-biofouling system in our technology demonstration program we are very pleased to be deploying these systems across coastal BC as part of the Smart Oceans program."

www.amloceanographic.com

MacArtney Connectivity for

Navy Bow Sonar Systems

MacArtney Underwater Technology supplied SubConn underwater connectivity solutions for the bow mounted sonar systems that are essential to the undersea threat detection and response capability of the advanced FREMM frigates currently operated by the French, Italian and Moroccan navies. In cooperation with naval defense technology contractors; Thales (France) and WASS (Italy), MacArtney has designed and delivered the outboard and inboard cable and connector solutions that interface all sonar elements and connect these to the on board communications and power network.

The first ship of the class, the Aquitaine, was commissioned in 2012 and so far, a total of 21 ships are on order. With a system supply spanning the Herakles multifunction radar, the Artemis infrared search and track system, various electronic warfare and communication systems along with a sonar suite, Thales has made a significant contribution to the multi-mission capabilities of FREMM frigates.

MacArtney supplies the 'inboard' lead-in cables running from the sonar dome (bulbous bow) to a central hub within the hull of the ship. Moreover, MacArtney supplied the outboard SubConn underwater connectivity harnesses providing the power and signal interface for all sonar elements within the sonar dome. Underwater connectors were needed for this job, as the dome (which is manufactured partly from reinforced rubber that is transparent to acoustic signal) is flooded with chlorinated water in order to maintain its shape. A total of 96 outboard harness cables were delivered, each featuring five power and signal outlets (two-pin SubConn connectors) for plugging into sonar elements - and one SubConn connector for interfacing with the inboard system at the opposite end. To eliminate risk of corrosion, all the SubConn connectors supplied were of the non-metallic PEEK type.

While all cables were manufactured with a specially designed polyurethane jacket, the inboard cables were made from halogen free polyurethane material. All cables and connectors were tested to 4.5 kV.

www.macartney.com

(Image: MacArtney)

(Image: DCNS)

Right:
FREMM bow sonar SubConn connectivity.

Far Right:
FREMM frigate outline: SubConn connectors are used to interface the hull mounted sonar

(Image: DCNS)

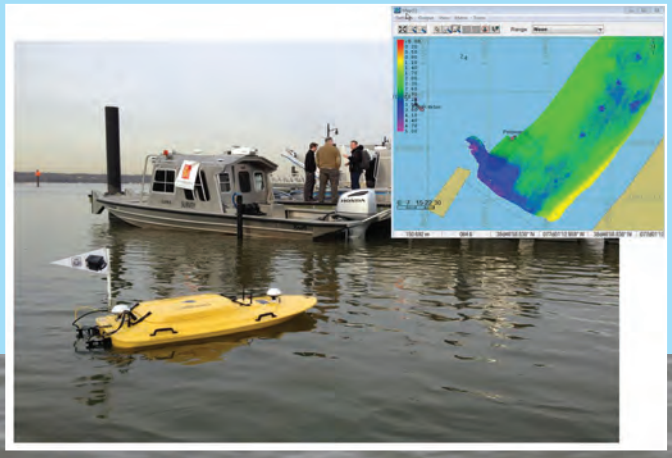
New Multibeam Z-Boat

Teledyne Oceanscience, in partnership with Teledyne Odom Hydrographic, unveiled the first public demonstration of a multibeam echosounder-equipped Z-Boat 1800 autonomous remote survey boat at the U.S. Hydro 2015 Conference. The 1.8-meter distinctive yellow survey boat is found in action all over the world conducting single-beam surveys in rivers, lakes and industrial water. The Z-Boat is typically used when access is restricted or conditions are unsafe for a manned vessel. Adding a multibeam echosounder allows users to expand the range of surveying tasks that can be undertaken with the boat to conduct detailed engineering surveys, river scour surveys and infrastructure inspection. The new Z-Boat may be manually controlled from the shore or operated autonomously using a waypoint navigation / line following system developed in partnership with MSubs Ltd. (UK).

Conference attendees were able to drive the Z-Boat using the manual shore control system and simultaneously observe their survey tracks and bathymetry data on the shore PC. With the Teledyne Odom MB1 on board, up to 512 beams may be configured in a 120deg swath, representing a potentially enormous improvement in data availability versus the previous single-beam sonar options. With on-board computing powering the multibeam echosounder, and HYPACK running on the Z-Boat PC, this combination opens the prospect of adding further instruments and sensors for simultaneously collected georeferenced datasets.

