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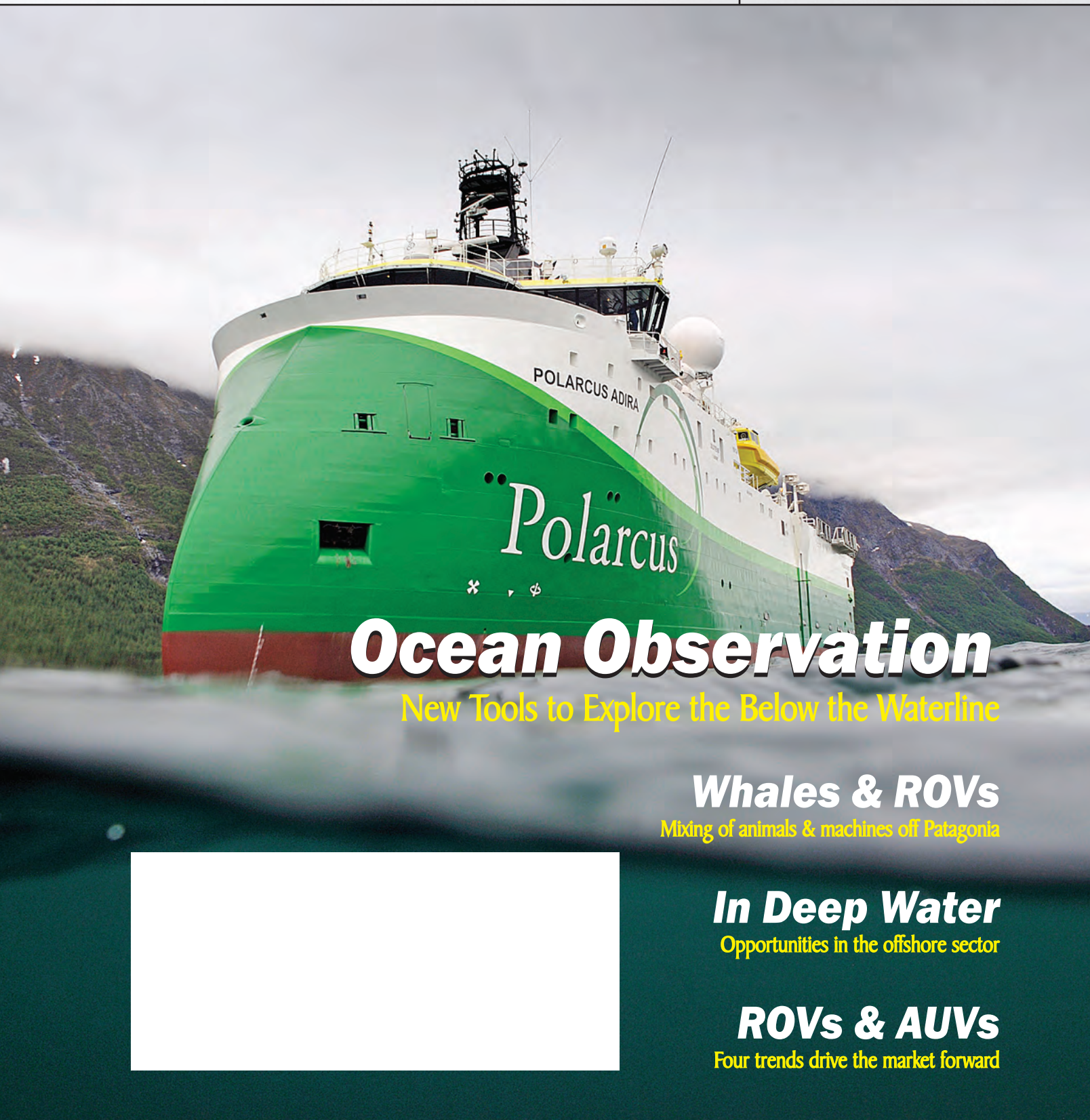
MARINE TECHNOLOGY REPORTER

September 2012 www.seadiscovery.com

Interview
Dr. Susan Avery
WHOI



Ocean Observation

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Mixing of animals & machines off Patagonia

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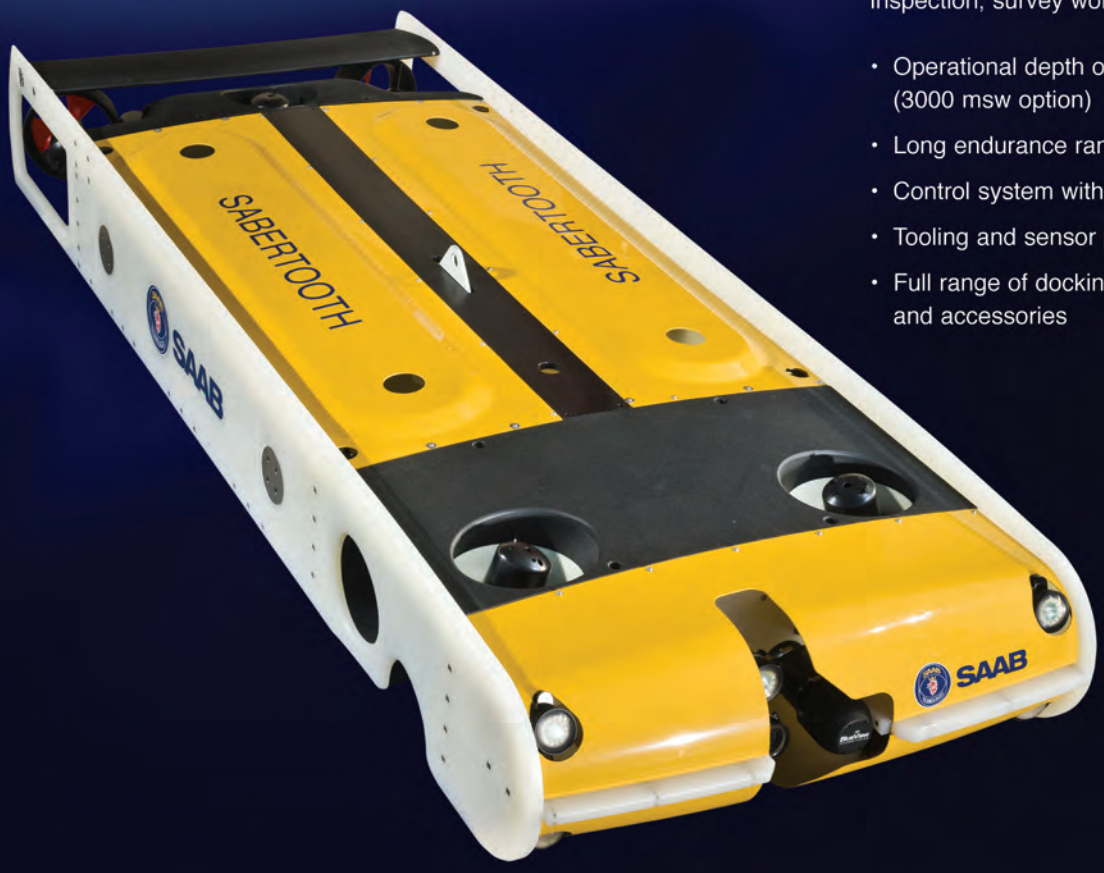

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SAAB TECHNOLOGIES

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Contents

Volume 55 • Number 7

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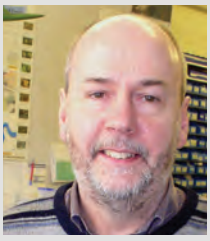

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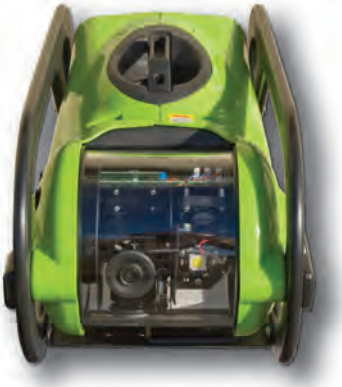
SeaBotix



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As dynamic and technically advanced as the global subsea market is, it certainly is not immune from the short- and long-term challenges and problems that beset every other industry. Strong cyclical market rides, increased global competition, a never ending search for qualified technical talent in a shrinking pool, and pricing pressure from public and private entities are just a smattering of the business challenges you face every day.

Oceanographic institutions in particular, entities which serve multiple roles across all sectors of the subsea industry and are the literal life lines for next-generation thinking and technology, are under particular pressure these days, as the world economy slogs through year five of the economic global collapse of 2008 and supposed recovery, meaning that many traditional funding sources - from government to private and corporate sources - are shrinking or not available.

For insight from the institution's perspective, we are honored this month to present Rhonda Moniz' conversation with Dr. Susan Avery, director of the Woods Hole Oceanographic Institution (WHOI). WHOI is arguably one of the best known and most prestigious of its breed in the world, and while it has faced its fair share of challenges, it has not slowed its march nor its mission to attract, retain, develop and deliver some of the world's brightest minds and innovative technology platforms in the quest to further discover and understand what lies and lives in the world's waters.

A main means to discover the mysteries of the world's most remote regions is increasingly via subsea robots: AUVs, ROVs and UUVs. While these vehicles have become increasingly common for use in the name of science, commerce and defense, it is wise to remember that subsea vehicles – particularly in the case of AUVS – is still a young technology, as 75% of existing AUVs were produced between 2001 and 2005. Lukas Brun from the Center on Globalization, Governance and Competitiveness, Duke University, delivers an enlightening ROV/AUV market analysis starting on page 48, excerpts from the free full report which breaks down the market for ROVs and AUVs and examines the major drivers that will move the markets forward in coming years.

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Bibby Offshore Receives Praise After

Hyperbaric Rescue Trials

Bibby Offshore is helping to lead the way in saturation diving safety in the North Sea after recently carrying out successful evacuation trials. The trials involved mating a Self Propelled Hyperbaric Lifeboat (SPHL) from the company's Diving Support Vessel (DSV), Bibby Sapphire, to a Portable Hyperbaric Reception Facility onshore. The Portable Hyperbaric Reception Facility, built by Mimiar, is a shore based point that allows saturation divers to be transferred from a SPHL to a more comfortable living area, pre-set at the correct atmospheric level, where they can continue to decompress safely. It also allows a medic or doctor to be in situ, capable of treating any divers that may require further medical attention.

"Bibby Offshore is determined to ensure that we have the best possible facilities for dealing with any diving emergencies," said Barry Porter, Global Diving Ops Manager, Bibby Offshore. "The success of the trial clearly shows our commitment to ensuring that, not only are we investing in state of the art equipment, but more importantly, document the processes and procedures we would follow in an emergency as proven."

The trials have been commended by diving authorities from two major global oil and gas operators.

Derek Beddows, BP global diving technical authority, was invited by Bibby to the trials. He said: "It is very encouraging to see Bibby Offshore now moving forward positively with this very important safety initiative that would be essential to the preservation of life in the event that divers ever had to be evacuated from saturation on a vessel in distress."

"It is also very satisfying to note that BP's own Policy Statement 002,'Effective Hyperbaric Evacuation, SPHL Transit and Diver Reception Facilities', is now being widely recognised and complied with across the Industry after little more than a year since its release.

"Going forward, I remain positive that all of our North Sea and Global Saturation Diving Contractors shall also consider the benefits of such trials between their own SPHL's and selected Hyperbaric Reception Facilities which shall provide us with the confidence that in the event of a hyperbaric emergency, the systems and facilities will both be in place and proven to be capable of giving the evacuated divers the very best chance of survival"

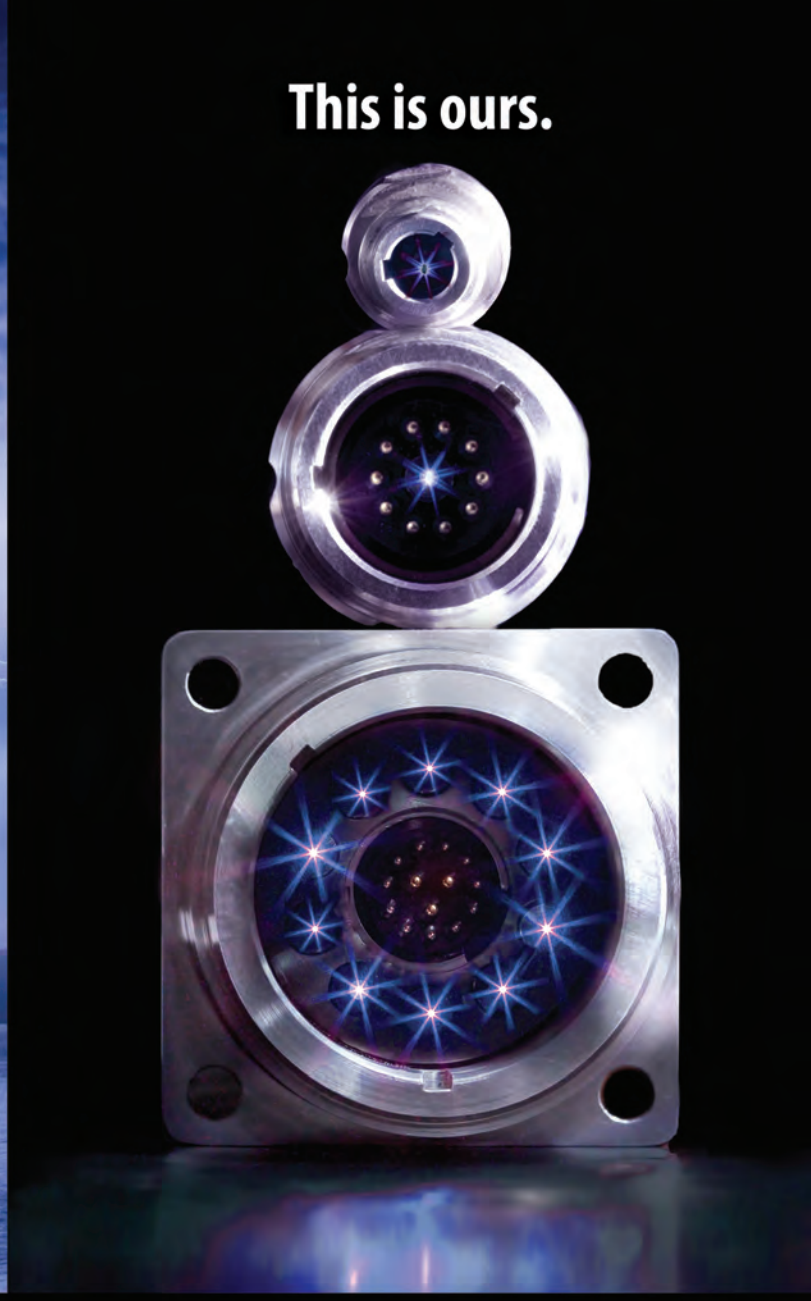
Bibby Offshore has grown from 10 employees in 2003 to 600 today, with offices in Aberdeen, Singapore and Trinidad.

