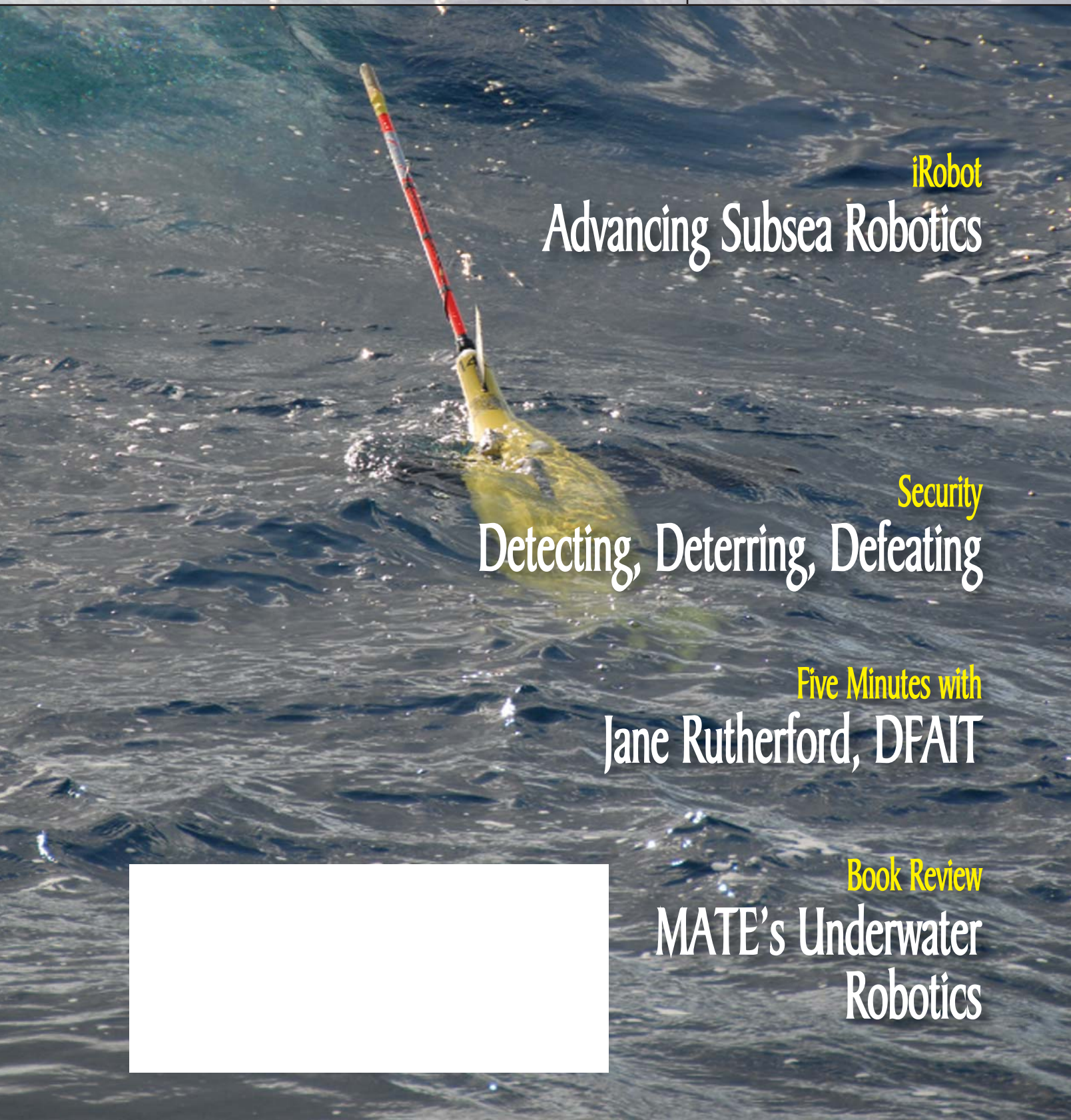
Floating Production Sector Looks Promising The View from St. John's

MARINE TECHNOLOGY REPORTER

November/December 2010
www.seadiscovery.com



iRobot
Advancing Subsea Robotics

Security
Detecting, Deterring, Defeating

Five Minutes with
Jane Rutherford, DFAIT

Book Review
MATE's Underwater Robotics

www.videoray.com

VideoRay
THE GLOBAL LEADER IN OBSERVATION ROV TECHNOLOGY

Photo: National Geographic / Mark Frapwell
Expedition Great White

VideoRay Remotely Operated Vehicles...
The **simple, rugged, portable, and reliable solution** for underwater observation challenges like those performed for Fischer Productions and the National Geographic television series *Expedition Great White*. The VideoRay Pro 4 ROV swam with the oceans apex predator and captured stunning close up high definition video. Learn more about VideoRay products, experience past missions, and view videos at **www.videoray.com**.

www.videoray.com
580 Wall Street Phoenixville, PA 19460 USA
phone: +1 (610) 458-3000 fax: +1 (610) 458-3010 e-mail: info@videoray.com

Piezoceramics - Transducers - Systems

CTG

CHANNEL TECHNOLOGIES GROUP

Stronger

ci

CHANNEL INDUSTRIES

Faster

ITC

INTERNATIONAL TRANSDUCER CENTER

Better

SONATECH

SONATECH

One Company. Three Divisions. World Class Quality.

www.channeltechgroup.com

879 Ward Drive . Santa Barbara . CA . 93111 . USA . Tel. 805.683.1431

November/December 2010

contents

Marine Technology Reporter • Volume 53 • Number 9

CNO Adm. Gary Roughead delivering remarks at the AUVSI Unmanned Systems North America 2010. Adm. Roughead is placing increased emphasis on the capabilities of unmanned underwater systems.

(U.S. Navy photo)

the Authors

Capt. Edward Lundquist, USN (Ret.), is a senior science writer for MCR LLC, and a regular contributor to Marine Technology Reporter.
See Story on page 18

Andrew Safer is a St. John's, Newfoundland based reporter on subsea technology.
See Story on page 22

Rear Admiral Christopher J. Parry CBE is a former British naval officer who is Chair of the UK Government's Marine Management Organisation and a leading world authority on maritime issues and security. He is also a senior adviser to Coda Octopus.
See Story on page 40

The Wendy Schmidt Oil Clean-Up Challenge

The X PRIZE Foundation (www.xprize.org), best known for launching the private spaceflight industry through the $10m Ansari X PRIZE, and the ultra-fuel efficient vehicle market through the $10m Progressive Insurance Automotive X PRIZE, announced the launch of its sixth major incentive competition, the $1.4m Wendy Schmidt Oil Cleanup X Challenge. Wendy Schmidt is president of The Schmidt Family Foundation, Founder of the Foundation's 11th Hour Project and Climate Central, as well as Co-founder, with her husband Eric, of the Schmidt Marine Science Research Institute. Other speakers included Philippe Cousteau, son of Jan and Philippe Cousteau Sr., and grandson of Captain Jacques-Yves Cousteau and co-founder and CEO of EarthEcho International; and Dr. Dave Gallo, Ph.D., Director of Special Projects at the Woods Hole Oceanographic Institute.

The goal of the Wendy Schmidt Oil Cleanup X Challenge is to inspire entrepreneurs, engineers, and scientists worldwide to develop innovative, rapidly deployable, and highly efficient methods of capturing crude oil from the ocean surface. The Wendy Schmidt Oil Cleanup X Challenge has two phases:

Phase I: From August 2010 – April 2011, teams are invited to register and to submit their approach to clean up oil slicks. An expert panel of judges from industry and academia will evaluate all of the proposals.

Phase II: The judges will select up to 10 of the top teams to demonstrate their ability to efficiently and rapidly clean up oil on the ocean surface in a head-to-head competition. These proofs of capability, which will determine the winner, will take place at the National Oil Spill Response Research & Renewable Energy Test Facility (OHSMETT) in New Jersey. The top team that demonstrates the ability to recover oil on the seawater surface at the highest oil recovery rate (ORR) and recovery efficiency (RE) will win the $1m Grand Purse. Second place will win $300,000 and third place will win $100,000 in purses.

(Photo Credits: iRobot)

www.seadiscovery.com

NEW YORK
118 E. 25th St., New York, NY 10010
Tel: (212) 477-6700; Fax: (212) 254-6271

FLORIDA
215 NW 3rd St., Boynton Beach, FL 33435
Tel: (561) 732-4368; Fax: (561) 732-6984

PUBLISHER
John C. O'Malley
jomalley@marinelink.com

Associate Publisher & Editor
Gregory R. Trauthwein
trauthwein@marinelink.com

Contributing Editors
Capt. Edward Lundquist, USN (Ret.) • Steve Withrow

Production Manager
Irina Tabakina
tabakina@marinelink.com

Production Assistant
Amanda O'Malley
aomalley@marinelink.com

Sales Administration & Office Manager
Rhoda Morgan
morgan@marinelink.com

Sales & Event Coordinator
Michelle Howard
mhoward@marinelink.com

Manager, Accounting Services
Rhoda Morgan
morgan@marinelink.com

Manager, Public Relations
Mark O'Malley
momalley@marinelink.com

Manager, Marketing
Jocelyn Redfern
jredfern@marinelink.com

Manager, Information Technology Services
Vladimir Bibik
bibik@marinelink.com

CIRCULATION
Kathleen Hickey
mtrcirc@marinelink.com

ADVERTISING

Vice President, Sales and Marketing
Rob Howard
howard@marinelink.com
Tel: (561) 732-4368 • Fax: (561) 732-6984

Advertising Sales Manager
Lucia M. Annunziata
annunziata@marinelink.com
Tel: (212) 477-6700 • Fax: (212) 254-6271

Japan
Katsuhiro Ishii • amskatsu@dream.com
Tel: +81 3 5691 3335 • Fax: + 81 3 5691 3336

Year end is traditionally a time of reflection and planning; an opportunity to evaluate what has occurred and incorporate these insights to better chart for future success. Despite a slowly recovering global economy and the universal tightening of budgets — from universities to government to corporations — today is a particularly interesting and potentially lucrative time to be in the business of subsea technology.

Offshore: While the Macondo spill in the Gulf of Mexico has quickly evaporated from front page news, the lingering effects — particularly the discussion and implementation of new rules and regulations in the wake of the disaster — will linger. But according to Jim McCaul, a noted offshore industry market analyst and head of IMA (www.imastudies.com), the recently lifted offshore drilling moratorium and resulting regulations will do little to stunt the industry's long-term growth. A report, with a bullish prediction of floating production systems, is on page 8.

Defense & Maritime Security: In a meeting earlier this summer, U.S. Navy CNO Admiral Gary Roughead signaled the USN's increased interest in the continued advancement of unmanned underwater systems, and a number of security breaches globally have kept the importance of port and harbor security — both in military and commercial sectors — at the forefront. Rear Admiral Chris Parry, starting on page 40, shares his thoughts on the "intelligent use of advanced technologies" to help minimize subsea threats. Starting on page 12, we are pleased to offer insights from Mark Andress, Director, Navy Maritime Domain Awareness, U.S. Navy, regarding the latest position on the USN and Maritime Domain Awareness.

Gregory R. Trauthwein • trauthwein@marinelink.com • tel: 212-477-6700

MARINE TECHNOLOGY REPORTER
www.seadiscovery.com
Vol. 53 No. 9
ISSN 1559-7415
USPS# 023-276

118 East 25th Street,
New York, NY 10010
tel: (212) 477-6700;
fax: (212) 254-6271

Marine Technology Reporter ISSN 1559-7415 is published monthly except for February, August, and December by New Wave Media, 118 E. 25th St., New York, NY 10010-2915. Periodicals Postage at New York, NY and additional mailing offices.

POSTMASTER: Send address changes to MARINE TECHNOLOGY REPORTER, 118 E. 25th St., New York, NY 10010-2915.
Postmaster send notification (Form 3579) regarding undeliverable magazines to Marine Technology Reporter, 118 East 25th Street, New York, NY 10010.

Publishers are not responsible for the safekeeping or return of editorial material. ©2010 New Wave Media.