For example, LiDAR imagery may be gathered from the Z-Boat for water level inspection of surface and sub-surface topography. With alternate Z-Boat configurations and telemetry options for other compact multibeam echosounders, users are able to match their choice of sonar with available Z-Boat deployment systems.

www.oceanscience.com



Below: Z-Boat Odom.

Left: Boat and HYPACK.

Photo: Teledyne Oceanscience

Seaperch

Underwater Robotic Championships

This year the SeaPerch Program will celebrate a half decade of national underwater robotic championships. On the last Saturday in May, the fifth National SeaPerch Challenge will be held on the University of Massachusetts Dartmouth (UMassD) campus where 150 teams of middle and high school students from across the country will compete on the national stage.

The phenomenal growth of the event is evident with a simple look back to the inaugural National Challenge, staged in Philadelphia five years ago attracting 38 teams and 187 students.

In May more than 1,200 students, family and friends will gather for a weekend of learning, sharing, competing and excitement. On the line will be the title of national SeaPerch championship, with trophies in all three competition events along with a number of new special awards.

Hosted by the New England Regional SeaPerch Committee, registered participants and spectators will be treated to the "college experience," as the entire weekend's activities, including Friday night's Ice Cream Social and Saturday's in-pool and poster competition events as well as the Awards Ceremony, dorm room accommodations and meals through Sunday morning, will be available for all participants on the university's picturesque campus near Buzzard's Bay.

What is SeaPerch

SeaPerch is the innovative K-12 underwater robotics program, sponsored by the Office of Naval Research (ONR) and managed by the Association of Unmanned Vehicle Systems International Foundation (AUVSIF). It is geared to train trains teachers and group leaders to inspire students to build their own Remotely Operated Vehicles (ROV) following an academic curriculum consistent with national learning standards supporting Science, Technology, Engineering and Mathematics (STEM) subjects with a marine engineering-based theme. The program promotes hands-on learning of engineering and scientific concepts, problem solving, teamwork

and critical thinking, and introduces students to potential and rewarding career opportunities in naval architecture, marine, ocean and naval engineering.

"With guidance afforded by AUVSIF and with ONR's commitment to SeaPerch, we have grown exponentially, reaching more than 200,000 students to date," said Susan Nelson, Executive Director of SeaPerch. Over the years, in excess of 14,000 teachers and mentors have committed to supporting student learning through this stimulating and fun hands-on activity and to promoting student discovery and excitement of STEM subjects leading to a potential future career path.

Diverse and Targeted

The program reaches a diverse population, so participants in the National Challenge frequently include students from inner cities to remote rural areas of the country to Native American reservations in Minnesota to the islands of Hawaii, all of whom have now been introduced to STEM though SeaPerch.

Beginning on Friday afternoon, May 29, arriving teams will first check into their UMassD dorm rooms, then head over to registration where they will check in and submit their ROVs for a compliance review. For those vehicles requiring adjustments and/or repairs, a triage station with spare parts and tools will be available. Following dinner at the Resident Dining Hall, teams will be treated to an Ice Cream Social where students from all over the country can meet, mingle and compare their design enhancements and innovations. All participants will receive National SeaPerch Challenge T-shirts and giveaway bags with items contributed by the SeaPerch program and its corporate sponsors.

Competition day, Saturday, May 30, will begin at the university's Tripp Athletic Center with the continuation of registration check-in and compliance reviews. Susan Nelson will preside over the opening ceremony in the gymnasium, with a number of speakers as well as last minute technical instructions for the teams.

The Competition

Teams may consist of a minimum of one student and one adult leader, and while there is no restriction on the maximum number of students that can participate, five members is the average. A juried poster competition is planned for the middle and high school teams to introduce their designs through graphic displays, with top qualifiers to deliver oral presentations about their design philosophy, construction challenges, and to answer questions from the judges. The in-pool technical competition events requires students to steer their ROV through the Obstacle Course consisting of five, 22-in. diameter submerged hoops oriented in different planes. Each year, the second in-pool event changes, requiring the students to design their vehicles specifically to meet the ever-changing missions. This year the event, aptly named "Finesse," will test the students' ability to perform precise maneuvers on the pool bottom. Detailed specifications for both underwater events have been posted on the

SeaPerch website, **www.seaperch.org,** for teams to construct their own events for practice prior to the national competition. Approximately 150 judges and volunteers are also anticipated to attend during the day in order to adequately oversee the multiple poster presentation and in-pool competitions as well as to ensure a rewarding and memorable day for all attendees.