Portable Hyperbaric Reception Facility (HRF) and Self Propelled Hyperbaric Lifeboat (SPHL).

QinetiQ's New Hyperbaric Trials Unit

QinetiQ re-commissioned its Hyperbaric Trials Unit (HTU) following an extensive refit. The HTU joins an array of specialist equipment that forms the recently opened Diving and Hyperbaric Test Center based in Haslar, Portsmouth. The HTU is a versatile, two compartment chamber that can be used for the testing and evaluation of undersea and hyperbaric systems. It will specifically enable the assessment of submarine escape and diving systems and components. Certified to test equipment to 1500m, it has a unique capability to re-create the actual pressure profiles experienced underwater, completely independent of the performance of the components under test. The HTU delivers a powerful and proven capability that can be applied in the defense industry and in commercial sectors such as the offshore oil and gas industry.

"The Hyperbaric Trials Unit delivers substantial cost savings to submarine operators and diving/escape equipment suppliers by using a controlled environment to test complete systems and individual components prior to conducting essential, but expensive, sea trials. The HTU is capable of testing the full functionality of a remote underwater operating vehicle and is now available for use by both defence and commercial customers," said Andy Dinsdale, Head of Maritime Life Support, QinetiQ.



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Mohawk Placed at Titanic Museum

Helping to tell the story of Loss & Recovery

Forum Subsea Technologies announced the placement on permanent display of a Sub-Atlantic Mohawk observation class remotely operated vehicle (ROV) at the Titanic Belfast Museum to help tell the story of the RMS Titanic. The newly opened

Titanic Belfast Museum, the world's largest Titanic visitor attraction, is located in the heart of Belfast.

Saturday, September 1, 2012 marks the anniversary of the discovery of the wreck of RMS Titanic. On this date in 1985, Robert Ballard, Jean-Louis Michel and their French-American team finally located the wreckage of one of the most famous and tragic ships in history. The discovery was made possible due to the development of ARGO-Jason, a remotely operated system to locate and videotape underwater objects. The ARGO-Jason was primitive by today's standards and was towed on a sled underwater by a ship.

In contrast, the fully electric Mohawk ROV is a compact, high-performance ROV system which can be used for a variety of underwater tasks including observation, survey, NDT inspections and other mission tasks. Those black and white images transmitted by ARGO back in 1985 have been replaced by full color High Definition images taken by multiple cameras and sensor interfaces. The Mohawk features: auto-heading and depth, AC propulsion thrusters, hydraulic or electric manipulators and is capable of several tooling skid options.

iRobot, Nortek to Provide Workshop at Oceans

iRobot Corporation (IRBT) and Nortek AS will provide a free workshop during Oceans 2012, Hampton Roads, Virginia Beach, VA. This workshop "Improving Glider Missions with Integrated ADCP," Monday, Oct 15, 2012, will highlight technical features of the autonomous underwater vehicle (AUV), iRobot Seaglider and the Nortek ADCP. Workshop topics will include a review of the married technologies, current and future applications of unmanned mission for researchers and industry.

In this half-day workshop, scientists and engineers from Nortek and iRobot will discuss considerations for operating a glider with an integrated ADCP.

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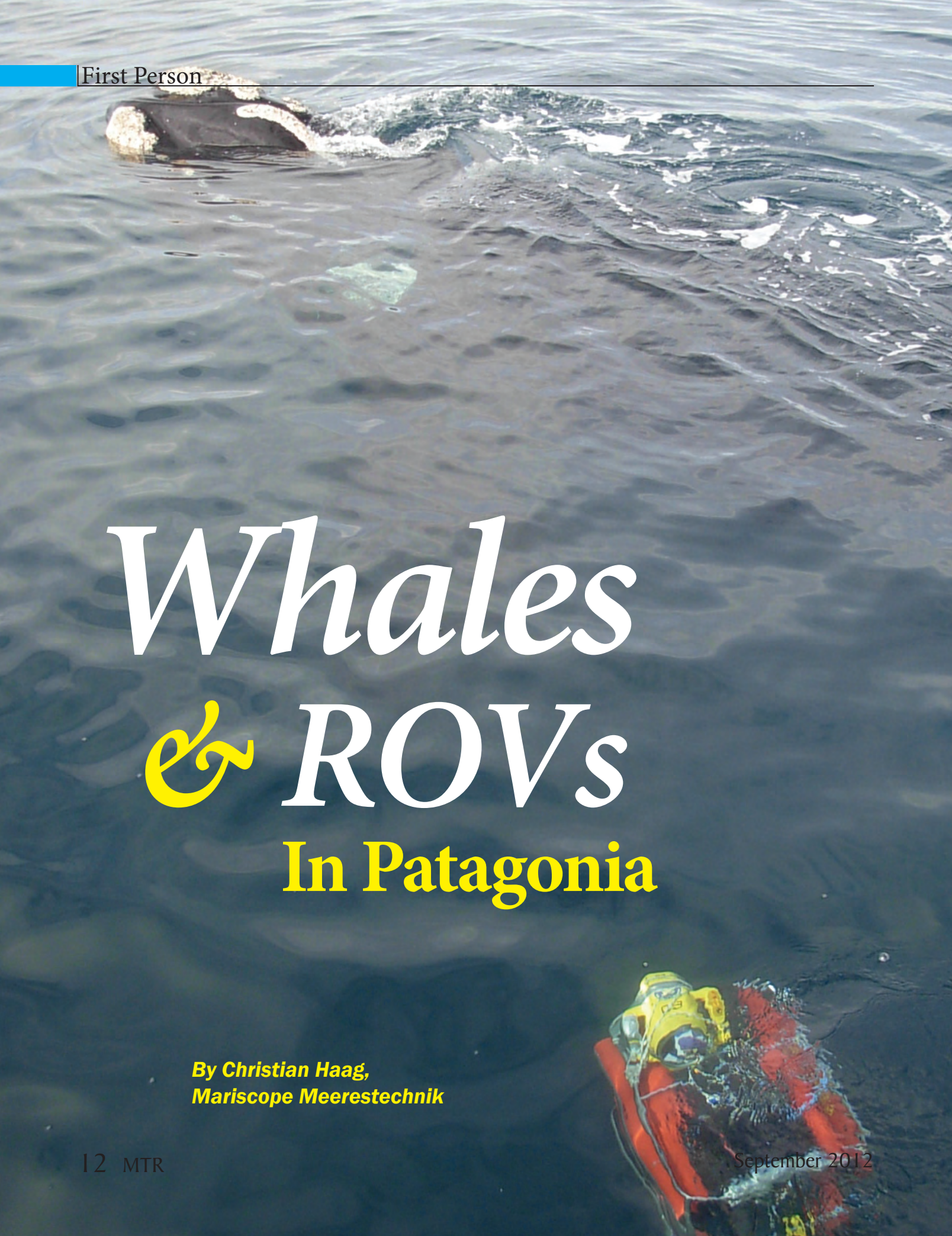

Whales & ROVs In Patagonia

By Christian Haag,
Mariscope Meerestechnik

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Several years ago I found myself on a tourist boat that carries out whale watching tours in Península de Valdés, Patagonia, Argentina. This location became famous over the last 30 years, due to the massive yearly encounter of the southern right whales (Eubalena australis) during their mating and birth period from May to December. The southern right whale got its name due to the friendly behavior and the fact that they float when the animal is dead. This was the 'right' whale to chase.

In the northern hemisphere, their cousins the northern right whales (Eubalena glacialis) have been nearly extinguished. With a current estimated population of 300 – 500 animals remaining, it appears that there are too few for a marine mammal population to recover.

The southern right whale had a bit more luck, and several thousands remained alive (the actual estimate today is around 7,000 animals).

As many as 1000 to 1500 of these friendly giants visit the coasts of Peninsula de Valdés each year. Until the early 70s this event was known only by the local fishermen. Dr. Roger Payne and Dr. Bernd Würsig are reportedly the first researchers to realize the incredible potential this areas offers to the research on whales and marine mammals. Not only whales live in these waters, also dolphins, orcas, sea lions, sea elephants and an incredible number of birds are present part of the year or living permanently along these amazing coasts.

It was not until the early 80's that the first visitors came here to join a very archaic kind of whale watching. Some local divers used their small boats and took few enthusiastic 'Indiana Jones'-type passengers to see the whales. An increasing interest by local, national and finally international tourists was the responsible for a growing whale watching activity, culminating in Unesco's declaration of world heritage in 1999. Argentina declared this species the first natural monument of the country in 1984.

During the last decade, the laws and ordinances for the activity of whale watching has been increased and only six companies are allowed to navigate with the whales, in a strictly controlled and professional manner.

Tourist Onboard

And there I was, sitting in one of these boats as a tourist together with my wife Cristina and our two sons Emilio and Enrique. As a physical oceanographer I had been involved in the research of dolphin's communication in the late 80's and early 90's. Still a student at that time, I already carried out my

Every year up to 1500 southern right whales (Eubalena australis) cavort in the waters off of Península de Valdés, Patagonia, Argentina to mate and give birth. Anything put in the water to view the whales is tightly controlled by the government.

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own projects in southern Spain and Italy, with a bunch of fellows, enthusiastic of interdisciplinary research (not really in vogue at that time). Since several projects I submitted to the European community were rejected with the simple judgment of 'interesting but not fundable,' I decided to create my own company and to build the equipment I thought I needed for my research. With this idea in mind, Mariscope Meerestechnik in Germany was born.

The guide took us a couple of miles away from the location of Puerto Pirámides and along the trip we saw Whale spouts, some fins and tails and far away a whale jumping. The excitement was high, but our guide told us that this was just the beginning.

What we saw a couple of minutes later is impossible to describe. Even after several hundreds of hours working with these animals it still is impossible to describe the feeling when the boat stops, and a 15-16 m, 30-40 ton whale of approaches the boat gently, ever mindful of the strange animals above screaming and shouting. More than that it is incredible to watch the giant observe the diver underwater, at a distance of less than 1 meter with its eye, as big as plate.

The diver is never the one who observes, it is always the whale observing the diver.

After the first tour a second followed, and my drive as a researcher led to some small talk with the guide. I was sure that since the early years of Dr. Payne and Dr. Würsig, the knowledge on the habits and behavior had increased enormously and that the ongoing research was carried out under the highest standards. The knowledge has been increased in fact, but ongoing researchwas under-financed and at a low level. I reasoned that "surely hundreds of hours of observations with ROVs have been carried out," but was surprised to find, according to the guide of 20 years, Claudio Nicolini, that the use of ROVs to make study of the whales had never been conducted.

As ROV manufacturer and scientist this was exactly the information I needed to take an immediate decision: to do it.

Two months later we were again on site but this time with ROV. But with the technology arrived bureaucracy too; and our initial request to put something in the water was immediately rejected.

Another hurdle was transport to the whales, as the limited number of carriers was focused on taking tourists – 50 to 70 per trip – and making money, so bringing an ROV into the water was not as commercially viable.

But then we were led to PININO.

While tourists ... or as the author describes from the whale's perspective ... "*the strange animals screaming and shouting above*" ... came in droves to watch this migration, intensive study of the whales and their feeding and mating habits was lacking.

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100 YEARS OF ACCELERATING TOMORROW

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Ricardo Orri, better known as Capitán Pinino, was instrumental in getting ROVs in the water with the whales, saying:
"Che Mariscope, let's do it. You bring your stuff and I will care for the logistics."

"He is the owner of Whales Argentina, you will recognize him immediately because he is really an old sea bear," we were told.

But this marked the start of an ongoing research work and amazing friendship with Ricardo Orri, better known as Capitán Pinino. Capitán Pinino has six companies that take tourists out to see the whales, but he also is involved in several scientific projects – most under funded.

So, we found ourselves at Whales Argentina and Pinino said 'Che Mariscope, let's do it. You bring your stuff and I will care for the logistics.'

A few months later we started to carry out the first trials with ROVs near the whales. First, we needed to know how these animals react to a machine, particularly the noise being made underwater and the closer proximity than a diver normally takes. The result was astonishing, as there was no change in the behavior. We were able to approach the animals without any problem most of the times. On occasion, the whales came to see the ROV, as they do with the tourist boats. On many occasions, they simply ignored the vehicle, allowing us to observe and document their behavior.

And then, one day, was our absolute highlight: We saw to tails rising nearly simultaneously out of the water, and the ROV operation was immediately initiated. A few minutes later we were looking at the mating of two right whales under water and were able to record the complete scene with perfect details. The distance between the ROV and the whales was just a few centimeters, but the whales kept going on with their business without any sign of interference with the machine.

From the first experiments we have modified the ROVs to get better research results. Now we are trying to record the feeding behavior of the whales at a depth of around 100 m. This is a difficult task, since the ROV has to dive nearly as fast as the whales do. The first results are encouraging. Additionally, we are carrying out research using actual satellite images analyzed by my wife Cristina, a PhD in Satellite Oceanography. Combining Oceanographic direct measurements, Satellite images and ROV observations, we are getting astonishing information, impossible to collect without the most advanced technologies in each of these scientific areas.