Member
BPA WORLDWIDE BUSINESS

Subscription:
To subscribe please visit
www.seadiscovery.com/subscribe

Gutta-percha

A Big Factor in the Early Sub Cable Industry

Gutta-percha is a genus of tropical trees found naturally in Southeast Asia and in many South Pacific islands. More importantly, for purposes of this posting, the term is also applied to the sap of these trees. The sap is an inelastic natural latex, somewhat similar to the sap of the rubber tree. The trees themselves can grow to be over 100 feet in height and up to nine feet in circumference. The leaves are a glossy evergreen, between five and ten inches in length. The tree produces berries up to two inches in diameter. The sap is biologically inert, water resistant, resilient to pressure, and (most significantly) a good electrical insulator. Unlike unvulcanized rubber (so-called India rubber), gutta-percha does not become brittle over time. Shortly after the invention of the electrical telegraph in 1837, it became apparent that laying a submarine communications cable between Europe and the United States could be both highly beneficial and highly profitable. Various experiments were conducted. One of the major problems was keeping seawater out of the cable. Tests soon revealed that gutta-percha was an excellent coating for the cable, as it was flexible, electrically insulating, and largely impervious to seawater. For the next hundred years, up until the chemical revolutions following World War II, gutta-percha was the product of choice for submarine cables globally. Its bio-inertness has also made gutta-percha useful in various medical applications. It is still used in dentistry to fill the empty space inside the root of a tooth following root canal procedures. Utilizing its thermoplastic characteristics, companies for many years made decorative and functional objects (such as chess pieces, tea trays, and plaques) out of gutta-percha. It was also used for the core of golf balls and for hand grips on revolvers and pistols.

The submarine cable industry, though, owes its tremendous success to the viscous juice of an obscure tropical tree.

(Posted on MaritimeProfessional.com by Dennis Bryant)

IMA Report

Floating Production Sector Looks Promising

The number of floating production systems continues to grow – 250 floating production units are now in service or available worldwide. Five years ago there were 177 units, ten years ago 119 units. In the current inventory are 155 floating production storage offloading vessels (FPSO), 42 production semis, 22 tension leg platforms, 18 production spars, 8 production barges and five floating storage regasification vessels (FSRU). Current order backlog consists of 49 production floaters. In the backlog are 35 FPSOs, 6 production semis, 1 tension leg platform, 3 FSRUs and 4 floating gas liquefaction vessels (FLNG). Brazil continues to dominate orders for production floaters. Of the 49 production floaters on order, 19 units are being built for use offshore Brazil – about 40 percent of the order backlog. Seven units on order do not have field destinations at this time. They include 4 FLNGs, 1 FPSO in liquidation and 2 FPSOs where work has been slowed.

Available production floaters

Eleven production floaters are off field and looking for work as of mid-November. Not all of these units will likely find new employment. Some are candidates for scrapping. But among the available units are at least a half dozen FPSOs that appear capable of being modified and competitively redeployed. In addition, the three FPSOs and four FLNGs that were speculatively ordered are available for field deployment. The number of available units will likely grow over the next several years. A significant number of FPSOs are reaching end of field life. Three FPSOs have been on field for more than 20 years, 8 for more than 15 years and 27 for more than ten years. At least half of these units look like redeploy candidates, particularly 15 units that have been operating in the North Sea more than ten years and 2 units that have been operating more than ten years off Australia.

According to Jim McCaul, head of Houston/Washington based offshore industry market analysts, "the fundamentals driving the floating production market look very strong." McCaul says "IMA is now tracking 196 offshore projects at various stages of design or planning that potentially require a floating production or storage system." New safety and permitting regulations imposed as a result of the Macondo spill will slow drilling starts in the short term and add cost to future offshore development. But McCaul said the regulations are unlikely to have major long term impact on project development in the GOM. "There will be added burden to obtaining permits and higher cost for equipment such as upgraded BOPs. But the burden will be insignificant in the context of the revenue potential of a large producing well."

According to McCaul, development in the GOM has not stood still over the past six months. "While the drill moratorium was in place, several major deepwater projects in the GOM moved to the development stage. A contract for a production semi on Tubular Bells was awarded and contracts for production floaters on three other projects (Olympus TLP, Jack/St. Malo production semi and Bigfoot TLP) moved to the contract-imminent stage."

The Macondo spill generated a flurry of proposals to suspend drilling in other deepwater areas. But according to McCaul, "the proposal by the European Commission to impose a moratorium on deepwater drilling offshore Europe was rejected. Canadian authorities decided no drilling ban offshore Canada was necessary. In Brazil, the most important floater region, deepwater is business as usual." McCaul said, "at the end of the day, the world needs oil and deepwater is a major source of future production." For further information on this study

Email: imaassoc@msn.com
or visit www.imastudies.com

FL Governor Proclaims "Ocean Renewable Energy Week"

Florida Governor Charlie Crist proclaimed November 1-7, 2010 as "Ocean Renewable Energy Week" in Florida in observance of a national conference being hosted by the Southeast National Marine Renewable Energy Center (SNMREC) in the College of Engineering and Computer Science at Florida Atlantic University. "Renewable Ocean Energy & the Marine Environment: Responsible Stewardship for a Sustainable Future," will bring together national and international leaders in ocean renewable energy to explore cutting-edge science and technology to identify gaps in the current state of knowledge regarding the environmental impacts of marine renewable energy. The conference took place November 3-5, 2010 at PGA National Resort, 400 Avenue of the Champions, Palm Beach Gardens, Fla.

$60.7B: Total Offshore Wind Spend

New research released by energy business analysts Douglas-Westwood reveals the world offshore wind market will see expenditure of $60.7B over the next five years. By 2015, annual expenditure will be in excess of $19B.

With over 3GW of capacity online by the end of 2010 and a further 2GW under construction at present, the offshore wind industry is growing extremely quickly. Over the five year period to 2015, more than 11GW of new capacity will be installed. The UK, Germany and China are the three biggest markets, which together will install almost 9.3GW, or 83%, of total global capacity for the period. The UK will continue its position as the leading market for offshore wind through the next five years with over 4.4GW of new capacity coming online. For the UK, the bigger success story is the momentum which is building in the supply chain with multiple offshore turbine manufacturers establishing themselves in the country. Critically, in the midst of big cuts to public spending, it has been made clear that government support for renewable energy and wind in particular is to continue. Although the UK has helped build the momentum in recent years, the large German market is now coming to life with project construction finally underway and tendering ongoing on projects for the next five years. Elsewhere in Europe, the Netherlands is now showing commitment to the sector, which should allow some of the many planned projects to reach construction. "While Europe has been the hot-spot of activity to date. We anticipate that China will become the world leader in offshore wind, overtaking the UK early in the next decade," said John Westwood, Chairman of Douglas-Westwood. "Having entered the offshore wind industry only recently, the country has massive ambition. A succession of small projects is now underway with construction of many larger projects imminent. Over 3 billion is expected to be spent in China over the next five years." **http://www.dw-1.com**

WHOI Receives $2m

Grant for Oceanography Imaging

Woods Hole Oceanographic Institution (WHOI) received a grant of more than $2m from the Gordon and Betty Moore Foundation for work in imaging informatics in oceanography. The WHOI study-to be done in collaboration with the Tetherless World Constellation group at Rensselaer Polytechnic Institute (RPI)-is an interdisciplinary project that will develop new tools for ocean scientists who work with underwater imagery, said Heidi M. Sosik, a senior scientist in Biology and a principal investigator along with WHOI Information Systems Specialist Andrew Maffei. "This project will address some of the challenges we face in converting our huge underwater imagery data sets into a better understanding about the ocean and its ecosystems," Sosik said.

Co-Principal Investigators Heidi M. Sosik and Andrew Maffei work with underwater imagery data.

(Photo by Tom Kleindinst, Woods Hole Oceanographic Institution)

The Gordon and Betty Moore Foundation's Chief Program Officer, Science, Dr. Vicki Chandler, cited WHOI's research as critical in generating "new knowledge about marine ecosystems through designing innovative informatics solutions to organize and analyze ocean sensor data."

As with many scientific investigations, any such success will rest on the project's ability to enhance scientific knowledge. For Sosik, this involves understanding how and why phytoplankton blooms occur at different times and places in the ocean. "We are very interested in the basic question of what regulates phytoplankton communities," she said. "For example, the timing and occurrence of the winter plankton blooms are very important for other species that rely on them as a food source-fish and invertebrates. If the bloom fails one winter, then you may get low survival of fish. We're all hopeful that, down the road, the kind of basic information we are collecting will allow us to do a better job of managing fisheries and other coastal resources."

WHOI has developed a number of innovative underwater imaging systems for research and emerging applications to address issues such as harmful algal bloom mitigation and ecosystem-based fisheries management. Sosik is co-developer of the Imaging FlowCytobot, an automated underwater microscope system that has been recording high-resolution images of hundreds of millions of phytoplankton at the Martha's Vineyard Coastal Observatory (MVCO) for more than four years.

The value of such instrument systems is limited, however, by the lack of efficient and easy to use tools to extract information from huge numbers of images and then make that information readily available to many users. The partnership between WHOI and RPI is expected to go a long way toward bridging that gap and will also set the stage for extending informatics solutions into other areas of the ocean and Earth sciences.

"This data set has the potential to provide us with phenomenal information about blooms in New England waters," Sosik said of the Martha's Vineyard observations. "And this project will help us develop the tools we need to efficiently extract that information and quickly learn from it."

"The informatics solutions will also make it really easy to help other users do the same with their data sets, which is very important since a commercial version of Imaging FlowCytobot is being developed right now," said Sosik, who is currently funded under the Gordon and Betty Moore Foundation's Marine Microbiology Initiative.

The Foundation grant will focus on two other projects as well: SeaBED, developed by WHOI scientist Hanumant Singh and colleagues, and HabCam, a camera system that provides a unique glimpse of the seafloor through optical imaging. SeaBED, an autonomous underwater vehicle (AUV) that can fly slowly or hover over the seafloor to depths of 6,000 feet (2,000 m), is particularly suited to collect highly detailed sonar and optical images of the seafloor, which can be made into mosaics.

"Over the last decade we have built up the capabilities in our underwater imaging platforms to gather large quantities of data," said Singh, an associate scientist in the Applied Ocean Physics and Engineering department. "This grant will help us leap forward, taking that data and

digesting it into useable information."

The HabCam vehicle flies over the ocean bottom, taking high-resolution images and creating a continuous image ribbon 100 nautical miles (185 km) in length each day. **"HabCam provides an expansive view of the seafloor, but we are swamped in images — we collect a half million every day," said Gallager, lead scientist for the vehicle.** "Extracting information from those in an automated and efficient way is essential to addressing long-standing science questions in benthic ecology. It may also enable us to move this technology into operational fisheries oceanography for the survey of sea scallops, ground fish, and other commercially important species. The Gordon and Betty Moore Foundation project will provide new tools to process and understand an ever-increasing amount of image data."

Maffei said the collaboration with RPI's Tetherless World Constellation, headed by Peter Fox, was "crucial to our success" in securing the grant.

UNOLS Polar RV Committee

UNOLS is seeking nominations for individuals interested in serving on a committee that will verify that the Polar Research Vessel (PRV) Science Mission Requirements (SMRs) reflect the current and future scientific needs. The PRV Committee (PRVC) membership shall be comprised of up to 12 individuals who will represent the various science disciplines. In addition to members of the academic community, the committee shall include individuals with experience in research vessel operations and technical support, as well as naval architects. Details are available on-line at **www.unols.org/committees/prvc/PRVC_StatementOfTask.pdf.** Nominations to serve on the PRVC can be sent to the UNOLS Office and self nominations are encouraged. Applicants or nominees should submit a brief statement of interest in serving on PRVC along with a CV to the UNOLS Office by email: office@unols.org. Include information about sea-going and/or polar experience. Appointments will be made in a manner to achieve a balance of expertise in the different scientific disciplines and technical areas. Committee members will be formally appointed by the UNOLS Chair.