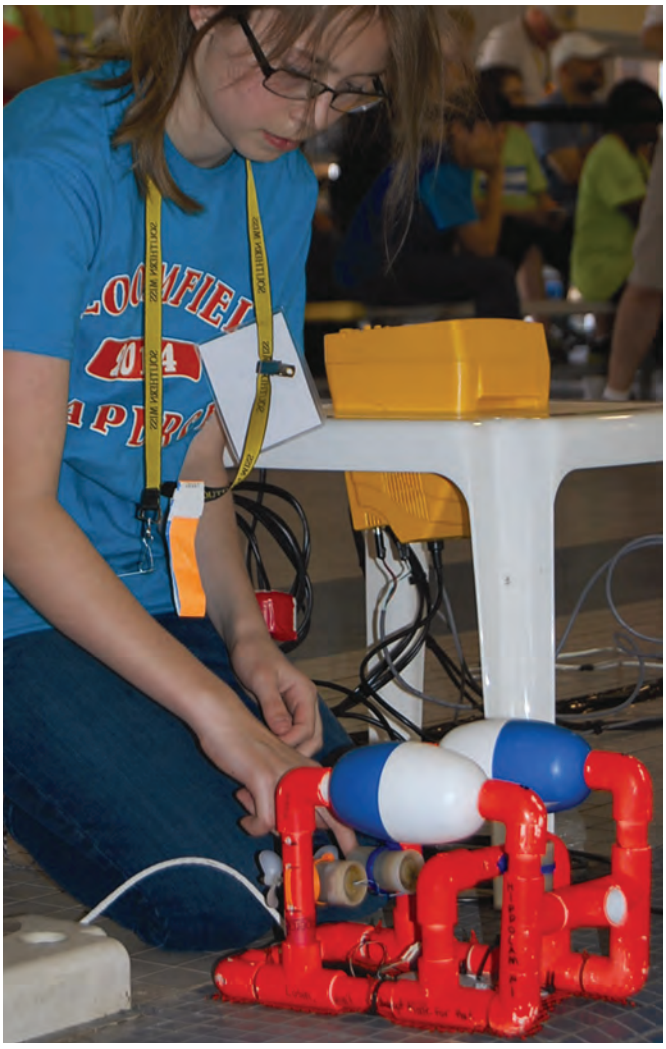
On Saturday evening the Awards Ceremony will take place again in the Athletic Center. Here, first-through-third place trophies in each event for middle school, high school and open classes, special awards and the naming of the 2015 national champions will be made by Susan Nelson.

Invited speakers, representing corporate sponsors, local and state congressional representatives, ONR, U.S. Navy, U.S. Coast Guard and other military branch personnel, will be able to take part in the day's activities, as well. They have been encouraged to arrive early and observe the competitions, judge various events and speak first hand with the students before addressing them that evening about the importance of STEM to their future careers.

All student team members will receive participation medals, and be photographed by team for the benefit of their families and schools. Additionally, Certificates of Participation will be available both for student participants and for teachers and advisors to download following the National Challenge. At the conclusion of the award presentations all registrants will enjoy an outdoor lawn party and barbeque.

Sunday, May 18, will be a free day for the teams to explore on their own the rich cultural history and outdoor activities in the greater Dartmouth area including parks and historic sites such as the nearby New Bedford Whaling Museum and Battleship Cove National Heritage Museum on the waterfront in Fall River where the Battleship, USS Massachusetts, the destroyer, USS Joseph P. Kennedy, Jr., the submarine, Lionfish, and PT Boats from the South Pacific are on display.

Sponsorship opportunities are still available for individual, local and corporate funding, and can be viewed on the SeaPerch website. Contact Susan Nelson at snelson@seaperch.org for those interested in sponsorship the event. Also, judges and volunteers are always welcome. Should you be interested in participating as a volunteer or judge on May 30, please contact Cheri Koch at koch@auvsifoundation.org.



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