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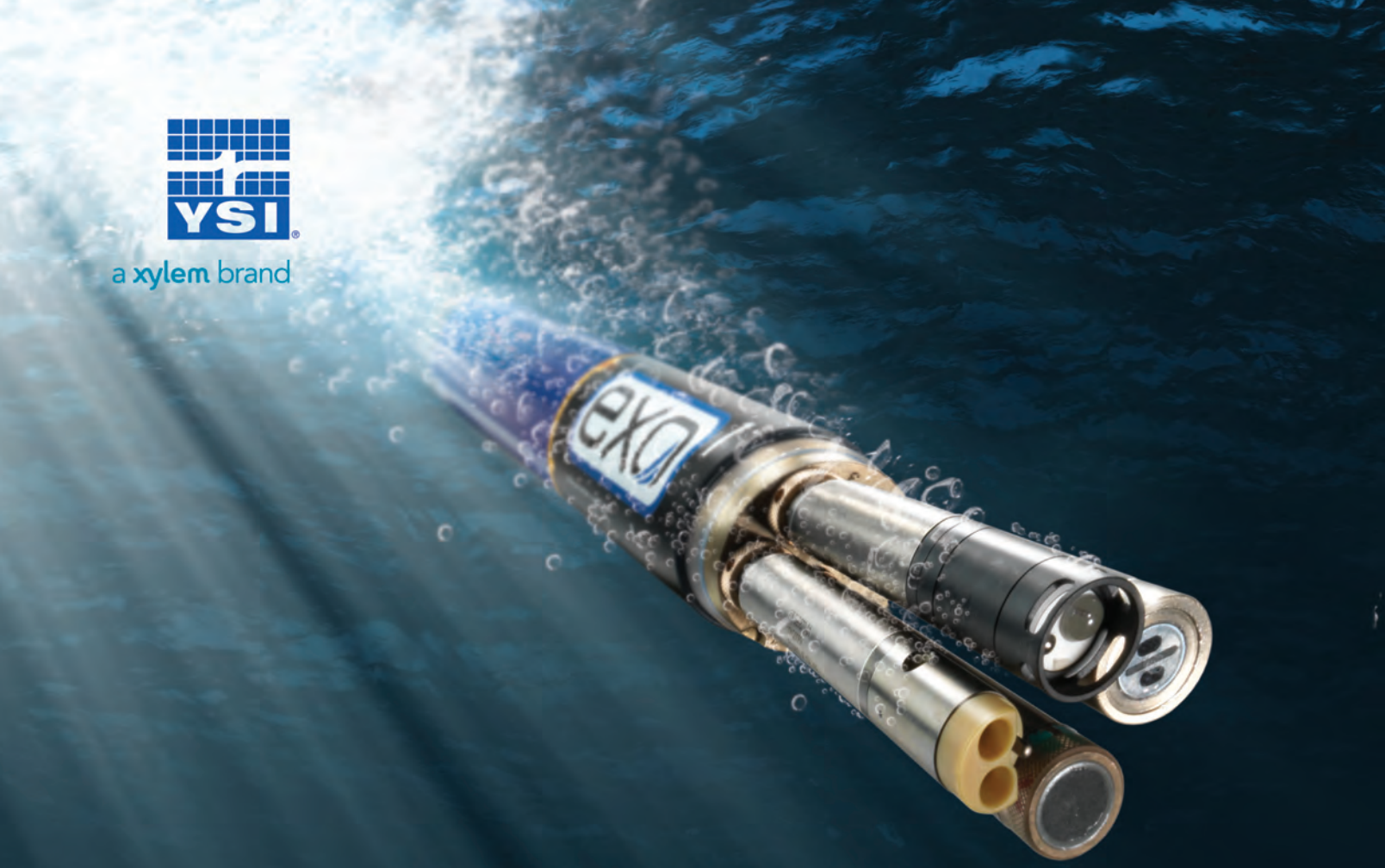

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Jim Davis, Teledyne Technologies

Teledyne Technologies has emerged as one of the pre-eminent global forces in the subsea sector, growing both organically and through acquisition to build a formidable corporation. The growth has been dramatic and rapid, with revenue generated from the marine sector growing better than ten-fold between 2004 and 2011, and is indicative of the subsea sectors trending towards fewer, larger companies. To gain insight on the company's past and future, Marine Technology Reporter recently spent some time with Jim Davis, SVP, Teledyne Technologies, for his take on the company and its future.

By Greg Trauthwein, Editor

Please tell us a bit about yourself and your position at Teledyne.

My name is Jim Davis, I am a Senior Vice President at Teledyne Technologies and I joined Teledyne ten years ago. I am the general manager of Teledyne's Instrumentation Segment. Under this segment we run several strategic business platforms. We also go to market under various brands, with one of the broadest being Teledyne Marine which currently consists of eleven business units.

The subsea industry has watched Teledyne quickly emerge as a technology consolidator. Can you give insights on the thought process behind the acquisition binge?

Prior to 2001, Teledyne's Instrumentation Segment

"Back in 2004, offshore marine represented just under 4% of total sales. In 2011, our marine businesses accounted for 19% of Teledyne's total revenues."

Jim Davis, SVP, Teledyne Technologies

consisted of three companies in the industrial process control space, one company involved with specialty interconnect devices and one in the seismic exploration domain. Beginning in 2001, we began acquiring environmental instrumentation companies, first in the area of air quality followed by assets serving the water quality markets. So, from environmental water quality entities we naturally gravitated toward acquiring marine instrumentation companies. In 2004 we only had one marine business with year-end revenues of $30M. By 2011 our marine sales had advanced to $373M. So, in just seven years we grew our marine activity more than twelvefold via targeted acquisitions and internal growth.

Roughly what % of Teledyne's overall business comes from the subsea/offshore/marine side of the business?

Back in 2004, offshore marine represented just under 4% of total sales. In 2011, our marine businesses accounted for 19% of Teledyne's total revenues.

Can you share with our readers the Teledyne philosophy behind the acquisitions?

Logically, we target acquisitions that are highly complementary, accretive to earnings-per-share, possess leading technology, market position and brand, who have demonstrated a growth path and who are led by a strong, dedicated management team. And, to further emphasize, we will not consummate a deal if the company's management team isn't prepared to remain at its helm. Every acquired company is encouraged to retain, nurture, privilege and continue to practice the innovative culture that attracted them to us in the first place. However, being a publicly traded company, we do impose a more frequent and timely financial reporting discipline as well as a corporate-wide set of operational excellence metrics. We extract the best practices and best-of-breed methodologies amongst our companies and share them across our segment. The integration process begins with financial controls, after which it is customized for each acquisition based on risk exposures, priorities, and/or business needs. We don't toss a rigid integration playbook at the feet of an acquired company. Early on we conduct a strategic technology roadmapping study of the business to hone and prioritize R&D investments in order to maximize benefit and impact. We also utilize experienced corporate and segment level functional experts to assist and remain on call during the integration phase.

What do you count as the biggest advantage to integrating multiple brands under the Teledyne corporate banner?

Clearly, the biggest advantage of associating and linking the Teledyne corporate name with the individual company names under a Teledyne Marine brand is the ability to directly connect with Teledyne's global commercial reputation, provide greater comfort and confidence to each acquired company's customer base, convey greater market strength, stronger business dependability and confidence, reduced business risk and uncertainty, superior critical mass and proven corporate resources to deliver on the most challenging of programs.

What do you count as the biggest challenge to integrating multiple brands under the Teledyne corporate banner?

There are really no significant challenges. However, because our acquisitions are highly complementary, sister companies want to immediately engage acquired companies with excellent ideas of integrating each other's technologies into exciting, novel systems-level solutions or into new or existing platforms. So, the minor challenge becomes one of choosing whose individual brand goes on the integrated solution or do the businesses defer to the umbrella brand of Teledyne Marine.

What areas, by technology type or niche, do you feel are most ripe today for consolidation and why?

Several areas come to mind, especially were a case for a broader offering of related products or services can be made. Marine sensors, whether physical,

Over 100 years ago, when Captain Bob Bartlett was heralded as the only person capable of delivering Robert Peary to the North Pole, no one in Newfoundland and Labrador was surprised... after all, at the time, he already had **over 400 years of ocean technology experience** to draw from.

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chemical, biological or biogeochemical provide an interesting opportunity, especially given that simultaneous, real-time, multiparameter measurements are of high interest. Mobile underwater platforms such as unmanned submersibles, both tethered and autonomous. Multibeam sonar solutions for underwater imaging, scanning, bathymetry, navigation and water column measurements. Software suites for the various multibeam data synchronization, filtering, geo referencing, calibration, processing and display applications.

How has the global economic slowdown affected your business?

To the degree that any global economic slowdown reduces government spending, then our government non-defense and oceanographic research markets are affected. Offshore oil and gas is less susceptible to economic cycles because of the magnitude, necessity, inertia and momentum of the subsea hydrocarbon exploitation process. Granted, projects may slide to the right but typically are not cancelled unless an unexpected, initially uncontainable calamity occurs in a highly regulated region of our oceans.

How is Teledyne investing in its products and/or people today?

Clearly, in order to grow market share a going concern must invest judiciously. Teledyne invests in new companies with great technologies and people. We invest in R&D to deliver superior solutions. We invest in advanced manufacturing capabilities to deliver reliable and robust products on time. We invest in intellectual property and protect it. We invest in our people with on and off the job educational opportunities and we invest to assure they all work in a safe environment. And, of course, we invest in margin enhancement initiatives that benefit our shareholders.

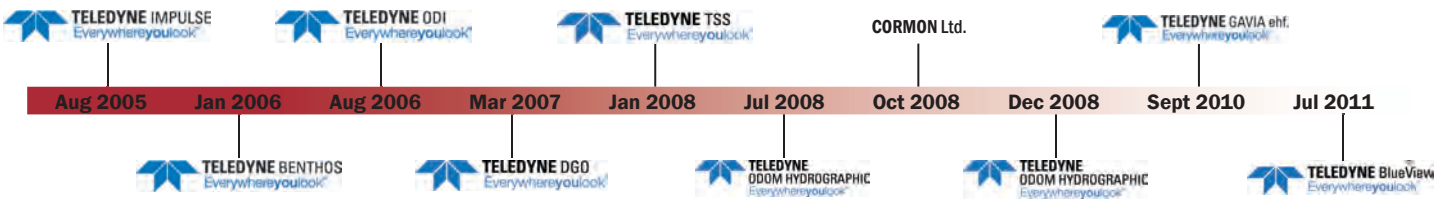
What markets, (by market niche and/or geographic region), do you see as the best bet for expansion in the coming 12 to 24 months, and why.

Personally, I see four themes that offer potential near term expansion. I would categorize them as commercial activity focused on marine surveying, networking of ocean-based sensor arrays, autonomous underwater vehicles, and offshore oil and gas.

Marine surveying is being driven by maritime traffic in general, new trade routes across water bodies previously inaccessible due to ice caps, larger displacement vessels, new port and canal construction in developing countries, harbor expansions, port security imperatives, offshore renewable energy projects, increased subsea hydrocarbon exploitation, ocean climate studies, deployment and replacement of seabed pipeline and telecommunication networks, increased dependence on aquaculture, seabed remediation and ocean resources management. In my view, marine surveying is quite expansive and includes hydrographic, metocean, geophysical, geotechnical, seismic, water column and underwater object classification surveys at the very least. New and novel marine surveying targets and techniques are multiplying. For example, mapping of subsea gas and sediment plumes is now in demand.

Increased numbers of fixed and mobile sensor arrays are populating larger regions of the ocean. To be more effective, these sensing nodes and arrays need to be networked. Moreover, additional value can be garnered by interrogating sensors and performing data exfiltration via acoustic communications.

Even though military budgets are being cut, spending on robots and autonomous and unmanned aerial, terrestrial, water surface and underwater defense systems is increasing. Protection of littoral waters is a naval priority. Autonomous underwater vehicles are replacing expensive manned surface vessels in certain types of hydrographic surveys. And, as subsea oil and



gas infrastructure gets denser and more complex, AUVs will be favored. AUVs are also seeing increased utilization as mobile nodes in subsea sensor networks.

Offshore oil and gas is driving marine technology activity. Deeper projects create challenges that call for new solutions as top side hydrocarbon processing applications are transferred down to the seabed. Coincident with this trend of denser subsea production infrastructure is the requirement for longer offsets in terms of umbilicals, pipelines, hydraulic lines and cables for power, signal and data transmission. Deploying and assuring the operational integrity of the entire subsea oil and gas installation offers a rich setting for marine technology application and adaptation advances.

From a government/legislative perspective, are there any matters on the horizon which could specifically spell trouble or opportunity for this sector? Please be specific.

If federal or local governments reduce oceanographic research funding on scientific pursuits at agencies, foundations, universities or other governmental knowledge-seeking institutions, then the marine sector would be affected to some degree. If governments legislate new rules, say, on any portion of the offshore energy generation spectrum, then delayed exploitation of the resource might be initially negative; however, if the new rules impose new technology requirements for safety, detection, monitoring, reporting, etc., then perhaps the new materials, products and services would prove overall positive to the industry and related sectors.

Technology for Marine Environmental Data Managementgies

By Martin Dyer, Thomson Unicomarine

Marine environmental survey data is an essential part of Environmental Impact Assessments. The surveys involve taking quantitative samples from the seabed and analysing them in the laboratory. The samples are analysed for chemistry, particle size structure and biology in order to determine and monitor the environment pre- and post-construction.

How Can Technology Help?

Some elements of chemical analysis are automated using methods such as Gas Liquid Chromatography. Sediment (particle size analysis) is partially automated using laser diffraction devices. However, much of the biological analysis cannot be automated and requires skilled manual extraction and identification of the fauna in the samples. As this part of the process is so labor intensive, it is important to automate the other parts. This saves time and reduces the chances of error when dealing with large volumes of complex data. Specialist marine environmental software, such as Unicorn, is available for this purpose. Unicorn is a unique marine software database system that is widely used by the scientific community, including the UK's CEFAS and Environment Agency. Its benefits are numerous.

Sample Tracking

It is fundamental that surveys at sea deliver the data they were designed to capture. Inaccuracies and gaps in data as a result of compromised labels, poor survey design and/or incomplete data capture, can lead to surveys needing to be repeated. The risk and significant associated costs of repeat surveys can be avoided by 'getting it right first time.'

Unicorn helps to avoid errors with its practical functions for survey planning, production of secure labels for sample collection and computerized, on-board digital data capture.