Information Ahead of Platforms

The Navy and Maritime Domain Awareness

*An interview with **Mark Andress,** Director, Navy Maritime Domain Awareness, U.S. Navy.*

By Edward Lundquist

The U.S. Navy has made a significant shift from being focused on platforms to being focused on information, according to Mark Andress, Director of Navy Maritime Domain Awareness. Admiral Gary Roughead, the Chief of Naval Operations (CNO), has recognized that the future budget may not support the number of platforms we need, and the Navy must better integrate the platforms it has. He recognizes that the explosion in information and the threats to the cyber domain that we're seeing requires the Navy to better focus on information at large," Andress says. "That means wholesale, from how we acquire a future Navy, all the way to how we operationalize it. If you want to know where the Navy is heading in the next decade, it's about information."

Andress says the CNO views this transformation as "being as significant as the transformation from sail to steam to nuclear power. He is really trying to get us to look at information and capabilities across all levels of war and across all disciplines."

The principals of net-centric warfare remain valid, Andress says. "Every platform a sensor, every sensor networked, and information available for use across that network whenever you need it."

But he says there's more, he says. "There is going to be the need for persistent ISR (intelligence, surveillance and reconnaissance), and a very aggressive approach into unmanned systems, to include unmanned aerial vehicles undersea vehicles and surface vehicles. Persistence is the key to going forward."

Persistence means the ability to keep a sensor in place for extended periods of time, and to be able to control it from a source far away. Just as important is expanding a state of processing, integrating intelligence, expanding communication capabilities, he says.

"With over 90% of global trade being conducted on the sea, it's more than just maritime nations that are affected by protection of the global commons—it's essentially the world," Andress says. "We have been actively focusing on fostering an environment where global maritime safety and security is a priority."

Andress says there has been an improvement around the world. "This last October, we hosted the International Seapower Symposium ISS – 19, at the Naval War College. Over a hundred navies were represented, including 90 heads of navies. One of the big themes was maritime domain awareness (MDA), or maritime situational awareness (MSA) as some countries around the world call it. We agreed that all of us need to a better job on issues such as piracy, terrorism at sea, illicit trafficking. We've got to do better at sharing information, and creating better understanding of trafficking in our own waters. Many of these countries have been pretty aggressive at standing up the Automated Information System (AIS) and integrating coastal radar systems with AIS. We're starting to see regional cooperatives. For example, in the

Mediterranean, you've got VRMTC, Virtual Regional Maritime Traffic Center. That is a cooperative in the Mediterranean basin where they're all sharing their picture amongst each other and then they are trying to advance that, with more and more information sharing as can be agreed. We see the same thing in the Pacific and we see the same thing in the Northern Med, and the Black Sea, etc. What's good about these regional networks is that you essentially get a coalition of the willing that is able to effectively share information."

Andress says information-sharing hurdles arise when attempting to establish a single, global network. "It's just too big to overcome, especially as it relates to the information on commercial shipping."

The U.S. government recognizes that it's not a just a Navy issue, or even a Navy-Coast Guard issue. "If we're going to achieve effective maritime security, it's got to be an inter-agency, whole-of-government approach. So through the maritime domain awareness effort, we're bringing together Coast Guard and Navy, FBI, Customs and Border Protection, the Maritime Administration. We have an entire government structure around trying to foster better and better information sharing amongst inter-agency partners, including the intelligence community."

These other countries are realizing this, as well. We've hosted multiple operational games, if you will, inviting different countries. We started inviting their customs, immigration and state department reps to come with their navies. We started information-sharing scenarios, and at the end of it, they're all realizing "Wow, this isn't a navy-navy issue; this is really a whole-of-government issue."

"Inside the United States, we're continuing to expand our partnerships, and now with our foreign partners, they're trying to do the same," he says. "It's almost like a social network starting to form and this social network is expanding into regions. Our next focus is going to be on linking the various regions together. We've got some efforts this year that are making a lot of progress between linking together a region in South America, with the Mediterranean, with the Indian Ocean, and then with the

Asia-Pacific region. So it ends up being about 50-some odd countries linked through four different regional partners. Inside the regional partners, they are sharing a lot of information. And then they'll start with a small group, sharing information back and forth."

Andress says the solution must include industry more. That's an area that where I think can always use improvement. We've hosted an industry day and invited industry to come in and hear us explain our requirements, major technology gaps, and where we need help. We openly presented a wide array of gaps from maritime application of infra-red and video surveillance to information integration and anomaly detection. We want industry to know where to direct their IRADD (Individual Research and Development Dollars) to get to a certain point that we're going to be interested in acquiring what they offer. We told them, 'We want to be your best customer.' We will host another Industry Day next year and welcome participation from the commercial maritime industry."

The second area is more in direct partnership with industry on maritime security cooperation, Andress says. "I think the best place you can see this right now is in the Horn of Africa in countering piracy. The Navy is a part of a combined task force of protection against piracy in the Gulf of Aden off of Somalia. But this CTF is made up of international partner navies from around the world. They've got a strong EU and NATO presence, and they've even got partnerships from the Asia-Pacific region, as well. So, what they're doing now is making industry aware of the transit zones and transit groups so shipping can transit through at certain times and we are able to provide better protection in the region. What I also think is interesting is that we have had fairly aggressive information sharing with industry, through the Maritime Administration (MARAD), such that Navy and even the intelligence community—the Office of Naval Intelligence and the National Geospatial-Intelligence Agency (NGA).

Sharing information can raise sensitivities with industry, Andress admits. "I'm a licensed ship captain, so I've shipped. There are a lot of sensitivities with respect to the maritime domain, especially in partnering with industry. I certainly understand that the commercial carriers preserve privacy for the goods they transport. There's a competition factor, too. You've got markets, especially for commodities that are driven by very timely pricing. Understanding positioning of ships and where certain things are going to arrive at certain times can be market-changers. So, there are a lot of sensitivities in dealing with the maritime industry that doesn't make it as black-and-white as you might think. We need to move out, but we need to be sensitive and we need to do it in a way that allows us to take steady strain and make progress."

Chief of Naval Operations (CNO) Adm. Gary Roughead delivers remarks and answers questions at the AUVSI Unmanned Systems North America 2010 Symposium & Exhibition in Colorado. (U.S. Navy photo)

"Our strategy is about establishing trust and sharing in a region. I don't have to have all the information from a regional partnership led by a foreign country in their region, but I do want to know when they discover an issue of concern to the United States. I don't have to suck up the data and process the data myself. The fact is you're not going to make much progress trying to establish that level of data ingest and processing to get the answer. So, within these regional partnerships, there is processing and alerting based on criteria they're looking for. It varies by region and by threat. It varies if you are a Customs and Border Patrol or the United States Coast Guard. You've got different criteria you're looking for. And, certainly, the Navy has different things that it looks as do our foreign partners. The important point is that the alerts and the issues of interest are shared across these networks," Andress says. "And by establishing these sharing networks, you're also better able to respond at times of crisis. You've got a known group of people that you can reach out to for other information. Oftentimes, those barriers to sharing information may exist on a day to day basis, but during crisis these barriers suddenly shift, and information starts pouring more freely to help address a certain issue."

"If all of that information was available, all the time, then I could connect the known terrorist watch list to the ship that is loading a passenger in Romania, for example, and I could act. But there are a million and one obstacles between connecting that all together. The biggest obstacle is trust."

"The end state we are striving for is the creation of a cooperative network of regionally focused information sharing exchanges that are able to connect the dots of potential threats from the maritime domain and rapidly respond in times of crisis," he says.

"The Navy's future is in information and we can better integrate it, better process it for understanding, and how to better partner and share it in order to better protect the United States and its maritime industry," Andress says.

Capt. Edward Lundquist, USN (Ret.), is a senior science writer for MCR LLC.

Preparing the Next Generation

Underwater Robotics

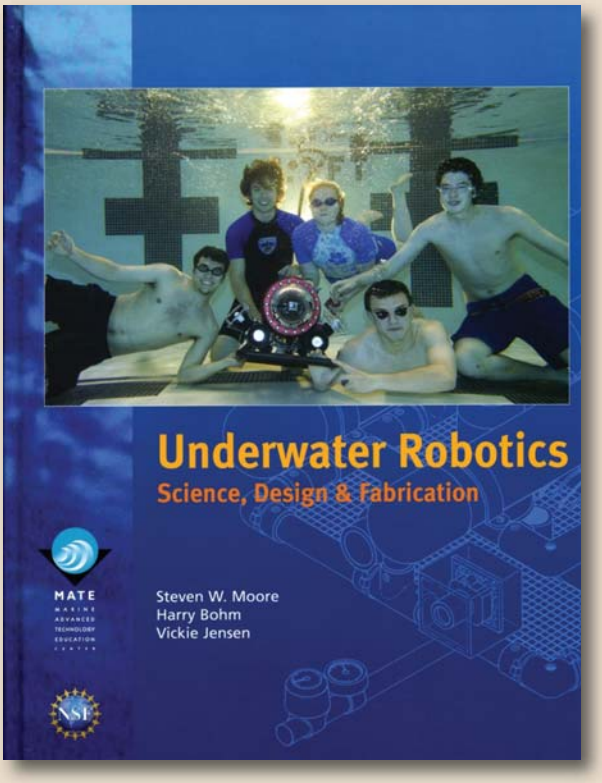
Science, Design & Fabrication

There was a time when designing and fabricating underwater robots to carry out subsea work was the domain of professionals, preferably those with lots of expertise and education. But things have changed. And how! Over the last decade, underwater robots have invaded hundreds of garage workshops and junior high, senior high, home school, and university classrooms, as teachers, students, and tech enthusiasts have been drawn to the hands-on learning that designing, building, and piloting these underwater craft can provide.

Many of these newcomers cut their teeth on Build Your Own Underwater Robot and Other Wet Projects, an enthusiastic introduction co-authored by Harry Bohm and Vickie Jensen and published by Westcoast Words. Student teams built and learned by participating in events such as the Marine Advanced Technology Education (MATE) Center's international ROV competition program, which annually challenges thousands of young inventors to create ROVs (Remotely Operated Vehicles) to grapple with a series of "real life" underwater scenarios.

But students and teachers wanted more. Building on this groundswell of enthusiasm for its ROV competitions, MATE set out to write a comprehensive textbook that would provide more advanced information, answers, and ideas for teachers as well as both beginning and intermediate students or do-it-yourself inventors. The result is Underwater Robotics: Science, Design & Fabrication, by Steve Moore, Harry Bohm, and Vickie Jensen and published by the MATE Center.

The MATE Center is one of more than 30 Advanced Technological Education Centers established with funding from the National Science Foundation. Headquartered at Monterey Peninsula College, in Monterey, California, MATE is a national partnership of community colleges, research institutions, professional societies, government organizations, and marine indus-



About the Book

Underwater Robotics: Science, Design & Fabrication

- *ISBN: 978-0-9841737-0-9*
- **Authors: Dr. Steven W. Moore, Harry Bohm, Vickie Jensen**
- **Illustrator: Nola Johnston**
- **Pages: 770 with bios, appendices, glossary and index**
- **Over 500 illustrations, diagrams and photographs**
- **Publisher: Marine Advanced Technology Education (MATE) Center, Monterey, CA**
- **Ordering info: www.westcoastwords.com** or **www.marinetech.org**
- **Price: $99.95 plus shipping**

tries working to improve marine technical education and meet the needs of the ocean workforce. MATE's student ROV competi¬tions, its summer institutes for faculty development, and this textbook are all examples of products and services developed by the Center to fulfill its mission.

The textbook was a tall order--to create a resource that would introduce students, educators, and other aspiring inventors to subsea technology and demonstrate the wide range of career options in contemporary ocean science, technology, and engineering.

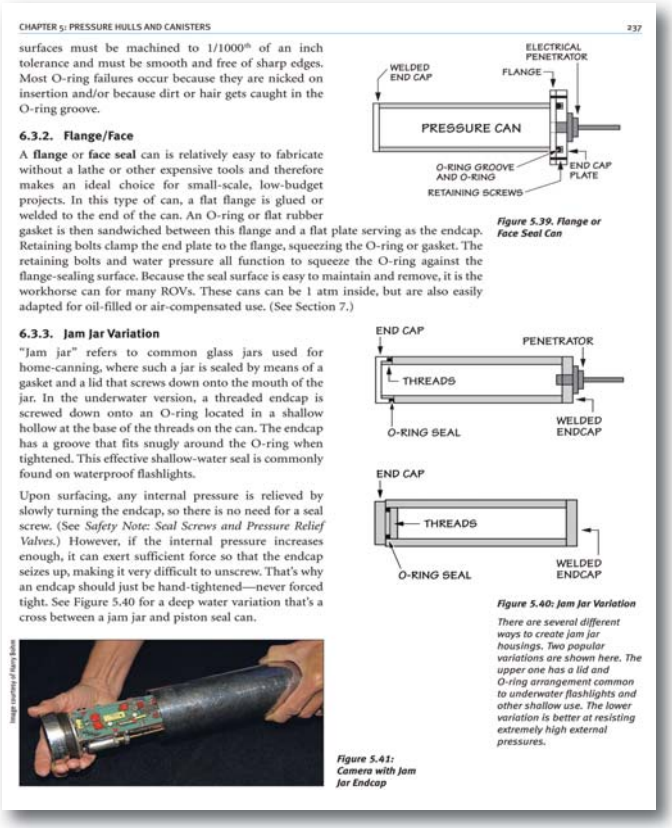
To do so, the authors provide clear, concise scientific information for a range of readers, from those just getting their feet wet in the underwater world to those already immersed in the field. The pages of text feature numerous illustrations that depict those scientific principles, as well as photographs comparing do-it-yourself-built craft with commercial robots and submersibles functioning in the real world.

The textbook also provides a design rationale, as well as stressing the importance of teamwork, safety, deadlines, and budget, all essential skills whether readers are building robotic craft for a competition or self-designed underwater mission or are going on to a subsea career. Equally important in the book are the examples and projects that provide hands-on learning, as well as adaptations and modifications for additional missions.

Does Underwater Robotics live up to this challenge? Marty Klein, side scan sonar pioneer, looked at final chapter drafts and stated, "This book

MATE competition, 2008.

www.seadiscovery.com



CHAPTER 5: PRESSURE HULLS AND CANISTERS 237

surfaces must be machined to 1/1000th of an inch tolerance and must be smooth and free of sharp edges. Most O-ring failures occur because they are nicked on insertion and/or because dirt or hair gets caught in the O-ring groove.

6.3.2. Flange/Face

A **flange** or **face seal** can is relatively easy to fabricate without a lathe or other expensive tools and therefore makes an ideal choice for small-scale, low-budget projects. In this type of can, a flat flange is glued or welded to the end of the can. An O-ring or flat rubber gasket is then sandwiched between this flange and a flat plate serving as the endcap. Retaining bolts clamp the end plate to the flange, squeezing the O-ring or gasket. The retaining bolts and water pressure all function to squeeze the O-ring against the flange-sealing surface. Because the seal surface is easy to maintain and remove, it is the workhorse can for many ROVs. These cans can be 1 atm inside, but are also easily adapted for oil-filled or air-compensated use. (See Section 7.)

Figure 5.39. Flange or Face Seal Can

6.3.3. Jam Jar Variation

"Jam jar" refers to common glass jars used for home-canning, where such a jar is sealed by means of a gasket and a lid that screws down onto the mouth of the jar. In the underwater version, a threaded endcap is screwed down onto an O-ring located in a shallow hollow at the base of the threads on the can. The endcap has a groove that fits snugly around the O-ring when tightened. This effective shallow-water seal is commonly found on waterproof flashlights.

Upon surfacing, any internal pressure is relieved by slowly turning the endcap, so there is no need for a seal screw. (See *Safety Note: Seal Screws and Pressure Relief Valves.*) However, if the internal pressure increases enough, it can exert sufficient force so that the endcap seizes up, making it very difficult to unscrew. That's why an endcap should just be hand-tightened—never forced tight. See Figure 5.40 for a deep water variation that's a cross between a jam jar and piston seal can.

Figure 5.40: Jam Jar Variation

There are several different ways to create jam jar housings. Two popular variations are shown here. The upper one has a lid and O-ring arrangement common to underwater flashlights and other shallow use. The lower variation is better at resisting extremely high external pressures.

Figure 5.41: Camera with Jam Jar Endcap

676 UNDERWATER ROBOTICS

Figure 12.37: Potting Set-Up with Epoxy Potting Compound

The liquid compound then hardens (cures), sealing the camera and its connecting wires inside the container. A potted camera can easily withstand water pressure to 130 feet (approx. 40 m). Remember, however, that the camera cannot be removed if it has been encapsulated with a polymer. The advantage of wax is that it's possible to remove and reuse or repair the camera.

The simple potting technique explained in the instructions below is based on suggestions made by Nuytco Research Ltd. and VideoRay LLC. It should allow you to successfully waterproof a camera to depths of 100 feet (approx. 30 m). This set of instructions uses polyurethane as the potting compound, but you can opt to use wax instead.

8.2.1. Camera Parts and Materials

To pot your camera, you'll need the items listed below.

- one CCD video camera, such as the model PC 166XS sold by Supercircuits: Note that there are many tiny, inexpensive video cameras available—check out various websites, catalogs, and stores in your area. Make absolutely sure that any camera you get is compatible with the 12 VDC battery power used in *SeaMATE*. Many of the smaller video cameras are designed for use with 5 volt DC supplies or low-voltage AC power; those models generally will not work with a 12 VDC supply and may even be permanently damaged by connection to such a supply.
- one transparent plastic box, big enough to hold the camera: A clear polystyrene jar (Figure 12.37) works well, too. This clear container needs to be at least 1½ inches wide by 1½ inches long by 1½ inches deep in order to fit most small cameras. No lid is necessary. The part of the box that the camera will look through needs to be optically clear with no seams, ripples, lines, etc.
- one video monitor compatible with camera video output format
- one small tube of silicone sealant: (5-minute epoxy is a good, faster alternative.) Get the smallest amount you can buy, since you'll be using only a dab. Silicone is used to secure the camera lens to the bottom of the transparent box. Use a toothpick or sliver of wood for an applicator.
- one 8-oz epoxy or polyurethane compound kit for potting: Get compound with a longer curing time (1-2 hours). This is available at hobby shops, hardware stores, fiberglass supply outlets or via the internet. Toilet bowl wax is another option.

is going to become an instant classic." Drew Michel, chair of the Marine Technology Society's ROV Committee says, "This is the book that underwater robotics educators have been waiting for."

Underwater Robotics: Science, Design & Fabrication is written for advanced high school classes, college and university entry-level courses, and the underwater technology enthusiast. Each chapter begins with a true scenario (called Stories From Real Life) that sets the stage for the ocean science, physics, math, electronics, and engineering concepts that follow. All chapters include an outline, learning outcomes, and summary. The range of chapter subject matter is as follows:

CHAPTER 1: Underwater Vehicles
CHAPTER 2: Design Toolkit
CHAPTER 3: Working in Water
CHAPTER 4: Structure and Materials
CHAPTER 5: Pressure Hulls and Canisters
CHAPTER 6: Buoyancy, Stability, and Ballast
CHAPTER 7: Moving and Maneuvering
CHAPTER 8: Power Systems
CHAPTER 9: Navigation and Control
CHAPTER 10: Payloads
CHAPTER 11: Operations
CHAPTER 12: SeaMATE

- Chapters 1-2 provide an introductory overview of manned and unmanned underwater craft (from earliest times to modern day) and suggest pragmatic strategies for designing underwater robots (particularly ROVs).

- Chapters 3-10 introduce the limitations and challenges of working in water then focus on specific technical issues, ranging from structure and materials to power systems and payloads. In each of these topics, the relevant science is paired with practical robotics. The chapters are filled with visual and textual examples, ranging from basic home-built vehicles to complex, commercial craft.

- Chapter 11 and 12 move from theory into hands-on learning. Chapter 11 details how to prepare and carry out missions, particularly those conducted by smaller ROVs. Chapter 12 provides complete plans and instructions for SeaMATE, a build-as-you-learn ROV, then discusses ideas and strategies for more advanced projects.

This 770-page resource features over 500 color photographs and illustrations. The wealth of photographs help readers connect with actual examples of commercial and scientific subsea robotic craft. The straight-forward illustrations are designed to expand and explain textual con-

cepts. The textbook concludes with author bios, appendices, glossary, and index.

The varied expertise of the three co-authors combines to provide a very readable mix of science, design and fabrication tips, and pedagogy. Dr. Steven W. Moore completed his Ph.D. in bioengineering from the University of California (UC) Berkeley and UC San Francisco and currently teaches courses in marine biology, physics, and electronics/robotics at California State University Monterey Bay (CSUMB). Harry Bohm has a pragmatic background in diving, workboats, and serving as manager for Simon Fraser University's Underwater Research Lab. He conceived of the Sea Perch ROV project that is now in wide use in many science classes and clubs across the United States. Vickie Jensen, co-author and editor of the textbook, earned her maritime waterwings as editor of Westcoast Mariner Magazine, traveling aboard tugs, tankers, fishing boats, dredges, or charter craft each month. She and Harry Bohm co-authored Build Your Own Underwater Robot and Build Your Own Programmable Lego Submersible. Illustrator Nola Johnston specializes in educational and interpretive design and illustration, as well as teaching design courses. This is her third underwater robotics book. Jill Zande, textbook project coordinator, is the MATE Center's Associate Director and coordinator of its ROV competition program. She has spent the last 10+ years working with her team to excite and engage thousands of students and teachers from around the world in hands-on science, technology, engineering, and math learning experiences.

MARINE TECHNOLOGY REPORTER

The global authority for underwater technology & ocean science information presents the 2011...

MTR 100

Profiling the 100 leading companies in the underwater technology marketplace.

MARINE TECHNOLOGY REPORTER

MTR 100 APPLICATION

Marine Technology Reporter's annual MTR100 awards edition is the subsea industry's most awaited annual ranking of the leading companies serving the global subsea industry.

The July 2011 Edition of Marine Technology Reporter will profile the leading 100 companies currently serving the marine technology market. This exclusive editorial product will be distributed to MTR's world-leading qualified circulation, and will serve as an invaluable guide for companies, government agencies, municipalities, research institutions and universities seeking product and service providers throughout the year.

DEADLINE: Return this application to MTR's editorial offices by May 27, 2011, or visit www.seadiscovery.com to apply. Alternately, you can e-mail required information and images to trauthwein@marinelink.com.

Photographs: In addition to information, please submit 2 photographs: one of the top executive, and one which depicts your companies leading technology. Please submit at 300 dpi/.jpg files.

Company Name: _____

Contact Person: _____

Contact Person Title: _____

Address: _____

City _____

State _____

Country _____

Postal Code _____

Tel: _____

Fax: _____

E-mail: _____

Website: _____

CEO: _____

President: _____

Vice President: _____

Marketing Director: _____

Sales Manager: _____

General Manager: _____

Engineering Director: _____

Facility: _____

Acres: _____

Square Footage: _____

Testing Capabilities: (ie. test tanks, boats, pressure chambers): _____

_____

_____

Number of Employees: _____

Annual Sales (US$): _____

Company Profile: 250 Word Description

Please provide here a maximum 250 description of your company, its history, and significant accomplisments.

_____

_____

_____

_____

_____

Technology Profile: 250 Word Description

Please provide here a maximum 250 description of the products and services your company provides, with particular emphasis on unique developments, or current R&D initiatives.