Once entered onto the system, samples can then be tracked at each stage of processing through to analysis and reporting. Details of analysts and checking personnel can also be incorporated, providing quality control measures entirely compatible with ISO 9001 requirements.

Comprehensive Data Capture

Unicorn is designed by marine biologists with a deep knowledge of taxonomy, the marine environment and the ecological data needs of the regulatory authorities. The software records survey and sampling information, species information, positions, sediment particle size data and photographic images, along with a host of other valuable data. It also has a GIS mapping system for plotting distributions of species, samples and surveys. A future version (in development) will allow the storage and analysis of underwater video.

Data Integrity

At the core of Unicorn is a species list of over 6000 species. The list is maintained by taxonomic specialists at Thomson Unicomarine and updates are issued regularly to Unicorn users. When data is entered, the system checks the species names automatically and this prevents inconsistencies that would otherwise lead to data inaccuracies in multiple data sets from a number of surveys. Large and complex sets of data can be collated and evaluated accurately, delivering unequivocal results for client reports and planning applications.

Analyses and Reporting

Complex investigations can be undertaken by using Unicorn to combining matrices from several surveys. This precludes the need to build and link spreadsheets, prevents errors and saves a great deal of time. The data can then be exported as

Excel files or data analysis packages for multivariate analysis.

International Standardization

The underlying taxon master list used by Unicorn is cross-referenced with the international lists maintained by the World Register of Marine Species (WoRMS) to ensure international and national standardization.

Security and Flexibility of Data

Many projects continue for some years and have multiple possible future uses not originally envisaged. It is therefore important to have both security and flexibility of data. By storing the data in a secure database it can be used for later aspects of the consent, such as a requirement for long-term monitoring, comparison with later surveys or the resolution of discrepancies and questions.

An Example of Where Unicorn has Saved Time

During two Public Inquiries into developments at the UK ports of Harwich and Felixstowe, Thomson Unicomarine acted as Expert Witness for the developers.

Thomson had undertaken many surveys for the port authority, including monitoring the effect of dredging and disposal, foreshore recharging and fish populations in the estuaries. Over several years the company had produced more than 70 detailed reports. The data were all stored on Unicorn. When the Public Inquiries required detailed evidence of marine life in the area, it was therefore a relatively simple task to supply the data they required in a suitable format. The accuracy and detail of the data supplied backed up by Thomson Unicomarine's expert status, helped both developments to gain approval.

Why Can't Biologists Use Machines to Speed up Analysis of Biological Samples?

For biological analysis, sea bed samples need to be sieved and the fauna extracted from the sediment. Occasionally larger animals such as crabs and starfish are found, but mostly the animals are small; sieves of either 1mm or 0.5mm are usually specified. A grab sample of 0.1 sq. m. can contain up to several thousand individual animals. For samples with very large numbers of individuals, sub-sampling techniques are used, but extraction of the animals from the sediment still involves picking them out under microscopes. There is currently no reliable mechanized way of doing this because each sample is so varied.

The extracted fauna and flora then need to be identified and it is the identification of the fauna that takes so much time. DNA sequencing is not an option at present. The reference collection at Thomson Unicomarine contains over 6000 species and few, if any, have been DNA sequenced. Future technology may enable DNA sequencing to be used for sample analysis, but the species would still have to be identified initially by an experienced biologist. Subsequent sequencing and mechanisation of the sample analysis process would present further challenges for future technology. There can be as many as 50 species in each 0.1 sq. m. sample and several thousand individuals of many shapes and sizes. In practice, skilled biologists will be required to analyze samples for the foreseeable future.

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Deep Water Developments and Increased Confidence Driving Growth in Subsea Vessel Operations

By Joseph Corrigan

*The new second edition of **The World Subsea Vessel Operations Market Forecast 2012-2016** analyzes the main factors that are driving demand for ROVSV, DSV, Flexlay, LWIV and Pipelay Vessels and provides supporting information analysing each key sector. The report builds on the success of the first edition to include a comprehensive supply-side competitive landscape with major players and their fleets, segmented by vessel type, day-rate analysis and geographic focus.*

Market Summary

DW forecast that approximately $77b will be spent on subsea vessel operations in field development, inspection, repair & maintenance (IRM) and subsea well intervention between 2012 and 2016,. This is an increase of 63% over the preceding five-year period. Global vessel demand for these markets is expected to increase 33% on the previous five-years.

Global vessel expenditure grew from $8.7b in 2007 to over $10b in 2009 before dipping in 2010. During this period vessel contractors were largely insulated from the financial crisis that strongly impacted some other sectors and were able to work off their backlog.

Subsea Vessel Operations

The report considers three main areas of activity; Field Development, IRM and Subsea Well Intervention.

Subsea infrastructure and equipment is installed by vessels with specialist capabilities. Subsea wells and infrastructure require regular inspection, repair and maintenance (IRM) and intervention services to ensure production rates remain high. Subsea tasks and services often involve complex and challenging engineering in difficult conditions which is why the costs associated with subsea developments can be far higher than platform-based developments.

Field Development: *Tasks carried out by vessels which can lift and install offshore and subsea infrastructure for new developments or connect additional subsea equipment to an existing production facility.*

The field development market is expected to see strong growth from 2012 onwards with vessel day demand totalling an estimated 149,413 days with $4.2b of expenditure over the forecast period.

The sector suffered a decrease in activity of 5% between 2008 and 2010, a drop in 2,586 vessel days, as operators stalled projects due to the economic crisis. 2012 will mark the first year of growth after this period as confidence returns to the market and operators drive delayed projects into the installation phase.

Africa and Latin America will exhibit strong demand for field development and construction vessels and will become the most significant regions, requiring approximately 10,000 and 7,000 vessel days respectively by 2016. The development of Brazil's pre-salt basins will be the dominant driver for this.

Future demand will be driven by developments in deeper waters. Oil majors have an urgent requirement to renew reserves to keep up with growing global demand for oil and gas and the largest prospects lie in deep water.

Between 2012 and 2016 the number of vessel days associated with deep water developments is set to more than double with an estimated 26,223 required by 2016.

IRM: *Tasks carried out on offshore infrastructure below the water line in order to maintain production and ensure suitable HSE standards are met.*

Total demand for IRM vessel activity grew by 19% between 2007 and 2011 and expenditure reached $4.5b in 2011 which represents nearly 27,929 vessel days. This continuing upward trend is being driven by the growing installed infrastructure base and is forecast to be worth $7.5b by 2016, a 53% growth on 2012.

North America is the most dominant region for IRM activity due to the mature nature of the region and the sheer volume of infrastructure in place. Over the forecast period the region will require 25% of all IRM activity and have estimated expenditure of $7.5b. This is impacted by the Deepwater Horizon accident, which has placed greater focus on regulators to ensure infrastructure is inspected at more frequent intervals.

Subsea well intervention: *is an umbrella term for a number of distinct tasks which are designed maintain structural integrity of wells or increase production.*

The use of intervention vessels will grow due to substantial cost savings over using rigs. From 2012 onwards the demand for riserless and rigless intervention vessels will increase dramatically by 77% to 5,443 days by 2016.

The vessel demand forecast over the period 2012-2016 is expected to total an estimated 23,046 days – an increase of

132% compared to the previous five year period. This demand growth is driven by the realisation, by the major market players, of the large cost savings possible through the use of intervention vessels and the subsequent increased adoption of this reasonably new technology.

Subsea Vessel Supply

The last five years have seen an unprecedented increase in the number of newbuilds entering the subsea vessel market. Between 2006 and 2012, 169 vessels joined the fleet, increasing capacity by 60% from 277 to 446.

Cyclicality has always been an inherent characteristic of this market (similar to most offshore oil & gas sectors). The recent cycle has dwarfed all historic newbuild booms and as a result of the slackening of demand due to the economic downturn and saturation of the market we are now in a period of oversupply.

Vessel Contractor Competition:

The market for vessel contractors operating in field development, IRM and subsea intervention is highly fragmented. DW has identified 446 vessels from 83 different contractors. Whilst there has been some consolidation in the industry with the Subsea7/Acergy merger, the vessel market is comprised of a significant number of international vessel contractors and smaller regional players. The industry possesses high barriers to entry. New competitors face the challenges of the complex nature of project execution involved in offshore developments, the requirement for highly skilled employees and limited access to cheap newbuild financing options. Additionally, operators tend to favour companies that have a proven track record and the experience of completing high cost projects.

Market Forecast

DW forecast strong growth over the next five years with annual subsea vessel operations expenditure set to rise from $11.3bn in 2012 to $20.3bn by 2016. This growth is a result of confidence returning to the subsea industry, a move towards deep water in underdeveloped regions and ultra deep in some already developed, and the subsequent increased demand for higher specification vessels over increased operational timescales.

By 2016, there will be a move towards more complex deepwater projects being sanctioned and this should benefit the vessel contractors with deepwater capability and engineering experience. Deepwater awards will suit contractors with modern vessel fleets, strong project execution skills and a strong track record in delivering such projects.

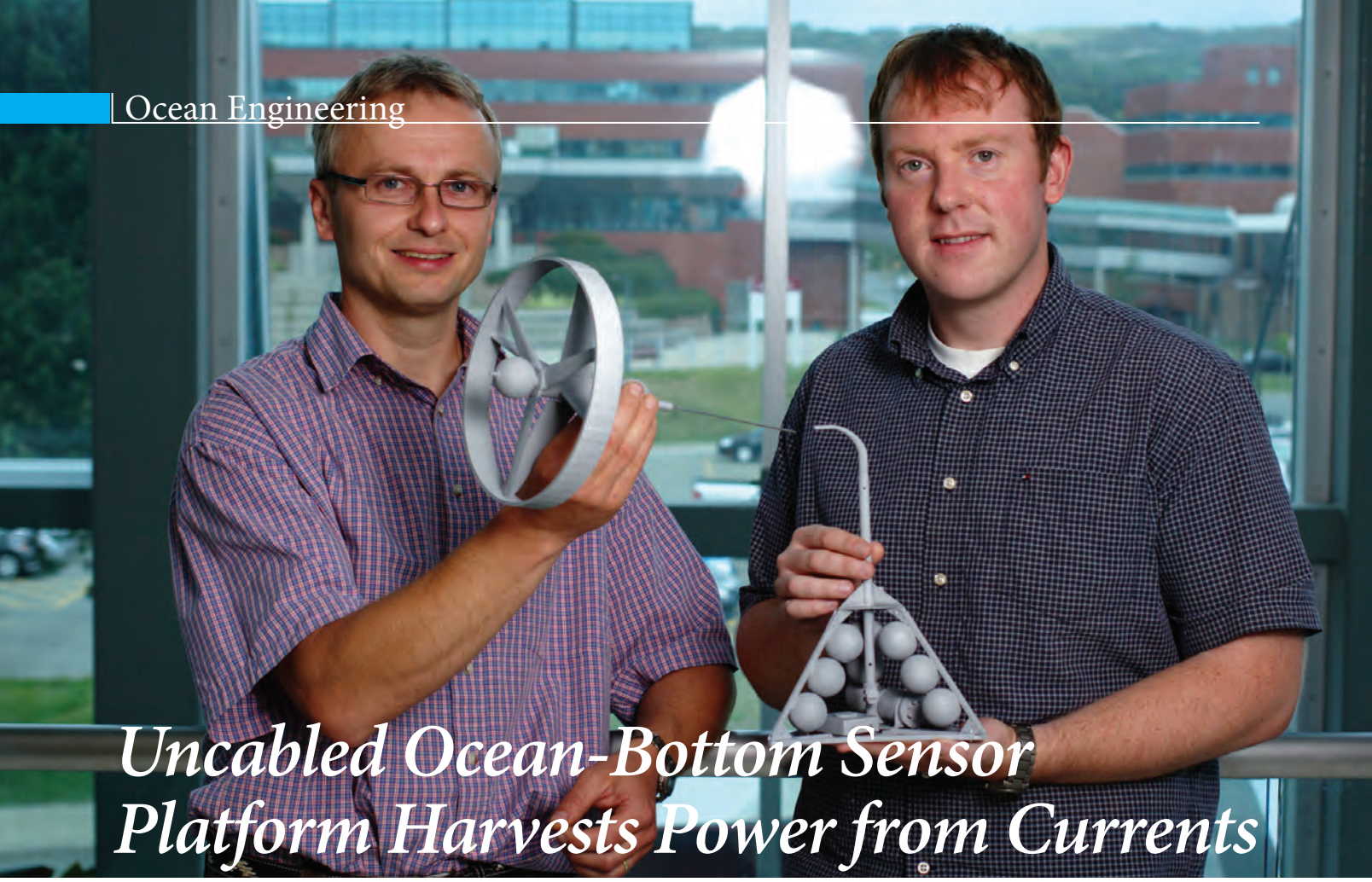
Conclusions

The offshore industry has been a major contributor to global energy supply for a number of decades, however, the nature of this business has evolved dramatically over the past ten years with deepwater accounting for 24% of activity in 2011 compared to 6% in 2000. This trend has driven an evolution in the types of vessels required by the industry to support offshore field developments with cranes, deck spaces & dynamic positioning systems incresing in size, complexity and efficiency.

Over the next decade we expect to see deepwater activity to continue to account for an increasing share of demand for subsea vessels, however, a more imposing trend could be the ever expanding role that is to be played by natural gas in the offshore sector. With number of high profile long distance tie-back projects already at the EPC stage and global demand for LNG expected to increase by 54% by 2020 demand for SURF related vessels to install the hundreds of kilometres of flowlines and umbilicals is expected to reach all-time highs by 2016 at an estimated 17,346 vessel days. One other consideration is the impact of the growing FLNG industry on this outlook and the potential for these floating liquefaction terminals to bypass the need for long distance tiebacks in some instances and maybe reverse the km of flowline to subsea tree correlation that has characterized this sector for the past ten years.

About the Author

Joseph Corrigan sits within Douglas-Westwood's Research team where his principal activities include quantitative analytics and macro-economic analysis, competitive analysis and supply chain mapping.