_____

_____

_____

_____

_____

118 E. 25th St. - 2nd Floor, New York, NY 10010 • tel: 212-477-6700 • fax: 212-254-6271
Email: trauthwein@marinelink.com • www.seadiscovery.com

Oceans Week 2010

Spotlight on Underwater Vehicles

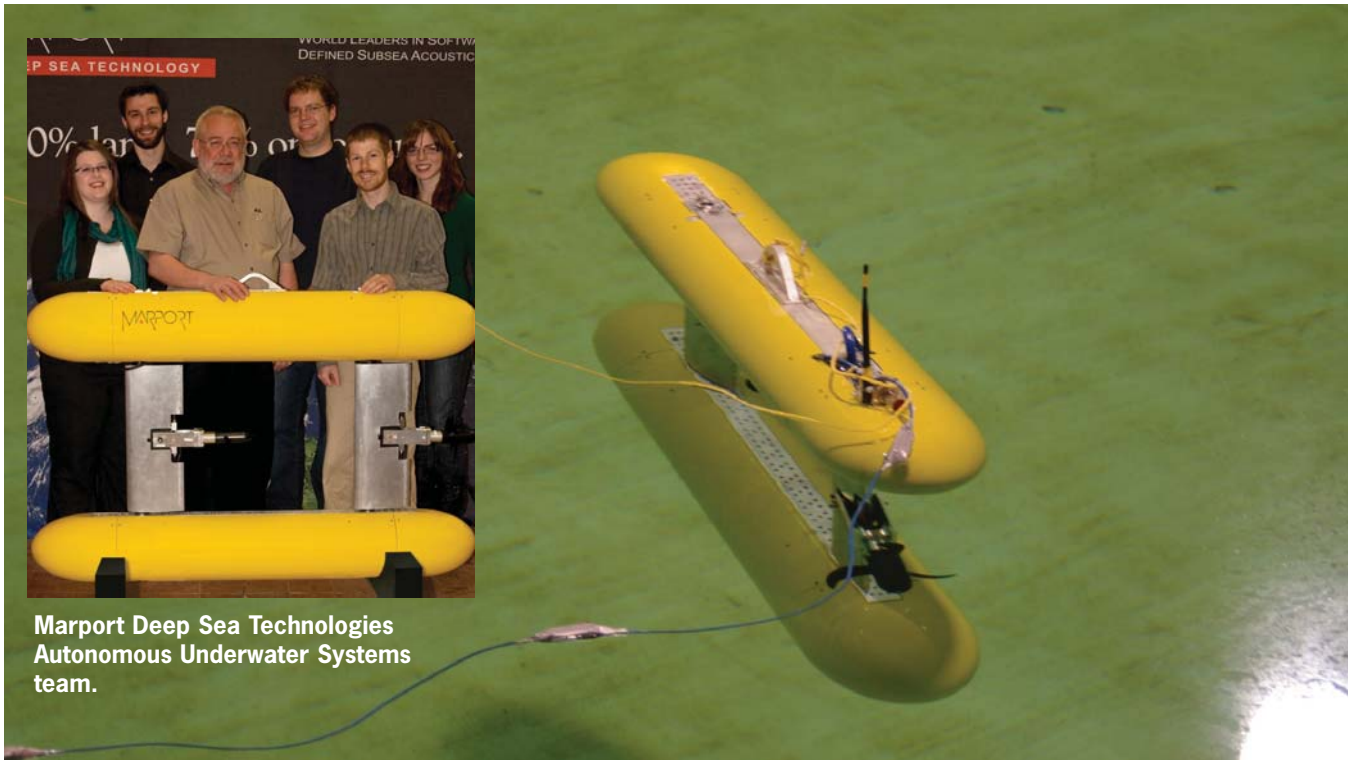
By Andrew Safer

Oceans Week in St. John's, Newfoundland and Labrador focused a spotlight on underwater vehicles at both the Ocean Innovation conference and the 6th Biannual National Research Council-Institute for Ocean Technology (NRC-IOT) Workshop on Underwater Vehicle Technology between October 17th and 23rd. Now in its eighth year, Ocean Innovation was the brainchild of Randy Gillespie, Director of Applied Research at the Marine Institute's School of Ocean Technology. Asked why St. John's has become a center for ocean technology development, he said, "A large number of individuals have been working in the oceans sector here for 25+ years. They know each other, and that level of familiarity makes this place unique. In a Canadian context, the fact that the government of Newfoundland and Labrador has identified the ocean technology sector as a priority is also unique."

The two-day specialist workshop on underwater vehicle technology brought Canadian researchers together "so they find out who's who, get them talking to each other, and collaborations may result," said Chris Williams, NRC-IOT Senior Research Engineer and a lead organizer of the event. Building capacity is another objective. There were 24 presentations including 11 by graduate students from University of Victoria, Dalhousie and Memorial Universities.

The recently established Autonomous Underwater Vehicles Laboratory at Memorial University is becoming a hub for AUV development. Commenting on the facilities available to the laboratory and the research performed there, Ralf Bachmayer, Canada Research Chair in Ocean Technology and director of the lab, said, "I'm not aware of anyplace in the world that has compara-

Marport Deep Sea Technologies' SQX-500 twin-pod AUV being tested in the Ocean Engineering Basin at the National Research Council of Canada – Institute for Ocean Technology.



Marport Deep Sea Technologies Autonomous Underwater Systems team.

ble testing facilities, infrastructure, and the application area right at its fingertips."

Three St. John's-based companies presented on their underwater vehicle technology: GRI Simulations Inc.'s VROV Field Development Kit, Marport Deepsea Technologies Inc.'s SQX-500 AUV, and Pangeo Subsea's Sub-Bottom Imager.

GRI Simulations' (http://www.grisim.com/) VROV Field Development Kit (FDK) supports the design and development of subsea oil and gas fields, from site survey through design, construction, production and decommissioning. Stephen Dodd, Vice President, Operations & Business Development, explains that the system builds on the high-fidelity dynamics and graphical capabilities of GRI Simulations' VROV Simulator, a training and rehearsal system for ROV pilots.

The FDK links GIS, bathymetry, and model databases to ensure that field design models are dimensionally correct and realistically situated. The 3D visualization incorporates pipeline routes, geological features, pipelines, trees, manifolds and other objects in the field. The same model is updated through the life of the project, and can be used for accessibility testing, flowline crossover detection, hazard identification, and mission rehearsal. When switched to the simulator mode, an ROV pilot-trainee can interact with the 3D pipe and other visualized equipment. Currently in operation on international projects with two major oil companies, the FDK is being extended to life of field support roles through embedded interfaces for historical documents and real-time data related to engineering analysis.

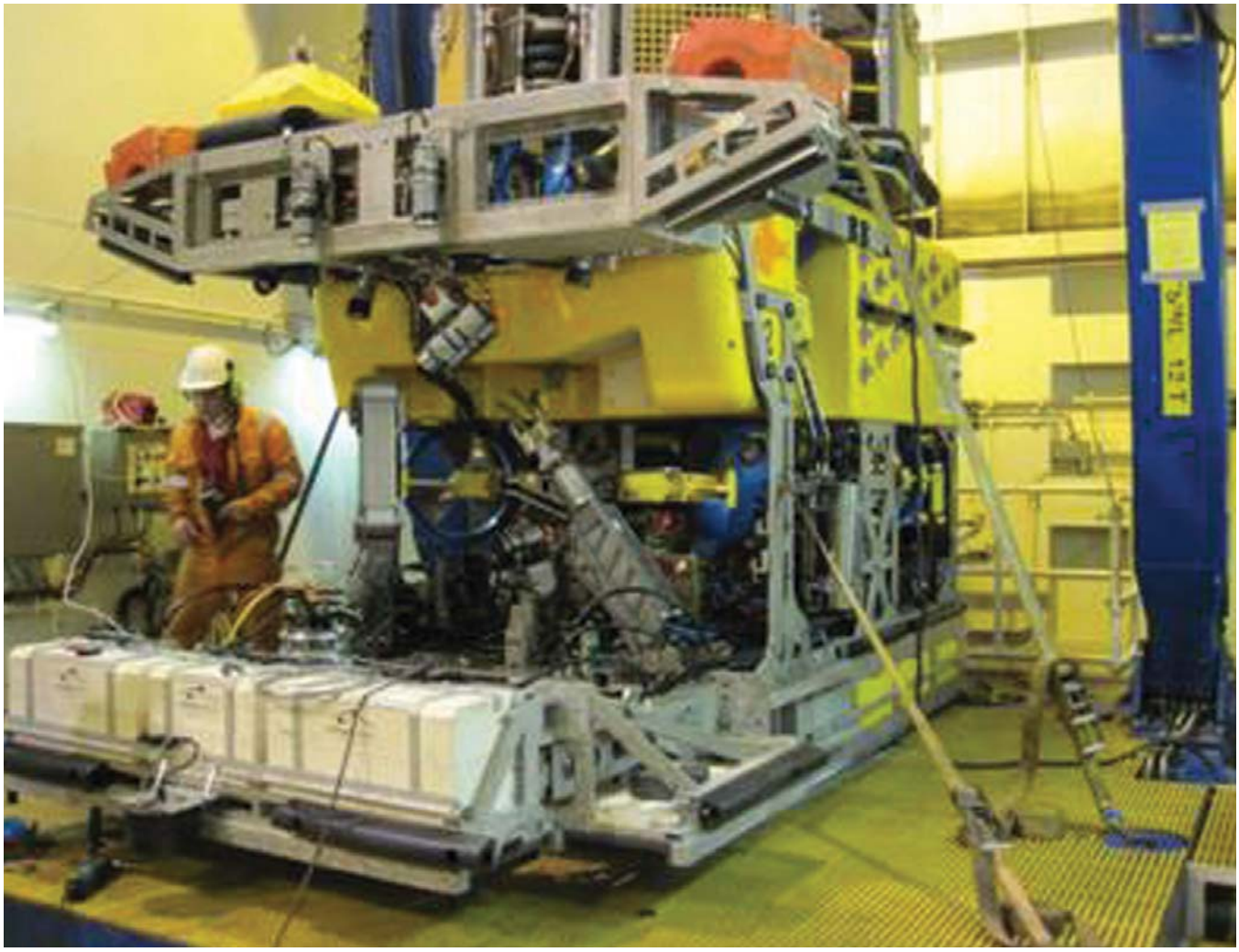
(L to R): Dean Steinke, Director of Operations, Dynamic Systems Analysis; Stephen Dodd, VP, Operations & Business Development, GRI Simulations Inc; and Chris Collier, Principal Consultant, Hudson Solutions Group, LLC.

For these purposes GRI is partnering with Dynamic Systems Analysis (DSA) of Halifax to develop the interface that integrates DSA's riser model and analysis software into the FDK, and with Hudson Solutions Group of Houston to enable real-time access and display of historical documents including video and production process data such as pressures, temperatures, and alarm status.

When Marport Deep Sea Technologies Inc. (http://www.marport.com/) developed the SQX-500 AUV, they married the twin-pod design developed by the Woods Hole Oceanographic Institute to a unique 3D thrust-vectoring system which "allows almost an unprecedented degree of maneuverability for an AUV," said Neil Riggs, Vice President, Research and Development and Project Manager, Autonomous Underwater Systems. The unit's propulsion and control systems enable hovering, "turning on a dime," and crabbing (moving side to side). The heavy components are in the bottom pod and the lighter components are in the upper pod, ensuring the center of buoyancy is considerably higher than the center of gravity and providing stability in pitch and roll.

The company performed tests and hydrodynamic experiments in the towing tank, ocean engineering basin, and cavitation tunnel test facilities at the National Research Council's Institute for Ocean Technology and the flume tank at the Fisheries and Marine Institute of Memorial University. Pressure, drag measurement, and full-scale propulsion tests were conducted as well as stability

PanGeo Subsea's Sub-Bottom Imager on work class ROV.



(Credit: PanGeo Subsea Inc.)

and propeller design characterization experiments. Geodetic Offshore Services Ltd. (GOSL) of Nigeria is purchasing the SQX-500 to locate, inspect, and monitor oil pipelines using side-scan sonar and video. Harbor acceptance testing is slated for January/February. In 2011, Marport Deepsea Technologies plans to develop an SQX AUV capable of operating at a depth of 3,000 meters.

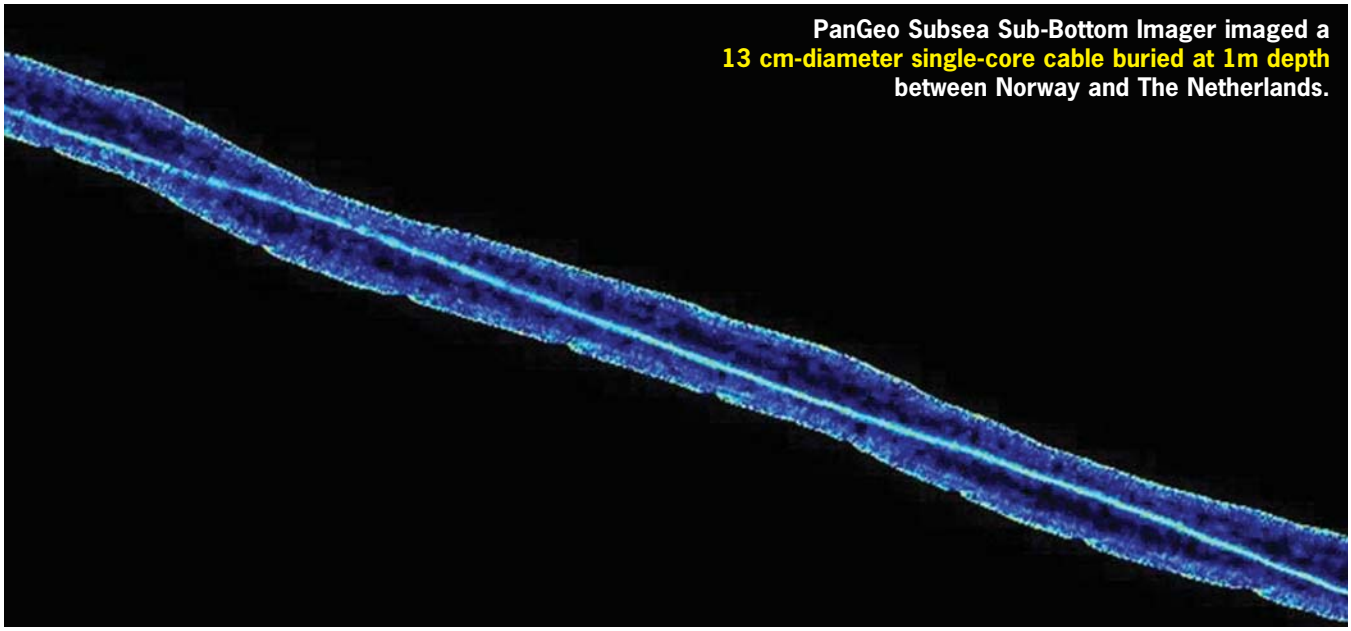
PanGeo Subsea Inc.'s (http://www.pangeosubsea.com/) Sub-Bottom Imagerä is an acoustic survey tool that creates a five-meter-deep by five-meter-wide 3D volumetric image of the sub-seabed which images buried pipelines and cables, stratigraphy, geohazards, unexploded ordnances, and other manmade objects.

The unit which includes a 40-channel acoustic hydrophone array is mounted on the front of a work class ROV outfitted for survey work. As the ROV moves across the sea floor, data received by the acoustic package is transmitted to a nearby vessel and processed in real time to populate the 3D image. Assisted by a surveyor, the pilot is able to see the image of the buried cable or pipeline underneath the ROV, and can continue to track it. In a commercial pilot arranged with Statoil, DOF Subsea, and the Research Council of Norway in 2009, the Sub-Bottom Imagerä imaged through a rock dump covering a pipeline in the North Sea. "This was the first time to our knowledge that anybody has imaged a buried pipeline with a sonar system," said Gary Dinn, PanGeo Subsea's Vice President, Technology Development. The images also showed the point where two buried pipelines intersected, and recorded exact distances.

In another demonstration project, in March 2010 the unit imaged a buried cable between Norway and The Netherlands in conjunction with a NorNed cable survey. After the repair work was completed, the Sub-Bottom Imager™also verified the depth of burial at approximately one meter. "We thought it might be more challenging to image the oil-impregnated cable, compared to steel pipe," reports Dinn. "This was the first time anybody has imaged something like that in the seabed with that degree of resolution."

(Credit: Andrew Safer)

Gary Dinn, Vice-President, Technology Development, PanGeo Subsea Inc.



PanGeo Subsea Sub-Bottom Imager imaged a 13 cm-diameter single-core cable buried at 1m depth between Norway and The Netherlands.

(Credit: PanGeo Subsea Inc.)

Five Minutes with DFAIT's

Jane Rutherford

Trade Commissioner & Global Practice Lead, Ocean Technologies

Jane Rutherford is a trade commissioner with the Canadian department of Foreign Affairs and International Trade (DFAIT) and has recently started an assignment as the global practice lead for the ocean technology sector. Jane has worked in various senior management roles with the Government of Canada, most recently with the Department of Public Safety, before joining DFAIT five years ago. She has a long interest and attachment to the sea from having travelled as a child on a cargo ship along coastal west Africa and the Congo River, to earning a steering ticket while guiding a bulk carrier through Spain's Canary Islands.

— by Greg Trauthwein, Editor

Put in perspective the Canadian Federal Government's attitude toward the development of the Subsea industry?

JR The Government of Canada is putting a sharper focus on the ocean technologies sector by developing a global strategy to support growth of the sector. The new strategy will guide the work of the Trade Commissioner Service in our offices abroad and across Canada. The Department of Foreign Affairs and International Trade (DFAIT) is leading the development of the strategy. I'm doing this work from St. John's and based with OceansAdvance, the ocean technology cluster organization in Newfoundland and Labrador. We have just signed an MOU with OceansAdvance to help connect with industry across Canada. We are aiming to base the new strategy on the strengths, objectives and needs of Canadian companies. The subsea industry is part of what we're looking at in the ocean tech sector. In addition to subsea technology products and services, we're also looking at innovative Canadian technologies that work at the ocean surface and on-board vessels. We've had really great feedback to date from Canadian companies as well as from partners in other federal and provincial government departments. The marine business is highly international so it makes sense for the government to have a global strategy on how we can best support development of the Canadian sector.

What is your vision for the development of the Subsea Industry in the next five years?

JR The drivers pushing development of this industry are heating up. These are considerations such as:

- increased concerns with security,
- understanding climate change,
- concerns about food supply,
- the need to better predict tsunamis,
- protecting fragile marine eco-systems,
- on-going energy supply concerns that push deeper exploration for hydrocarbon resources and innovation in ocean renewable energy technologies,
- changing shipping routes due to changes in global trade patterns,
- the opening of the Arctic
- All of these are an impetus for more technology to work in and understand the changing marine environment.

For the Canadian industry, we are aiming to grow exports, support international partnerships for development of innovative new technologies, and attract foreign companies that would like to establish operations in Canada and build on those partnerships and access our world class R&D infrastructure in this sector. Robust R&D activity and commercialization of new technologies will put Canada at the forefront in terms of being able to respond to emerging requirements. As well, Canadian entrepreneurs are seeking opportunities for international partnering. Increasingly, we'll all be looking at subsea technologies for international waters – deeper, colder, more remote and hostile environments. Incidentally, and perhaps as no surprise, Canadian companies are particularly good at developing technologies that work well in harsh water environments. This is one of the areas of R&D at the National Research Council's Institute for Ocean Technology (IOT) where I am based in St. John's NL,

(Photo credit: Lisa Piercey)

Jane Rutherford is a trade commissioner with the Canadian department of Foreign Affairs and International Trade.

Canada. IOT's ice tank, towing tank, and wave tank along with the flume tank down the road at the Marine Institute make for an excellent environment to test marine technologies.

What do you see as the top challenges to successfully reaching this goal?

JR The world's oceans are not unlike outer space when it comes to some of the technology challenges of exploration and development. However, most of the countries with space exploration programs aren't putting the same level of support towards oceans exploration. And then there are parts of the world that may be facing significant challenges in coastal and ocean management but without the funds or awareness of the types of subsea technologies that could help address the problem. So awareness of this technology area and funding for R&D can be a challenge. Those of us in the business have an ongoing role to promote it! Another challenge, again in the area of coastal and ocean management, is interoperability of systems so that as ocean observing projects expand, they can 'talk' to each other. This underscores the importance of international collaboration on technology R&D in the subsea industry.

What government programs are in place, or being created, that are directly geared towards expanding the business of your Canadian companies?

JR There are various programs across different parts of the country. For information on these government programs, you can to refer to www.canadabusiness.ca and follow the links depending on where you are in the country and what specifically you're looking for. When it comes to international business development – for Canadian companies or companies outside of Canada looking to partner with Canadian companies, the best place to look for information is www.tradecommissioner.gc.ca.

Can you detail, specifically, the funding or programs available to Canadian companies that are intended to help them expand in the Subsea sector?

JR While Canada's very active in terms of marine technology as a whole, there are very few programs that specifically target the subsea sector. By using the Canada Business or Trade Commissioner links above, you can find

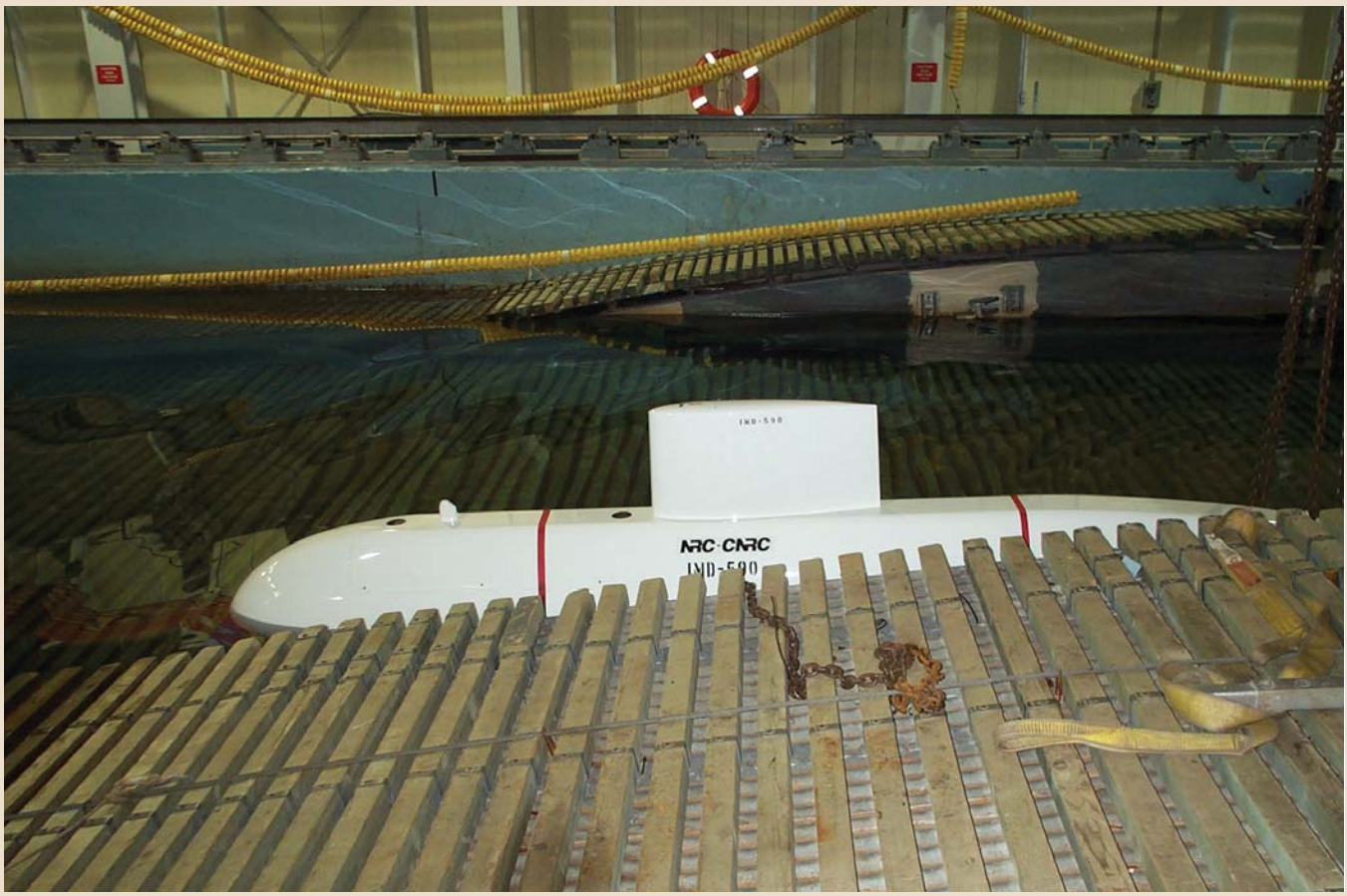
contacts who can respond to anyone who has specific questions.