Uncabled Ocean-Bottom Sensor Platform Harvests Power from Currents

By Andrew Safer

A novel seafloor instrumentation platform developed at Memorial University of Newfoundland in St. John's generates its own power and features an uncabled system that includes a fibre-optic seismometer and an acoustic network of sensors. Dr. Vlastimil Masek, Principal Investigator of the $3.23 million SEAformatics project, points out that "in the local environment where iceberg scouring is possible, it's too costly to build cabled infrastructure for ocean observation." To provide for power and communications, they developed a device that harvests energy from seabed currents, which powers autonomous units (pods) that relay sensor data to the surface via an acoustic network. To date, the system's components have been tested in the Flume Tank at the Marine Institute.

Led by Dr. Masek of the Faculty of Engineering and Applied Science at Memorial University of Newfoundland, the SEAformatics Group includes university researchers from the Faculties of Engineering and Applied Science at Memorial University and from the Faculty of Engineering at Dalhousie University, 19 graduate students, four full-time engineering staff, and two post-doctoral fellows.

A custom-designed horizontal axis turbine generates energy from ocean bottom currents. The system requires a minimum current flow of .1 meters per second. The flexible tether on the turbine allows it to operate when current flows in any direction. "It's like a palm tree in the breeze," observes Project Manager Andrew Cook. The turbine, with 1.5 meter blades, operates at 41 per cent efficiency. When tested in the Flume Tank in up to .6 meters-per-second current, the turbine generated 20 watts. The basic system—excluding the power requirements of sensors and data transmission—uses .75 to 1 watt. When transmitting data, the system uses approximately 8 watts. The seismometer uses 3 to 5 watts. A three-phase AC generator rotated by the turbine converts the power to DC, which feeds a lithium-iron phosphate battery and power management system which monitors the battery's state of charge. The battery also powers the sensors on all of the pods. The battery pack, which is sized to usage requirements, holds its charge through the low-current periods, and is recharged when the current exceeds .1 meters per second. To date, the project team has proven the principle of the power generation system in the lab environment. Genesis Group, the technology transfer office of Memorial University, has filed patent applications for the power-generating unit.

After visiting trade shows over the past four years, Cook, an electrical engineer, reports that most power generation systems have been developed for high-speed flows, such as tidal and river. "So far," he says," nobody has come along that is

doing the same thing"—that is, building a low-power, small-scale system.

SEAformatics' prototype system was developed to operate at a depth of up to 100 meters. The original specification allowed for a maximum of 100 pods in the system, with modems communicating over 2 kilometers.

The fiber-optic seismometer is the other component for which Genesis is applying for patent protection. The key differentiator from other seismometers is that the SEAformatics unit uses a single seismic mass on all three axes and all measurements are made on the single mass. "Geoscientists will like the fact that the mass is co-located," says Cook. He adds that the ocean bottom seismometer has three units in each package, each one sensing the x, y, and z axes. "Vibration in one axis doesn't cause sensing in another axis," he adds. Because of its single-proof mass, he says, the SEAformatics seismometer's cross-sensitivity is very low. Dr. Masek compares it to a geophone system that produces interference when it is oriented in the x direction, for example, and shaken or moved in the y direction. He notes that the seismometer could be used in the presence of nuclear radiation, as it would not provide any electromagnetic interference. The project team machined the seismometer components at micron scale in a micro-mechatronic laboratory they built. In lab tests, the seismometer provides a signal that is correlated to acceleration or shaking. The project team has proven the principle and is currently engaged in the testing phase. Performance has yet to be quantified.

Whereas acoustics relay information to the surface, communication to the rig or shore would take place via satellite or radio frequency. The system utilizes modem hardware from DSPComm in Australia, and supports networking algorithms built by the SEAformatics team.

Originally designed to house seismometers, the sensor pods have since been reconfigured to accommodate a wide range of sensors including:

a. current (Acoustic Doppler Current Profiler, conductivity/temperature/depth, dissolved oxygen, turbidity),

b. spill detection (fluorometers, methane sensors, and subsea mass spectrometer); and

c. surveillance (hydrophones, upward-looking sonars, active and passive detection systems).

The platform base can be redesigned to accommodate other applications.

Seismic exploration for oil and gas is a key application for the seismometer, reports Cook. The system would be deployed on the ocean bottom, with seismometers spaced approximately every 200 meters. Cook says the economics would compare favorably to deploying a cabled system and the advantage over other non-cabled solutions is the system's ability to send back data in near real time.

Another application is well depletion monitoring. Instead of re-surveying the

area of the well, the system could be used to passively measure the earth's response to oil extraction. "As you pull oil out," explains Cook, "it causes microquakes—vibrations." Measuring that over time would help in determining how much oil has been removed. The data could be accessed in real time, compared to the standard approach of recovering it every six months or so. Other applications include environmental field pollution monitoring, pipeline monitoring, spill detection, ice surveillance, port security, and coastline protection.

Project funding has been provided by the Atlantic Canada Opportunities Agency, Canadian Foundation for Innovation, National Sciences and Engineering Research Council, Government of Newfoundland and Labrador's Industrial Research and Innovation Fund, and Memorial University.

An ocean test at the Holyrood Marine Base is planned for September. The current five-year project has been extended to December 2012. The SEAformatics team is in discussions with an oil company regarding a two-year project which would include a 12-month large-scale field trial on the Grand Banks. Genesis Group is managing the intellectual property and commercialization of the SEAformatics system.

The Latest in Seismic Vessel Design from Polarcus

Photo credit Ulstein Group / Vasco Pinhol

By Henrik Segercrantz

The marine geophysical company Polarcus Limited received its eighth 3D seismic vessel on 21 June 2012 when Polarcus Adira was delivered at Ulstein Verft in Norway. The vessel is the second of two 12-14 streamer Arctic 3D seismic vessels built at the yard, and is the eighth vessel in the Polarcus fleet of the Ulstein SX134 design, characterized by the sleek Ulstein X-bow hull design the shipbuilder has become known for. The sistership Polarcus Amani was delivered by the yard at the end of March. Earlier vessels were built under license by Drydocks World Dubai LLC.. They include Polarcus Nadia (2009), and Polarcus Naila (2010), 12 streamer vessels of type SX124, Polarcus Asima (2010) and Polarcus Alima (2011), 12 streamer vessels of type SX134, Polarcus Samur (2011) and the Russian flag vessel Vyacheslav Tikhonov (2011), 8 streamer vessels of type SX133. The other vessels carry Bahamas flag. All vessels are designed by Ulstein Design and Solutions AS. Following a short shakedown Polarcus Adira will commence operations on charter for TGS-NOPEC Geophysical Company ASA (TGS).

Polarcus Limited, registered on the Oslo Stock Exchange, operates a fleet of high performance 3D/4D seismic vessels. Polarcus offers contract seismic surveys and multi-client projects worldwide and employs over 500 professionals. The company's principal office is in Dubai, United Arab Emirates.

Main vessel data

The hull of Polarcus Adira and Polarcus Amani were built at Kerch Shipyard Zaliv in Ukraine. As is the custom for the ships built by Ulstein Verft shipyard in Ulsteinvik. This was the seventh hull built at the yard.

The vessels are equipped with streamer winches, towing points and gun winches. The X-bow hull line design, combined with a redundant diesel-electric propulsion system, ensures good performance with regard to speed and fuel consumption.

The overall length of Polarcus Adira, yard number 293, is 92m and the breadth is 21m, which is identical to those of sister vessel Polarcus Amani. Depth to main deck is 9.0 m, design draught is 6.5m and maximum draught 7.5 m.

The deadweight at maximum draught is 4,472dwt. Gross tonnage is 7709GT and net tonnage 2313NT.

The hydrodynamic efficiency of the X-BOW, result in good sea-keeping abilities, it also provides a safe and comfortable workplace for the crew both during transit and seismic surveys, as it eliminates slamming. The soft entry in waves also reduces spray and eliminates icing.

The vessel is equipped with a helideck (D-value 22.2 m, 12t, UK-CAA CAP-437 suitable for Sikorsky S-61N / S-92) for added safety and to ensure an efficient crew change, and is built according to IMO code of safety for Special Purpose Ships (SPS), enabling it to operate worldwide. The vessel has two workboats, by Westplast, and a Norsafe MOB boat onboard and six life rafts each for 35 persons with dedicated davit.

Machinery

The vessel has diesel-electric propulsion. The main propulsion system comprises two Wärtsilä 9L26

main diesel generators, each 2920ekW at 1000rpm, plus four Wärtsilä 9L20 1710ekW diesel generators, at 1000rpm. The generators are supplied by ABB. The total power is 12,680ekW. There are two propellers of controllable pitch type in nozzles,

the shaft line of each driven by two variable speed electric motors through twin in-single out reduction gears type Scana Propulsion ACGTS 1000.

All diesel engines have selective catalyst reactor (SCR) units, supplied by H+H Umwelt, to reduce NOx emissions. NO2 emissions are reduced by some 90% to 98%, soot by 20% to 30% and hydrocarbon emissions by 80% to 90%. There are two ABB electric propulsion motors in parallel configuration on each side, each motor 0-2200ekW, 0-1000rpm. The two controllable pitch propellers in nozzles, supplied by Scana Propulsion, each absorb 4400kW at 160rpm and have a diameter of 3700mm. There is an Caterpillar emergency generator with a power of 240ekW.

The vessel runs on marine gas oil (MGO) with low sulphur content. The Fuel oil (MDO) capacity is 2030 cu.m. and fresh water capacity 1032 cu.m.. The vessel can also carry ballast water/tech. fresh water 2170 cu.m., lube oil 63 cu.m., and urea for the catalysts reactors 289 cu.m.

Towing pull in seismic operation is 82t. Bollard pull exceeds 125t. Polarcus Adira has a maximum speed of 17 knots, at 5.5m draft.

There is one 1200kW tunnel thruster forward equipped with a controllable pitch propeller and one 850 kW retractable azimuth thruster forward. There is one tunnel thruster aft, 830 kW, controllable pitch.

The vessel is equipped with a roll damping tank system. There are two fresh water generators, each producing 15 cu.m./24h. There are two fuel oil separators, self cleaning type and three lube oil separators. In addition there is one mobile hydraulic oil separator and a USCG approved bilge water separator. A ballast water treatment system is installed.

Switchboards, navigation and DP

Ulstein Power & Control has delivered the switchboards 690V, 400V and 230V, the emergency switchboard, and the communication and information system type Ulstein COM® to the vessel. Alse the bridge control and navigation system is of Ulstein delivery.

The vessel has a Kongsberg Maritime Dynamic positioning system, DP2 type,

Photo credit Ulstein Group /Per Eide

and has two DGPS, and a radius reference system. There is preparations for Kongsberg's HiPAP 500 high precision acoustic positioning. The integrated automation system is supplied by Høglund Marine Automation.

Arctic class

Polarcus Adira is an Arctic-ready vessel designed and built for operations in Arctic waters carrying the ICE-1A* and Winterized Basic notations from Det Norske Veritas, the classification company of these vessels. Polarcus Adira can operate in first-year ice of up to 1 metre thickness without the assistance of icebreaker. The hull is ice-reinforced and the vessel has de-icing and ice-preventing systems at critical tanks, pipelines and systems, and the propellers, gears and thrusters are dimensioned for withstanding operations in ice. Escape corridors and rescue equipment are also protected against icing during Arctic operations.

The hull form is not really icebreaking, why the intention is to do the work in open water. 3D seismic acquisition will only take place in ice-free water. The Arctic qualities of the vessel enables the vessel to relocate through ice to and from the survey area, or remain in icy areas waiting for the ice to clear, increasing the operational window of the vessel.

Seismic equipment

Polarcus' worldwide service capabilities encompass conventional 3D surveys and sophisticated wide- and multi-azimuth projects, high-density 4D development surveys. Polarcus Adira is a 3D/4D 12-14 streamer seismic research vessel capable of deploying up to 14 Sercel Sentinel solid streamers. The navigation system is ION Orca and the depth positioning system is of type ION DigiBIRD combined with DigiFIN lateral control and DigiRANGE acoustic ranging, supplied by ION Geophysical Corporation. The seismic air gun source is by Bolt Technology

1500-LL/1900-LLXT with dual sources. The source controller is a fully distributed digital gun Seamap GunLink 4000 controller.

The seismic operation room is located midship over two decks in close vicinity to the seismic winches in the work area. Seismic dedicated areas include a Seismic operation room, Rack room (Server room), Back deck store, Bird shack, Air gun control room, Technical library, Tape store, Tail buoy workshop, Two battery stores and a Streamer store repair room. There are a number of winch systems fitted with radio remote control.

Under an agreement with GX Technology, this global independent data processing company provides the on-board seismic data quality control and when required seismic data processing services on-board Polarcus' vessels, and onshore advanced seismic data processing services at one of its Data Processing Centres.

Accommodation and interior spaces

Polarcus Adira is built with a hotel compliment with permanent capacity for 60 persons in 32 single and 14 double cabins. There is a mess room which seats 43, day rooms, internet café, gym and sauna, as well as a hospital, offices and a conference room. There are three crew state cabins, one client state cabin, twenty-eight one-bed cabins, fourteen two-bed cabins. There are also rooms for dry provision, a cooler and freezer room, and laundries. There is a special helicopter reception room.

Classification

The classification company is Det Norske Veritas. The vessel is designed for environmental friendly operations. The vessel carries the Clean Design notation from DNV. A GREEN PASSPORT is issued. Low noise and vibration levels are recorded in the accommodation and on deck. Class notations are Det Norske Veritas 1A1, E0, DYNPOS-AUTR, CLEAN DESIGN, COMF-V(3), ICE-1A*, WINTERIZED BASIC, NAUT-AW, HELDK, BWM-T, TMON, SPS. The vessel carries Bahamas flag.

www.seadiscovery.com

Education insights with WHOI's

Dr. Susan *Avery*

Woods Hole Oceanographic Institution has a rich history in ocean exploration and research. Founded in 1930 the institution sits in the middle of a quintessential New England village with a thriving ocean science community. WHOI's beginnings date back to the early 1920's when scientists began to discuss a vision of an institution that would bring together experts from multiple fields to focus on global ocean research. The Institutions first research vessel, Atlantis conducted 299 cruises from 1931 to 1966 covering 700,00 miles, exploring all aspects of ocean science and exploration. Today WHOI is one of the most prestigious, and respected Oceanographic Institutions in the world. Recently MTR was able to sit down with Dr. Susan Avery, the current Director at WHOI to get some insight into the newest research and educational programs at the Institution.