From where you sit, which geographic regions in the world (outside of Canada) hold the most interesting promise in this sector?

JR Companies with innovative niche technologies are doing business literally all over the world. Given the commercial opportunities in this sector, companies are on the look out for market intelligence on upcoming opportunities – wherever in the world. Companies with technology applications in the offshore oil and gas businesses are following new exploration projects; companies with environmental monitoring technology may be interested in geographic regions that have experienced coastal flooding problems, etc. The U.S. and Europe have long been active in this sector with mature companies and advanced R&D programs, and Canada has a long history of innovation partnering with both. However, as with other sectors, emerging economies are also areas of interest: China, India, Brazil are countries with a lot of offshore activities or needs requiring advanced technologies.

What do you count as the leading strengths of Canada's Subsea technology sector?

JR There is a lot happening right now in Canada. Canada is a leader in ocean observation systems as well as with various technologies designed to function in a harsh marine environment – in Canada we know about cold water, ice, waves and storms. For instance, Neptune Canada **www.neptunecanada.ca** is the world's largest cabled seafloor observatory and is located off the west coast of the country. We also have a big system in Quebec – the St. Lawrence Global Observatory **www.slgo.ca** and another one off the east coast called Smart Bay **www.smartbay.ca**. Across the country in industrial, university and government research labs there is ongoing work on the next generation of sensor technologies, innovative platforms such as autonomous underwater vehicles and even marine mammals. And then there's the challenging data component from its collection, fusion and communications. We're able to get increasingly complex information from diverse sources on the marine environment via the internet in real time. Because of our naturally cold water environment, a lot of the Canadian subsea technology is especially designed to operate in harsh environ-



(Photo credit: NRC Institute for Ocean Technology)

ments. We're looking at things like remote operation and power supply, and longer deployment functionality for these types of environments. If you want to know if your technology works, come and test it in Canada. We have the R&D infrastructure and expertise to help and you'll know that if it works off Canadian waters, it'll work anywhere! We have a great new online map of the Canadian ocean technology sector that can help you find contacts and capabilities. Check it out at **http://ocean.cinmaps.ca**.

Is the Canadian government fostering business alliances with companies/institutions outside of Canada?

JR The Government of Canada is fostering international business alliances in the oceans sector. We are also fostering international innovation partnerships or collaborative R&D alliances. The Canadian Trade Commissioner Service places a significant focus on international partnering as a 'win-win' way for Canadian companies and their foreign partners to grow. We facilitate relationships based on complimentarity of technologies – whether it's is for a joint bid on a big project or to advance commercialization of a promising new technology — we see international relationships as key to success and growth. Canada also has bilateral agreements with a number of countries to support technology innovation and collaborative research and development. Various federal departments have such agreements. For instance, the Department Foreign Affairs and International Trade Canada currently has four bilateral agreements – with Brazil, China, India and Israel — where the governments of the two countries fund collaborative R&D projects. The National Research Council's Industrial Research Assistance Program also has similar agreements. The Government also has a funding program called Going Global Innovation that helps cover the costs of getting Canadian companies and researchers together with international partners to discuss potential R&D collaboration. Companies and researchers outside of Canada interested in partnering with Canadian entrepreeneurs should contact the Government to learn more about the opportunities available to them. Find the nearest embassy or trade office to you at **www.tradecommissioner.gc.ca**.

How has the global economic slowdown affected any of your plans for developing the Subsea business here?

JR The Government of Canada is moving ahead with development of a new international strategy for the ocean technology sector. We do see, though, that companies have been impacted by the recent global economic challenges. And different companies have had different experiences. I know of companies that have pulled back and downsized due to a drop in

Canadian Company inks a
A Royal Deal

(Photo credit is Ultra Electronics Maritime Systems)

(L to R: Gerben Klein Baltink (TNO Netherlands), Jim Hanlon (President, Ultra Electronics Maritime Systems), Canadian Ambassador to The Netherlands James Lambert, Vice Admiral Matthieu Borsboom (Chief of Naval Staff, Royal Netherlands Navy), Alan Barker (President, Ultra Canada), Peter Beerens (TNO Netherlands), Ton van Koersal (TNO Netherlands).

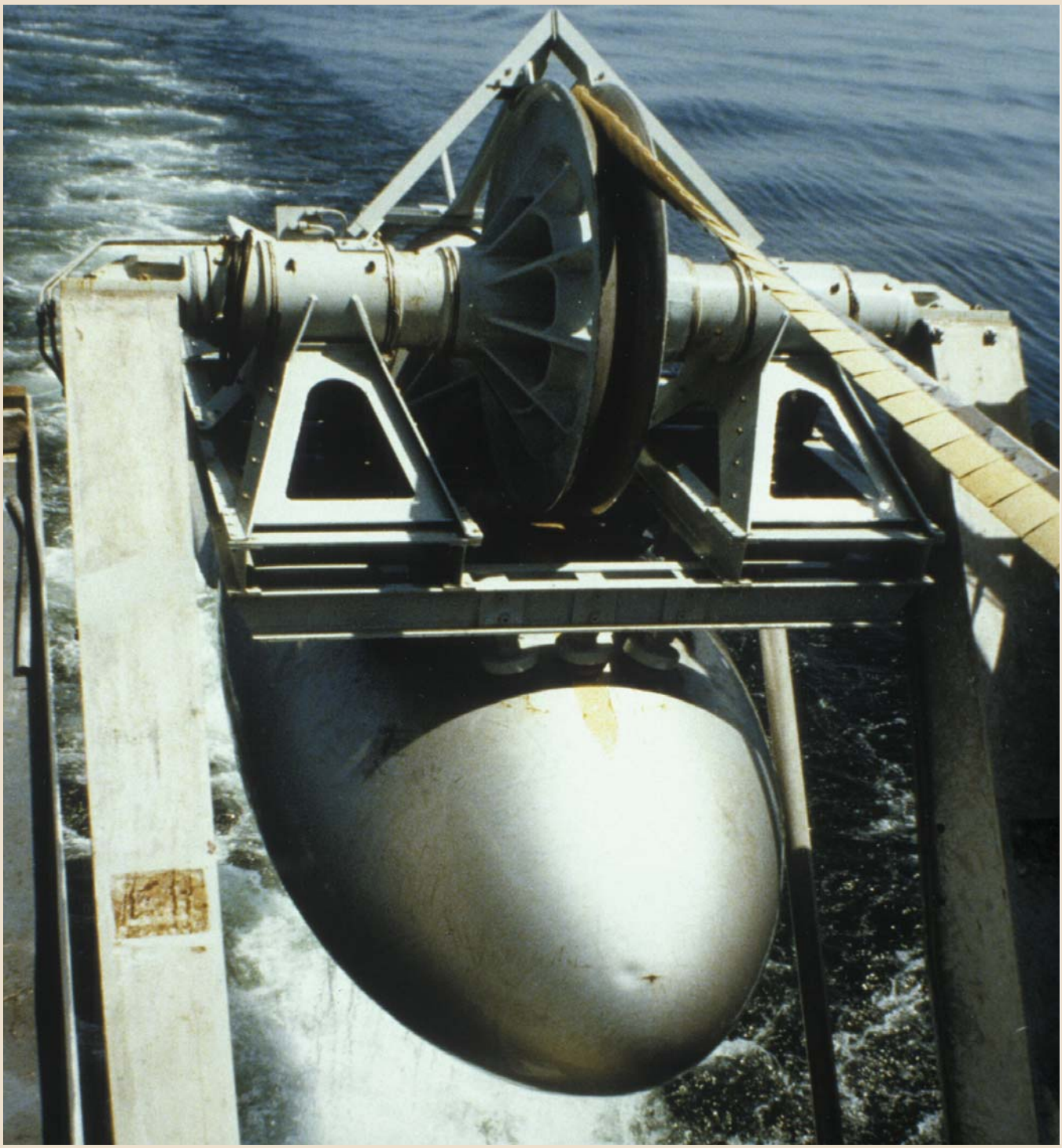
Ultra Electronics Maritime Systems is a leader in the development and manufacture of advanced undersea surveillance systems. In October 2010, the company entered into an Underwater Defense Cooperation Program with the Netherlands' Defense Material Organization. This involves support and future development of advanced technologies to meet the Dutch Navy's needs and builds on a series of projects that Ultra has with the Dutch Navy, including a recent contract award for the development and delivery of Multi-static Active Passive Sonar (MAPS) systems. The Canadian Embassy in The Netherlands was very supportive throughout these initiatives. Ultra is particularly recognized for its high power underwater sonar transducers and sophisticated towed array sonar systems. It's an example of a Canadian company with advanced subsea technology and a track record of continuing innovation.

www.ultra-uems.ca

exports. But I also know companies that have decided to enter new markets in the last year or two with a strategy of 'putting their eggs in more baskets' and profiting from other companies' diminished presence or activity level in a market.

If you had one paragraph to convince the world to seek business partnerships you, what would it be?

JR Canada is one of the world's leading maritime nations, with the world's longest coastline and bordering three of the world's oceans. We know the sea. Our innovative marine technology products and services are based on our experiences in one of the most challenging marine environments in the world. We are open to the world. Come and work with us.