By Rhonda Moniz

Could you tell us a little about your background, and how you came to WHOI?

Yes, I have been here now for four and a half years. Prior to this I was at the University of Colorado. I was at UC for 26 years as both faculty and in administrative positions. I am an atmospheric scientist, and a lot of people ask me what I am doing in oceanography. Well, turns out the ocean and atmosphere interact a lot together. They are both fluid, one is compressible and one is not. They obey some of the same physical laws. Chemistry is a little bit different and of course biology is a lot different in the sense that the atmosphere doesn't support the diversity of biology that the ocean does. A lot of the issues that we deal with in the ocean today are connected with the atmosphere, as they are joint coupled atmosphere-ocean problems. It has been a really exciting move for me because I have done a lot of interdisciplinary work. I headed up interdisciplinary institutes to a smaller scale before, and now this just adds the ocean dimension to the work that I have done in the past. It is really exciting.

What are some of differences and challenges this position has brought you?

It has allowed me to learn new things and share new ideas with people here. There have been some challenges because of the economy, but we are still moving ahead and doing some exciting science and engineering. Part of my work lately has been to coalesce what we are going to try to do in terms of setting the stage to be a little bit more robust, as well as developing new partnerships. We are looking at new dimensions of integrating a little more of the things that we have here, and the development of new partnerships in both academic and government areas. That is the direction we are going in. We are developing a new effort in marine robotics, and creating a new center for marine robotics that is really exciting. We are continuing to grow and look at new dimensions for our interdisciplinary institutes, and that is a really exciting new effort going on. We focused recently on conservation science, and we will probably be doing another focus in the future on ocean acidification, and of course we finished up a focus on the arctic. There is still a lot to do in the arctic.

With regard to the robotics center, could you tell us a little more about that?

Oh yes. We all realize that taking measurements in the ocean is a challenge, and robotic technology is the wave of the future with regard to getting more and more observations in the oceans. The development of autonomy and communications development associated with robotics, as well as the new centers we are developing that are coming online, provide us an opportunity to take a lot of the work we have done in robotics and really bring it together in a systems integrated approach.

WHOI is involved with the Ocean Observatories Initiative. Is the robotics center geared to ramping up that technology?

It is basically leveraging what we are doing already and enhancing it so that we can develop new tools for science as well as new tools for applications for working in the ocean. This is ultimately linked to the work we are doing with OOI and also our work with all of the new sensors. We have a number of new sensors coming on board.

What are some of the new sensors?

We have new small mass spectrometers that can be integrated into these robotic platforms that will be able to in real time measure, and analyze the chemistry of the ocean. The new imaging flow phytobot will really focus on getting images and the meta data associated with those images on phytoplankton. One of the challenges of putting AUV's in the ocean to do sensing is the ability to communicate with them because it is very difficult to communicate with them in water. We have developed a new optical modem for that communication. We have a new camera system called Habcam, which is now being used by NOAA for scallop surveys, and reef surveys in the northeast. We are also developing a new vehicle called Nereid developed for looking at under ice operations, particularly in the polar regions.

So Nereid is an AUV designed specifically for under ice operations?

Yes. We also have another instrument that is focused on taking measurements so that we can get a better idea regarding ocean acidification.

Sounds like there is quit a bit of activity on the ocean robotic side.

Well when you talk about the future of getting measurements out in the ocean and doing the science, ocean robotics plays an integral role. Not only the vehicle itself but the autonomy and the control of the vehicle as well as the

communication with the vehicle and the sensors on the platform. It also involves power and endurance and things like that.

Could you tell us more about the approach to problem studies you mentioned?

We have had these institutes that instead of focusing on the physical oceanography, chemical oceanography or biological oceanography they focus on problem areas. For example our ocean and climate studies, where we have had a major thrust in Arctic work. We have made some phenomenal progress in understanding the processes that are happening with the ice sheet melting and the accelerated ice loss in the Arctic. We have also done some work in the Antarctic as well. So that is a program that we want to continue to make sure it moves forward. New interdisciplinary problem oriented environment studies include the science that underlies conservation work. The idea there is, "look you can damage these marine protected

"Well when you talk about the future of getting measurements out in the ocean and doing the science, ocean robotics plays an integral role. Not only the vehicle itself but the autonomy and the control of the vehicle as well as the communication with the vehicle and the sensors on the platform."

-Dr. Susan Avery, Director, WHOI

areas, but if you don't know what your protecting or how your going to protect it, or even what the stresses are in these areas it is going to be very difficult for these areas to succeed". This involves really looking at what we are calling conservation science and indentifying areas that will be really good in terms of not only bio-diversity, but what are the stressors in these areas, how would you determine what is most likely needed if it was protected, and working with governments who have conservation areas under their jurisdiction. Also working with select conservation groups is important. So that is work being done in the marine protection area.

Now a third area which is really a new problem disciplinary area is in ocean acidification, which goes everywhere from making the measurements, which is not just measuring the PH, but measuring 3 or 4 other variables and really beginning to understand what is happening in the ocean. Also what are the biological, chemical, physical processes that are happening in marine ecosystems that are attacked by ocean-acidification. That in turn, leads to what is going to happen in terms of our marine fisheries and other marine mammal distributions.

Dr. Avery, I understand that much of the research coming out of WHOI also has an educational component can you talk about that?

Yes we have a regular joint degree program with MIT, which awards Graduate and PhD degrees. We have just awarded our 900th degree out of that program, which is quite exciting. We also have an out reach program. In the past we have always had the "Dive and Discover" program. When we know there is going to be a research crew out on a cruise that is conducting research, and we have the resources, we work with K through 12 grade teachers in developing a curriculum module around that expedition. We continue to do that when we have the resources to do it, and when there is a cruise going out with a scientist willing to put the time and work into it.

Secondly, two years ago I initiated a program where we got to do some public events and it has been a major success. I have always been shocked that the Cape Cod and Massachusetts area in general knows we are here, but not always what we actually do. Since we started with this we have done two events a year. We just did one about a week ago on ocean acidification with a panel and some hands on exhibits that people came to and had the chance to talk to people. That worked out pretty

Susan Avery boarding Alvin for her first dive.

well. We've got a more formal program than outreach with New England aquarium on climate literacy. The aquarium is actually the lead on this and we are a co-lead with them. This is really looking at how you communicate climate and how you use the aquarium environment to talk about the ocean and its role in climate. That is a big climate literacy program we are working on and we are delighted to be partnering with the New England Aquarium as well as many other aquariums across the country on this. And of course we have our exhibit center, which has been revitalized with some new exhibits. We have also done some projects including locating the air France plane that went down. We have done some more work on Titanic. Those projects highlight our technology but also I think draw in more people to take a look at what is really happening in the ocean.

Of course education and outreach is always an important element in dissemination of information and getting the word to the public about the research going on at WHOI.

Yes, it certainly is and it also encourages people to take a look at our web site and to come to our events. The public can get information on a variety of research and projects going on at WHOI including the re-build on our manned submersible Alvin, and more recently the keel laying ceremony on one of our newest research vessels the Agor 27. Education and outreach plays a vital role.

ROV/AUV Trends

Market and Technology

By Lukas Brun

The Duke University Center on Globalization, Governance and Competitiveness (CGGC) recently completed a study on ocean technologies, including remotely operated vehicles (ROVs) and autonomous underwater vehicles (AUVs), for a consortium led by Nova Scotia's Department of Economic and Rural Development and Tourism (ERDT). Excerpts from the report on the market and technology trends in ROVs and AUVs are provided in this article.

ROV market and technology trends

Global ROV vehicle sales in 2010 totaled approximately $850 million. In 2010, oil and gas purchased approximately 50% of ROVs, while ROV sales for defense & security and scientific research equaled 25% for each sector.

Market drivers for ROVs are offshore drilling, the security environment, and the need for ocean data. The prospect for offshore drilling varies by location, yet offshore exploration in Brazil, Nigeria, Indonesia, and the Gulf of Mexico are expected to be strong. In the security market, ROVs are routinely used for forward observation, reconnaissance, and mine counter-measures by the military. ROVs will increasingly be adopted by organizations charged with ocean rescue and port security seeking effective tools for scanning and observation, including hull inspection. The need for data on the oceans is driven by the need for creating detailed maps for navigation and minerals extraction, particularly in the Arctic.

The three market dynamics in the ROV market of particular note are 1) the growing market for mini and small ROVs driven, primarily, by their reduced cost and increased functionality; 2) the increasing number of sensors and robotics capable of being placed on vehicles; and 3) the reduction in cost of the platform relative to the cost of the instruments. The relative cost of instruments and platform is important to note because it indicates the maturation of the ROV technology. ROVs, although they remain highly sophisticated technology packages, have become adopted widely enough to expect continued cost reductions, or performance enhancements at the same cost.

Four technology trends in ROVs can be identified. The ROV industry is keenly aware of the need to simplify the interface between the ROV operator and the vehicle. Most ROVs in use have multiple screens for monitoring the ROV vehicle status (health), feeds from onboard cameras and video, robotic arm manipulation, and receiving feedback from data collection instruments. The trend is to simplify the interface by having information provided on one screen. The integration of multiple systems requires the development of software. ROV and instrument manufacturers are working to improve the integration of systems developed independently. This after-market integration between the platform and instrumentation is suboptimal. In the future, functional integration will be incorpo-

	Remotely Operated Vehicles (ROVs)	Autonomous Underwater Vehicles (AUVs)
Global Vehicle Sales (2010)	~ 850 million (US$)	~ 200 million (US$)
Demand Drivers	• offshore oil • security environment • need for ocean data	• need for ocean data and mapping • increased functionality of AUVs • offshore oil (reducing ROV costs)
Market Dynamics	• market for mini and small ROVs • increasing number of sensors and robotics on vehicles • reducing operational costs	• increased comfort with autonomous vehicles for monitoring and patrol • market for versatile products suit able for tough, physical environments
Technology Trends	• simplified user-interface • high-definition (HD) camera & video • reduced vehicle size • tether-optional (hybrid) ROVs	• increased functionality • longer mission life • reduced power requirements • miniaturization

Source: Duke University Center on Globalization, Governance & Competitiveness (CGGC)

rated into the design of ROVs and onboard systems.

The availability of relatively inexpensive High Definition (HD) camera and video has increased the demand for efficient data transmission from the ROV to the operator station. High definition allows better inspection of the underwater site due to improved quality of the image, better control of the vehicle, and allows for easy switching between video formats found in different parts of the world. The consequence is that the copper video transmission system used in most tethers must be replaced with fiber optic cable to accommodate the greater bandwidth required to transmit HD signals. Advances in fiber optic technology allow ROVs to communicate with the surface using millimeter-thin cables, allowing smaller diameters in the tether and reduced drag.

The size of the average ROV is decreasing due to technological developments in instrumentation. Smaller ROVs are preferred to large ROVs, keeping everything else constant, because of better maneuverability and lower deployment costs. Small ROVs deployed by one or two-man crews are less expensive to operate than vehicles deployed with large landing and recovery systems (LARS) requiring several operators. Maintenance costs are also significant drivers for reducing the size of ROVs, particularly in the scientific research market. In the past, large vehicles were needed to house the instruments needed to accomplish the dive mission; however, as a result of the reduced size of onboard instruments, cameras and robotic arms (often with improved performance) the size of the required vehicle has been reduced. The exception to this trend is in missions requiring the completion of heavy intervention tasks, as in offshore construction, or in missions where payload capacity is critical. Another driver of reduced weight is the result of technology improvements allowing greater propulsion power through a given diameter of wire. This has allowed for reduced weight in the entire ROV deployment system, including lighter landing and recovery systems. Improvements in compact buoyancy have also reduced the weight and size requirements for ROVs.

Hybrid ROVs (HROVs) are an interesting trend in the ROV market. Hybrid ROVs have tether-optional configurations in which the vehicle can conduct programmed missions free from the tether. The benefit of hybrid systems is increased maneuverability in locations where tethers would entangle or limit the ability to navigate around obstacles. Woods Hole's Nerus and Saab's Seaeye are examples of workclass HROVs. A number of manufacturers, including Seabotix, are making mini and small production HROV models. Canada's ISE has experimented with HROVs as a way to reduce monitoring costs. According to interviews conducted by CGGC, HROV configurations are expected to be an option increasingly offered by ROV manufacturers, particularly in the mini and small ROV markets.

AUV market and technology trends

The AUV market is smaller than the ROV market. According to industry interviews conducted by CGGC, the global annual expenditure on AUVs is roughly $200 million, dominated by U.S. manufacturers. Currently, the military/security market makes up approximately 50% of AUV sales. The scientific research market makes up approximately 30% of the AUV market. The oil and gas market makes up approximately 20% of AUV sales.

The market is expected to grow to $2.3 billion by 2019 (Westwood, 2010). Interviews with leading AUV manufacturers consider the 30% compounded annual growth rate implied by this forecast to be optimistic. However, the growth potential of AUVs is clearly large. Military and scientific research markets are expected to make up more than 75% of projected sales through 2019 (Westwood, 2010). AUVs increasingly will be used in the oil and gas market, primarily due to the cost of using ROVs. The increased functionality in AUVs and the demand for floating oil production systems and remote fields also are drivers for adopting AUVs.

The majority (~70%) of AUVs sold are rated for water depths less than 200m, illustrating the importance of small, light, shallow water AUVs for various end-markets. Of these shallow water AUVs, roughly 30% are rated for depths less than 30m. Unit sales forecasts through 2019 estimate that the majority of sales will occur in small AUV sales. However, large AUVs will dominate the projected $2.3 billion sales because of their high unit costs.

AUVs are still a relatively new ocean technology. The first recorded sale of an AUV occurred in 1985; 75% of existing AUVs were produced between 2001 and 2005. As newer technologies, the platform costs are greater than the instruments onboard. In contrast to ROVs, the AUV vehicle makes up the majority of the total cost of the vehicle. AUV platforms make-up, on average,66-75% of the cost (in comparison to 40% for ROVs), while instruments make-up 25-33% of AUVs. This of course depends on what instruments are included in the AUV. Some instruments (e.g., spectrometers, dissolved gas and nutrient sensors) are relatively expensive, while others (e.g., altimeters and pressure gauges) are inexpensive. The platform's share of the total AUV cost is expected to decrease as incremental innovations in the vehicle are implemented.

The technology trends in AUVs are increased functionality, longer mission life, reduced power requirements, and miniaturization. The trend in AUV technology is to increase their versatility from what essentially is an oceanographic data collection system to perform a greater variety of missions. AUVs are capable of mission lives up to a year, although this varies on the type of vehicle and amount of instrumentation onboard. Generally speaking, the greater the number of instruments onboard an AUV, the shorter its mission-life. AUV surveys in deep water (>3000 meters) are conducted two to three times faster than in towed systems because AUVs have higher cruising speeds, do not require repeated turns and passes over the same locations, and provide higher data quality because of the stability of the survey platform.

AUVs are currently being developed in the military market for locating and disabling mines. The University of Hawaii and the U.S. Navy's SAUVIM (Semi-Autonomous Underwater Vehicle for Intervention Missions) performed the first autonomous manipulation using feature based navigation in January, 2011

(MASE, 2011). Scripps Oceanographic Institute, the University of Washington, and the U.S. Navy developed the XRay Flying Wing prototype to track submarines and conduct remote sensing in shallow waters for up to 6 months.

A second trend is to increase the mission life of AUVs. Current AUVs can be deployed up to a year, after which batteries must be replaced and the vehicle reconditioned. The limitation on mission life is largely a power imposed constraint – the vehicle simply runs out of power to conduct its mission. Three developments have sought to address this limitation of AUVs. The first is the development of compact battery technology capable of storing more electricity. The second development is instrumentation and communication devices requiring less power. The third development is onboard power generation, either through the use of solar arrays kept above the ocean surface, or for gliders, through wave and bio-mimicking technology to power the vehicle.

A third trend is to reduce the power requirements for AUVs. Two power requirements exist for an AUV: forward propulsion and power for onboard instrumentation, guidance, computers, and communication devices. Forward propulsion for most AUVs is generated from power stored in onboard batteries. This limits the mission life of AUVs since physical limitations on the number and size of batteries carried onboard exist. The weight of batteries is a key drawback since they reduce the payload available for other instrumentation. Gliders have overcome some of these difficulties by using changes in the vehicle's buoyancy and onboard wings to propel the vehicle forward. Advances in mechanical design, particularly biomechanical engineering, may reduce or eliminate the need for stored onboard power in gliders in the near future. Researchers at the California Institute of Technology (US), Southampton (UK), Tokai University (Shizuoka, Japan), and the Delft University of Technology (Netherlands) have recently presented papers on biomechanical applications to AUVs. Most production glider models require stored power to bring the vehicle up at the end of its dive cycles. Onboard electronics are currently powered with onboard batteries or solar arrays. The use of solar arrays limits the depth the vehicle can dive; however.

The fourth major trend is miniaturization of onboard instruments and vehicles. The application of nanotechnology to robotics and electronic equipment holds tremendous potential to develop small, highly sophisticated underwater vehicles. While the promise of nanotechnology continues to develop, AUVs have continued along the same path as ROVs to become smaller while simultaneously adding capabilities.

About the Author

Lukas Brun is a senior research analyst at the Duke University Center on Globalization, Governance & Competitiveness (CGGC), and author of the ROV chapter in the Nova Scotia Ocean Technology report from which excerpts were taken for this article. The full report is available free of charge at http://www.cggc.duke.edu/pdfs/2012-03-05_Nova%20Scotia%20OTReport.pdf

NOAA Names Glang Nation's Hydrographer

Gerd Glang was named as director of the NOAA Office of Coast Survey and the nation's chief hydrographer, responsible for mapping and charting of all U.S. coastal waters. The U.S. Senate confirmed his nomination by President Obama to the rank of rear admiral (lower half), a prerequisite for the position. Glang will be responsible for overseeing NOAA's hydrographic services, and he succeeds Capt. John E. Lowell, who retired after 29-year career in the NOAA Corps. Glang has spent the past two years as the co-deputy lead of NOAA's planning efforts to make America's coastal communities resilient.

A NOAA Corps officer since 1989, Glang has a strong background in the hydrographic surveying and seafloor mapping science. Glang is a 1984 graduate of the SUNY Maritime College with a bachelor's degree in engineering, He received a graduate certificate in ocean mapping from the University of New Hampshire Center for Coastal and Ocean Mapping, and is a graduate of the Harvard Kennedy School Senior Executive Fellows program.

Brown Relieves White

Rear Adm.(lower half) Brian B. Brown relieved Rear Adm. Jonathan W. White as commander of the Naval Meteorology and Oceanography Command (NAVMETOCCOM) in a traditional Navy change of command ceremony on Aug. 3 at Stennis Space Center. For the past year, Brown has been the Executive Assistant to the Oceanographer and Navigator of the Navy in Washington, but he previously served at Stennis as commanding officer and executive officer of the Naval Oceanographic Office (NAVOCEANO) and on the NAVMETOCCOM staff. NAVOCEANO is NAVMETOCCOM's largest subordinate command.

Ng to Head LITE

Louisiana Immersive Technologies Enterprise's (LITE) newly appointed chief executive officer (CEO), Dr. Kam Ng, has officially arrived and is active in his new position. Ng was selected in April of this year and is joining the LITE team after retiring from the Office of Naval Research (ONR) as the deputy director for research.

Ng is relieving Dr. Robert Twilley who has served as the interim CEO for LITE since November 2010. Twilley took the position of interim CEO while also serving as the vice president of research at the University of Louisiana at Lafayette, and left in August to head up the Louisiana Sea Grant Program at Louisiana State University (LSU).

Ng received his Ph.D. in mechanical engineering and applied mechanics from the University of Rhode Island in 1988. He also received an MBA from the Marymount University in 2005, a Master of Arts in international commerce and policy from George Mason University in 2008, and completed the Senior Executive Fellow Program from the Kennedy School of Government at Harvard University in 2002, and the Senior Executive Program at the Federal Executive Institute in 2004.

FMC: Change at the Top

FMC Technologies said that Robert L. Potter has been appointed President of the company. Potter assumes this responsibility from John T. Gremp who remains Chairman and CEO. Potter previously served as Executive Vice President of Energy Systems with responsibility for the Subsea Technologies, Surface Technologies and Energy Infrastructure business segments, in addition to several support functions. He has been with the company since 1973.

Douglas J. Pferdehirt has joined the company as EVP and COO.

WHOI Names New CFO

The Woods Hole Oceanographic Institution (WHOI) appointed Jeffrey Fernandez to the position of Chief Financial Officer and Vice President of Finance. Fernandez joins WHOI after nearly 30 years with the University of California.

CTG: New Board Named

Channel Technologies Group (CTG) named Ret. Vice Adm. John J. Donnelly, Ret. Rear Adm. Nevin P. Carr and Ret. Rear Adm. Winford (Jerry) Ellis to the company's first Strategic Advisory Board (Board).

Hydroid Hires Five

Hydroid, Inc., a Pocasset-based manufacturer of Autonomous Underwater Vehicles (AUVs), announced several staff changes. Rich Amirault has joined, as Manufacturing Manager; Robert Murray has joined as Customer Service Manager; Libby Signell has joined as Program Manager; Jim McKay has joined as Technical Documentation Product Manager; and Timothy Stam-

nitz has joined as a Senior Sales Engineer for emerging markets.

Sonardyne Sales Agent

Sonardyne Inc., Houston, appointed Mike Chapman, founder of MECCO Inc., to its expanding team of sales agents in the U.S. Based in Duvall, Wash., he has over 30 years of experience in the marine and oceanographic industries.

MD at First Subsea

First Subsea appointed John Shaw as managing director. Previously First Subsea's global operations director, he will be responsible for the on-going development and growth of the company's ball and taper connector business.

Lade Joins Saab Seaeye

Chris Lade has been appointed Defence Sales Manager at Saab Seaeye. This is a new position with responsibility for sales of underwater vehicle systems to the defense industry and follows Saab Seaeye's expanded role in the defense industry since the transfer of Saab's underwater vehicle systems for defense to Saab Seaeye. Lade joins the company following a successful career in the Royal Navy that included mine and anti-submarine warfare, and diving operations. His new role comes as the company develops more advanced ROV, AUV and hybrid systems that will expand its defence systems capability.

UTEC Appoints COO

UTEC appointed Brendan Ryan as COO. Ryan is the holder of a BAI in Engineering and a BA in Mathematics from Trinity College, Dublin and a MBA from Texas A&M in Corpus Christi, Texas. He is also a Chartered Engineer from the Institute of Engineers in Ireland and will be based in UTEC's Houston of-

fice. UTEC also announced the appointment of Ranald Blair as Chief Surveyor of the group.

L-3 Klein Appoints Allen

L-3 Klein Associates appointed Ron Allen as its director of engineering. Working in conjunction with other members of the L-3 Klein management team, Allen is responsible for the engineering design and development of the company's next-generation sonar systems.

Applied Accoustics Name Rickards

Applied Acoustic Engineering strengthened its Sales team with appointment of Julian Rickards as Technical Sales Advisor. Rickards has more than 15 years experience within the industry with Acoustic and Inertial manufacturers so brings a wealth of experience to the company, including time spent operating positioning equipment offshore. Commenting on the appointment Gavin Willoughby, Sales Manager, said, "His extensive knowledge, technical capability and strong personal understanding of this industry will be invaluable to us."

Manley Named to IOOS Committee

Teledyne Benthos said that Justin Manley, Senior Director of Business Development, was appointed to the Integrated Ocean Observing System (IOOS) System advisory committee.

VCT Harbor Scan UUV

Vehicle Control Technologies (VCT) said that VCT's HarborScan UUV (Unmanned Underwater Vehicle), equipped with L-3 Klein's UUV 3500 Side Scan Sonar, is now available to the AUV/UUV commercial and military markets. HarborScan has completed extensive acceptance testing with the National Oceanic and Atmospheric Administration (NOAA) and is now considered fully operational.

Clear Signal Coating for OOI

Teledyne RD Instruments and Nobska selected Severn Marine Technology's Clear Signal Biofouling Control System to coat their instruments for long-term deployments in the ocean observing initiative (OOI).

Nautronix NASDrill Selected

Nautronix won a contract to supply NASDrill RS925 deep-

ABS Certifies Portugal Offshore Wind Turbine

WindFloat ushers in a new era of offshore wind energy

ABS provided certification services for the design, fabrication and installation for the first WindFloat facility. The WindFloat Aguçadoura unit is a 2 MW floating wind turbine moored in slightly less than 50 m water depth 4 km offshore the northern Portuguese coast.

The WindFloat project is the first offshore wind deployment in the world that did not require heavy lift equipment offshore. Final assembly and pre-commissioning took place in a controlled shoreside environment. This installation also is the first deployment of a semisubmersible structure supporting a commercial size wind turbine.

ABS design review engineers in Houston and ABS surveyors on site at the fabrication facilities in Portugal worked together with the developers and builders during the design, fabrication and installation phases of the project. ABS certification of the semisubmersible and the mooring system was based on the applicable sections of ABS Offshore Rules and Guides and the ABS Guide for Offshore Wind Turbine Installations.

water acoustic positioning system, for Rowan's third new ultra-deepwater drillship. The vessel will be constructed at Hyundai Heavy Industries shipyard in Ulsan, Korea and will be based on a Hyundai Gusto P1000 design. It is scheduled for completion in Q4 2014. This is the third order that Nautronix have received for the Rowan fleet; for their NASDrill RS925 system, following on from vessels one and two. NASDrill RS925 combines Short Baseline (SBL) and Long Baseline (LBL) to calculate multiple independent position solutions providing reliable, repeatable input to the vessel DP system; with SBL mode providing accuracies of 0.15% slant range and LBL mode providing accuracies up to 1m RMS independent of water depth.

Hine: Tech Pioneer '13

Liquid Robotics said that Roger Hine, Liquid Robotics co-founder and CTO, was named as one of the World Economic Forum's twenty-three Technology Pioneers for 2013.

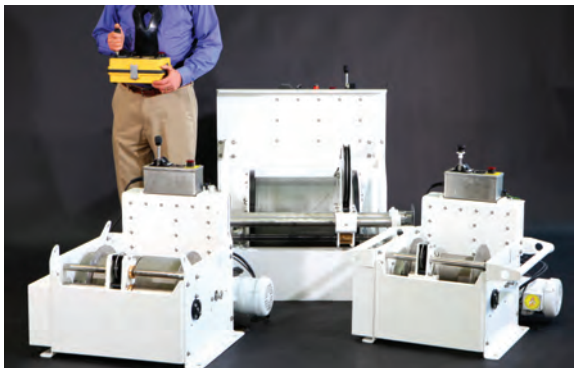
Roger Hine's invention of the Wave Glider, the first autonomous marine robot designed to operate solely on renewable energies (wave and solar power), was selected based on its ability to revolutionize the way the world monitors, explores and operates in our oceans.

"I am incredibly honored and proud of the collective achievement of the Liquid Robotics team," said Hine, Technology Pioneer and CTO. "Our customers seek to improve scientific understanding, protect our environment, and forecast the behavior of complex, interconnected planetary systems that impact our lives. To do this they need widespread, continuous ocean data collection. What better way to monitor our vast oceans than with intelligent mobile devices that consume no fuel, and have no crew?"

Wave Glider products and ocean data services are used across a broad array of scientific, oil & gas and defense applications. These applications include: tracking Great White Sharks along the coast of California, monitoring Atlantic hurricane and Pacific typhoon intensity, measuring water quality in the Gulf of Mexico, and providing real time observations and communications for ocean operations around the world.

Featured Product

SOSI's New ECO Winch Line



Original ECO winches were designed for profiling relatively small instrument packages aboard small vessels for shallow water (<600 m) estuarine and coastal oceanography; ECO and large lake and reservoir monitoring. A relatively small drum can hold a lot of small diameter cable (2.5 to 5 mm), making small economical winches feasible. However, the working life of small cable is vulnerable to potentially severe wear from uneven spooling, so a good levelwind is essential. Traditional diamond screws need to be precisely designed (pitch and length) for the intended cable diameter and drum width. Even then, dynamic operating conditions can cause repeated small spooling errors that accumulate beyond the mechanical ability of the levelwind to spool properly, and force operator intervention to avoid cable damage. Diamond screws also prevent changing to a different cable diameter without also changing the diamond screw and/or the sprockets driving the screw. Nonetheless, sales of diamond screw ECO winches grew because they are mechanically simple, relatively inexpensive, and until now, a cost-effective alternative was unavailable. The new ECO Winch family consists of 1 and 2 HP ECO-ELW winches (ELW signifies electronic levelwind to distinguish from earlier models), a 3 HP ECO Magnum, and a 7.5 HP ECO OceanPro. The ECO Magnum and OceanPro winches can be configured with different drum sizes and levelwind sheaves, guide shoes or rollers to suit a wide range of rope, cable or umbilicals, and the OceanPro can also be configured with a 3, 5, or 7.5 HP motor. An optional derrick, turntable, pedestal and ECO Sheave can be combined with the 1 or 2 HP ECO-ELW, to create a simple, manually operated instrument handling system.

www.soundocean.com

Acoustic Telemetry Goes Mobile

Over the past decade, fisheries scientists around the world have used HTI acoustic telemetry to remotely track fish behavior with fine-scale 2D and 3D positions. These studies provided a wealth of information about fish passage, survival and behavior. Most often the surveys used fixed receivers for monitoring site-specific areas (e.g., water intakes, diversions, and hydropower dams). In recent years with increased need to evaluate fish behavior beyond fixed stations, an easy means for mobile surveys became essential. HTI's new Model 395 Micro Data Logger finished testing this spring at various locations on the west coast. HTI (Hydroacoustic Technology, Inc.) announced its official release of the Model 395 Logger recently. Data loggers are not new in acoustic telemetry. However, there are three new game changers exclusive to the Model 395 Micro Data Logger that make it unique. Beyond its ability to detect and identify hundreds of fish at the same time in real-time, it's now possible to achieve fine-scale 2D/3D tracking of each tagged fish with multiple units.

www.htisonar.com/datalogger_Model395.html

FET: Subsea Sim Software Modules

Forum Energy Technologies released VMAX Editor 1.0 and VMAX ROV Simulator 2.5. VMAX Editor 1.0 allows the rapid creation of offshore simulation scenarios. This simulation editing tool provides a preview of the scenario with complex tooling interactions, and allows the user to modify and place items within a scene by dragging-and-dropping. The tool provides a classic 3D-view of the project field as well as a free camera view that allows the developer to fly around the scene and validate their designs. VMAX ROV Simulator 2.5 is the latest version of Forum's popular core simulation software and incorporates technology that allows performance and accuracy. In addition to being used for engineering studies and SIT simulations, VMAX ROV Simulator 2.5 is used for Remove Operated Vehicle (ROV) pilot training and rehearsal sessions.

www.soundocean.com

Mini Connectors

The new Fischer MiniMax from Fischer Connectors is a first-of-its kind rugged push-pull interconnect solution for smaller devices. An all-in-one 20 signal (0.5A) and 4 power (5A) connector with a patents-pending 24 mixed contacts. It is designed for the harshest environments, passing extreme temperature tests and boosts an impressive 1,000 hours of salt water spray.

The MiniMax is available in three latching systems: push-pull, breakaway and screw lock, and come with the following specifications:

- Small profile
- Sealed to 120m, mated and not
- Unbreakable keying system
- Over-molded assemblies

www.fischerconnectors.com

Divelocker Released

SurfaceSupplied launched Divelocker, a software suite. Integrating data download, product software configuration and firmware upgrades, Divelocker is free, available for the SurfaceSupplied Unibody range of Gas Analysis equipment and the TRITON 3 Diver Bell Gas Management Panel.

Featured Product

Sonardyne Scout USBL

Engineers prepare the ROUMRS ROV, equipped with a WSM 6 transponder, ready for deployment

Supported by Sonardyne International Ltd's Scout USBL acoustic positioning technology, ARA Incorporated has completed a subsurface survey of Terminal 91 in the Port of Seattle. Commissioned following the discovery of World War II munitions on the seafloor under the cruise ship facility at Pier 91 within the terminal, ARA's operation was to identify and clear any magnetic anomalies that could potentially warrant further investigation.

A complete vessel based acoustic positioning system, Scout USBL is designed for tracking divers, ROVs and towfish in waters up to 1,000m. Calculating the position of a subsea target by measuring its range and bearing from a vessel mounted transceiver to an acoustic transponder fitted to the target, the system offers high accuracy performance with efficient subsea tracking operations. To undertake the survey, ARA mobilized its Remotely Operated Vehicle (ROV) ROUMRS which was fitted with a Sonardyne WSM 6 transponder and a Scout transceiver was deployed from the side of the dock on a simple pole arrangement. Positioning data from Scout was fed to the accompanying Sonardyne ViewPoint navigation software which transforms the coordinates of surface vessels, subsea vehicles and structures into geographical information that is overlaid on easy-to-use guidance displays.

www.sonardyne.com

Multigauge 4100 ROV

The tanker RFA Darkdale was sunk by a German U-boat and was the first British ship sunk south of the equator. As it lay in 40m depth, its hull is starting to show signs of leaking oil. A team of nine from the Ministry of Defense DE&S Salvage and Marine Operations (SANMO) were deployed to St Helena in April to investigate the condition of the ship and to ascertain whether RFA Darkdale is likely to become an environmental hazard. Part of the survey involved using a Tritex Multigauge 4100 ROV mountable thickness gauge, manufactured by Tritex NDT, mounted onto a Seaeye Falcon ROV. The gauge was used to inspect the corrosion levels and determine the amount of wastage that has occurred in the hull and whether there is any risk of the hull leaking any more oil. The Multigauge 4100 uses multiple echo which allows metal thickness can be easily measured without removing coatings. The multiple echo's are also compared to each other providing error checked readings from the back wall. The gauge mounts onto ROVs and is supplied with a datalogging software that allows measurements to be stored in a grid or string format.

www.tritexndt.com

BIRNS Helmet Lights

Birns, Inc. launched a new line of Ultra Violet (UV) lighting systems for the commercial diving and ROV market. The all new BIRNS Snooperette-UV and the BIRNS Aquila-UV bring versatile new options to a range of Magnetic Particle Inspection (MPI) and Non-Destructive Testing (NDT) projects. With the new BIRNS UV helmet lights, divers can have both hands free while using a powerful UV light to help identify metal fissures and weak areas at depth. Whether used in ship inspection, or for myriad military and offshore oil and gas applications, the new low voltage BIRNS UV lights have brilliant LED illumination in conjunction with UV lamps, so they operate safely both in and out of the water. Plus, they are ballast-free systems, with instant On/Off capabilities. Rated to 3,400m, the BIRNS Snooperette-UV is highly versatile, compact (Ø76mm), and is perfect for divers, cameras and ROVs. The BIRNS Aquila-UV is rated to 200m and features a Ø60mm (Ø2.4-in.) housing with wire-free construction, which combines advanced design characteristics with a streamlined 97mm (3.8-in.) profile that makes it simple to relamp in just 30 seconds.

www.birns.com

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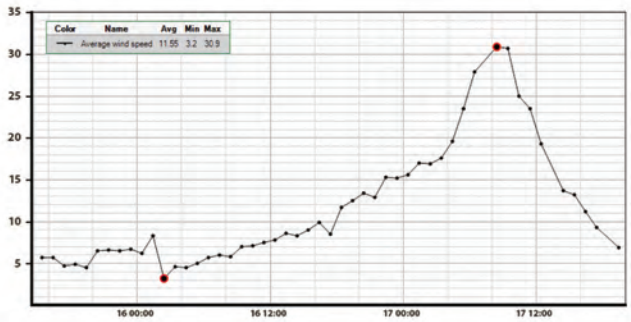
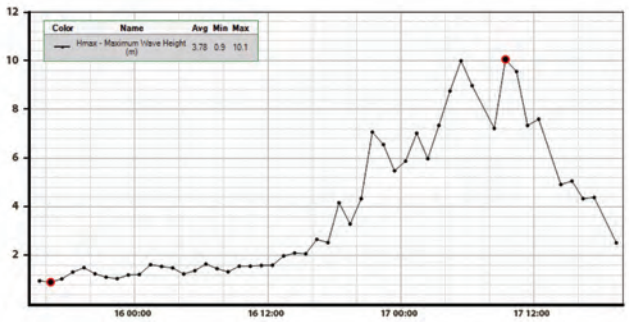
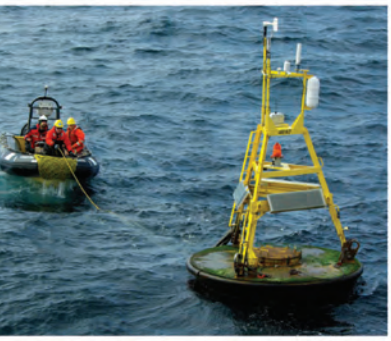
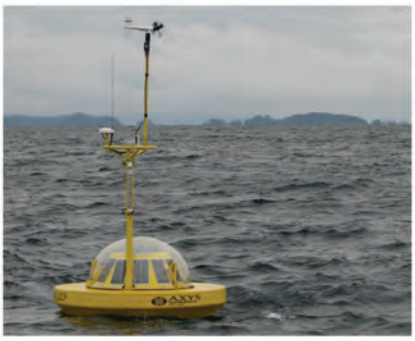


Met / Ocean: Average Wind Speed



Met / Ocean: Maximum Wave Height (m)





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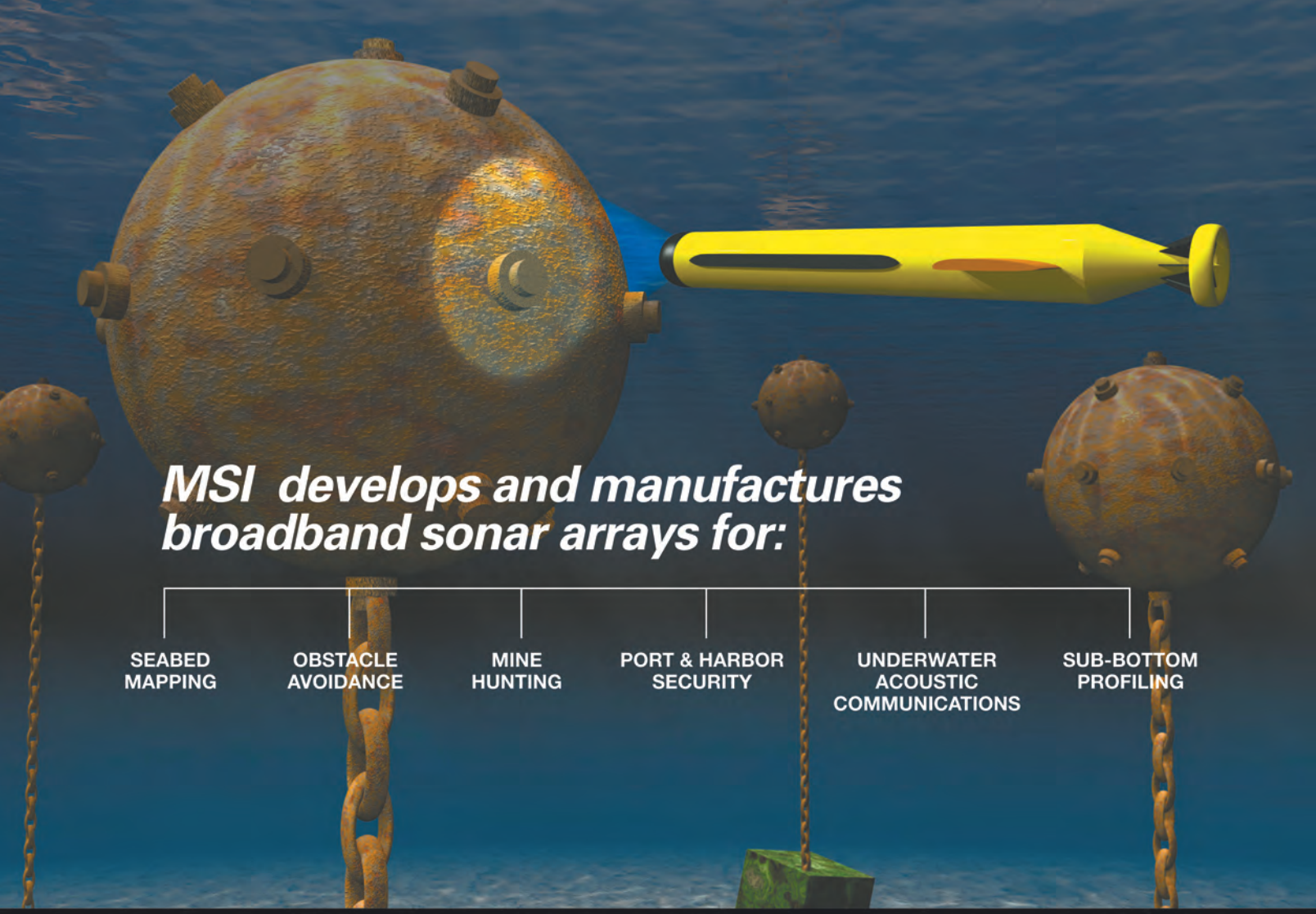

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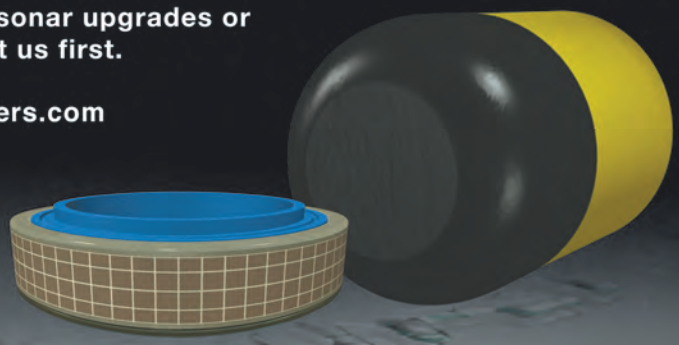

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