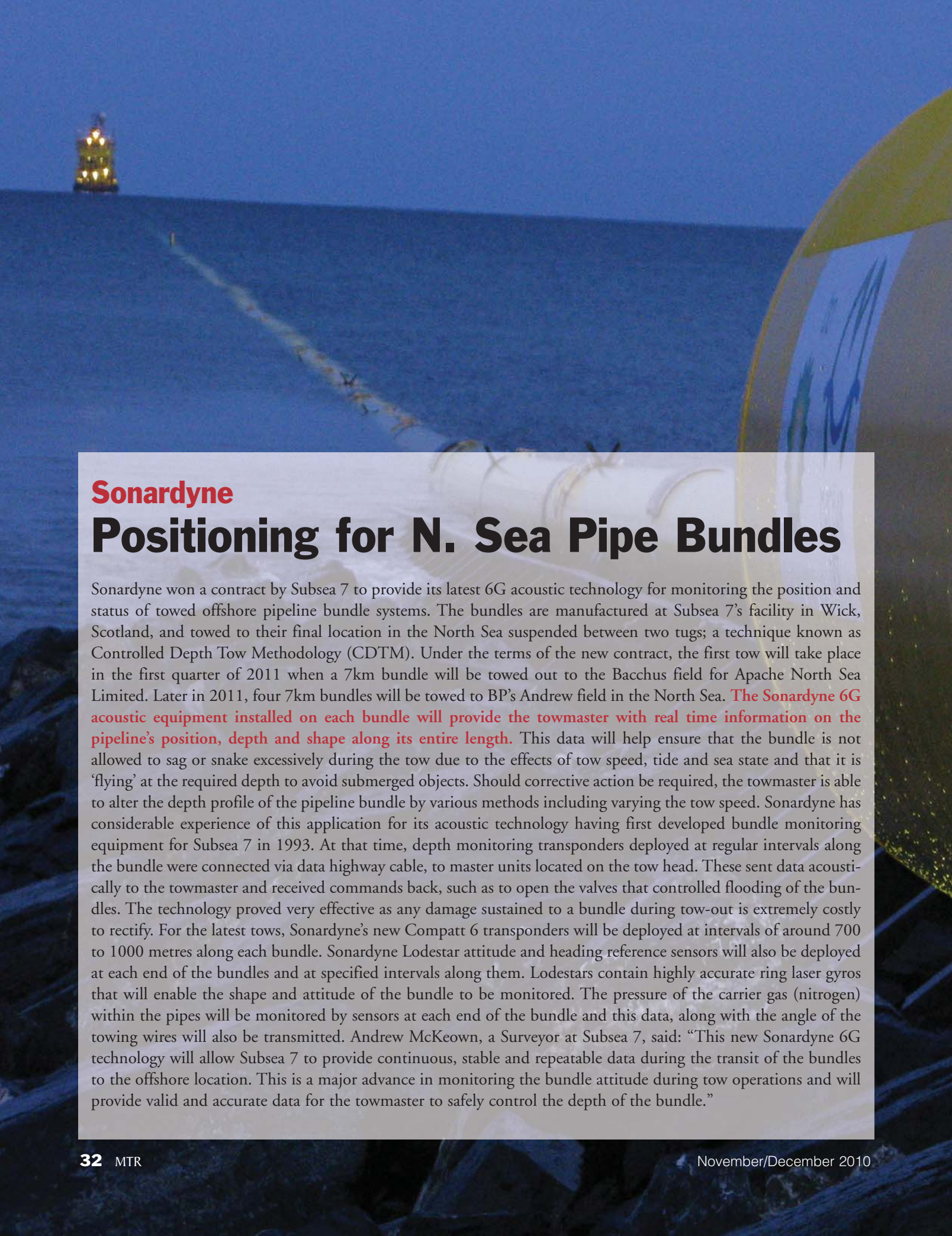
International Submarine Engineering

Going Deep

Since its inception in 1974, International Submarine Engineering Ltd. (ISE) and its partners have placed a priority on innovation. While this priority has resulted in many new underwater products, it has also resulted in new developments other areas. These include an automotive refueling system developed for Shell Oil, a remote manipulator system developed for training astronauts on the CanadaArm and technology to automate operations in mines. Recently, ISE has been working with Natural Resources Canada to obtain arctic seabed data for Canada's claim to the United Nations Commission on the Law of the Sea (UNCLOS). This project has fostered the development of a number of innovative products including the "Catchy" system developed in partnership with Memorial University of Newfoundland. Catchy enables an underwater submersible to be captured, held in place, recharged and refreshed with new mission plans. The Catchy has been a fundamental tool in the operation of these vehicles in our arctic since 2009.

www.ise.bc.ca

(Photo Credit: International Submarine Engineering)



Sonardyne

Positioning for N. Sea Pipe Bundles

Sonardyne won a contract by Subsea 7 to provide its latest 6G acoustic technology for monitoring the position and status of towed offshore pipeline bundle systems. The bundles are manufactured at Subsea 7's facility in Wick, Scotland, and towed to their final location in the North Sea suspended between two tugs; a technique known as Controlled Depth Tow Methodology (CDTM). Under the terms of the new contract, the first tow will take place in the first quarter of 2011 when a 7km bundle will be towed out to the Bacchus field for Apache North Sea Limited. Later in 2011, four 7km bundles will be towed to BP's Andrew field in the North Sea. **The Sonardyne 6G acoustic equipment installed on each bundle will provide the towmaster with real time information on the pipeline's position, depth and shape along its entire length.** This data will help ensure that the bundle is not allowed to sag or snake excessively during the tow due to the effects of tow speed, tide and sea state and that it is 'flying' at the required depth to avoid submerged objects. Should corrective action be required, the towmaster is able to alter the depth profile of the pipeline bundle by various methods including varying the tow speed. Sonardyne has considerable experience of this application for its acoustic technology having first developed bundle monitoring equipment for Subsea 7 in 1993. At that time, depth monitoring transponders deployed at regular intervals along the bundle were connected via data highway cable, to master units located on the tow head. These sent data acoustically to the towmaster and received commands back, such as to open the valves that controlled flooding of the bundles. The technology proved very effective as any damage sustained to a bundle during tow-out is extremely costly to rectify. For the latest tows, Sonardyne's new Compatt 6 transponders will be deployed at intervals of around 700 to 1000 metres along each bundle. Sonardyne Lodestar attitude and heading reference sensors will also be deployed at each end of the bundles and at specified intervals along them. Lodestars contain highly accurate ring laser gyros that will enable the shape and attitude of the bundle to be monitored. The pressure of the carrier gas (nitrogen) within the pipes will be monitored by sensors at each end of the bundle and this data, along with the angle of the towing wires will also be transmitted. Andrew McKeown, a Surveyor at Subsea 7, said: "This new Sonardyne 6G technology will allow Subsea 7 to provide continuous, stable and repeatable data during the transit of the bundles to the offshore location. This is a major advance in monitoring the bundle attitude during tow operations and will provide valid and accurate data for the towmaster to safely control the depth of the bundle."


subsea 7

iRobot

Advancing Robotics Underwater

In an increasingly crowded unmanned underwater vehicles field, iRobot stands out with its robotics pedigree.

– by Greg Trauthwein, editor

The advent of robotics in the mainstream has arrived, and while the inherent challenges of building and operating robots in the marine environment lags robotics found on land and in the air, Bedford, Mass.-based iRobot is intent on doing its part to move forward the capabilities of unmanned underwater systems.

Born from the halls of academia, iRobot was founded in 1990 when Massachusetts Institute of Technology roboticists Colin Angle and Helen Greiner teamed up with their professor Dr. Rodney Brooks with the vision of making practical robots a reality. In 2009, iRobot generated more than $298m in revenue and employed more than 500.

Tom Frost, Program Manager, iRobot Maritime Systems, has spent his entire professional career with iRobot, a dozen years spent initially as a software engineer, coding for a DARPA project that led to the development of the Packbot, iRobot's ubiquitous land-system that is designed for the battlefield, and counts more than 3,000 units delivered to the military and civil defense forces worldwide. It was Frost, who as program manager helped to usher the Packbot from the technology lab into a manufactured product line that is built and delivered with consistency and efficiency, that was chosen in 2008 to serve as program manager for the company's new maritime systems offcice, which today includes:

- **iRobot 1KA Seaglider** A long-range, high endurance UUV that measures temperature, salinity and other quantities in the ocean
- **iRobot 15A Ranger** A man portable UUV that supports technology development related to mine warfare, expeditionary warfare, underwater surveillance/reconnaissance and other missions
- **iRobot Transphibian** An autonomous UUV and bottom crawler capable of supporting a wide variety of defense, first responder and commercial applications

"Today, my role in our maritime group is to oversee transfer of technology into manufactured products," Frost said. "I have the opportunity to take some great concepts and superior technology and migrate it into a product that we are able to manufacture and ship."

Today the Seaglider is in full production; the Ranger UUV is still in the prototype stage, projected to enter manufacturing in 2011.

Challenges Underwater

While iRobot is still a relatively new name in the field of unmanned underwater systems, Frost counts the company's pedigree as a strategic advantage. "We have a history of delivering high quality robots in quantity," he said. "iRobot is really one of the only companies that is pure robotics play. We pride ourselves on taking these technologies and manufacturing them in quantity."

According to Frost, the main challenge in designing robots for use underwater lies in the ability and ease, or lack thereof, in communication, a factor which demands the development of an autonomous or tethered unit.

With the evolution and acceptance of robotics in general in the marine environment, though, expectations continue to evolve, and Frost and the iRobot maritime team work around the clock to address emerging demands.

"In addition to the issue of autonomy, one thing that is common in all of robotics is the need for more battery life," Frost said. "Power (availability and consumption) is always a factor in robotics, and today in the underwater environment, (customers) are always looking to pack in more sensors and capabilities, which of course loops back to power."

While the need for power is echoed across the industry,

Deployment of the Seaglider.

from military to scientific to commercial communities, Frost projects continual improvement in this area. "We're making breakthroughs all of the time, and there is a push for more efficient batteries across nearly every industry, particularly the automotive industry," he said. "There is a lot of money and pressure toward making better batteries. In my business, we take the best that is out in the field (lithium primary, non-rechargeable for its glider; rechargeable lithium for the Ranger AUV) and continually strive to extend the mission time and capability."

As mission length increases, additional challenges emerge as well, such as dealing efficiently with the matter of biofouling. "With all long endurance UUVs, biofouling can be an issue, and with Seaglider's we're out for up to 10 months at a time," Frost said. A top consideration in this regard is the depth at which the vehicle operates. In shallower water, fouling is much quicker and more aggressive, whereas the glider's ability to dive to 1000m helps mitigate the problem to an extent, as at this depth "it causes a number of things to shake loose."

Looking at Robotics as a whole, Frost counts advances in processor speed as the leading technological factor driving robotics forward during his career. "We are riding a delightful curve on processor speed, with a doubling of power every two years that allows us to do much more with the robots," he said. Similarly, tremendous strides in sensor capacity and performance, advances in laser-based scanners (smaller, more durable, more accurate) and cameras as contributing factors.

"Another big factor, though not a technology, is simply acceptance," Frost said. "If you look at the way robots have been deployed in the last 10 years, there is a much greater acceptance of them in warfare and commercial applications."

In the Field

iRobot systems are designed for a variety of missions: military, commercial and scientific, and the company has a number of significant success stories on its log. Most recently, it played a pivotal role in the collection and dissemination of information following the massive oil outflow in the Gulf of Mexico.

iRobot's Seaglider Unmanned Underwater Vehicle (UUV) was used as a platform to collect ocean data in an effort to monitor the recent Gulf of Mexico oil spill. iRobot worked with Dr. Vernon Asper of the Marine Science Department at the University of Southern Mississippi (www.usm.edu) and Dr. Craig Lee from the University of Washington's Applied Physics Laboratory.

In this role, Seaglider measured temperature, salinity and other ocean properties in 3D at depths of up to 1000m (3,290 ft.), allowing researchers to collect data at depths not easily achieved using traditional surface platforms or other UUVs, and to potentially detect the presence of oil and its movement in affected areas. Researchers in the Gulf of Mexico deployed Seaglider to locate and monitor large clouds of dispersed oil droplets believed to be at depths of approximately 700 meters (2,296 feet).

SeaGlider Poirposing.

"iRobot is really one of the only companies that is pure robotics play. We pride ourselves on taking these technologies and manufacturing them in quantity."

• Tom Frost, Program Manager, iRobot Maritime Systems

"With Seaglider, we are realizing new and important mission profiles that it can support," said Joe Dyer, Chief Operating Officer at iRobot. "Traditionally, gliders have proven themselves to be very useful tools for researchers and oceanographers to collect ocean data. With this technology, we also see potential for the oil and gas industries to monitor existing lines and to detect new offshore oil sources."

Unique to its use in the Gulf of Mexico was the fact that iRobot did not merely supply the vehicle, it also provided the glider pilots and made the information gathered publicly available via a number of websites.

To date, more than 120 Seagliders have been delivered to customers worldwide, including the U.S. Navy, government agencies and research organizations.

www.irobot.com

iRobot®

1990
- MIT roboticists **Colin Angle, Helen Greiner** and **Rodney Brooks** co-found iRobot.

1991
- iRobot develops Genghis robot designed for space exploration.

1996
- iRobot develops Ariel, a robot that **detects and eliminates mines in surf zones.**

1998
- iRobot wins DARPA contract to build a tactical mobile robot, leading to development of iRobot PackBot.

2001
- The iRobot PackBot searches at the World Trade Center after the September 11 terrorist attacks.

2002
- **iRobot launches the Roomba** floor vacuuming robot.
- The iRobot PackBot is deployed with U.S. troops for the first time.
- iRobot and the National Geographic Society develop a robot that searches the Great Pyramid in Egypt.

2004
- iRobot wins contract to develop Small Unmanned Ground Vehicle.

2005
- iRobot launches the Scooba floor washing robot.
- iRobot stock **begins trading on the NASDAQ** Stock Exchange.

2006
- iRobot launches the Dirt Dog shop sweeping robot.

2007
- iRobot launches the Verro pool cleaning robot.
- iRobot launches the Looj gutter cleaning robot.

2008
- iRobot expands into maritime robots.
- iRobot launches the Roomba pet series and professional series vacuum cleaning robots.
- iRobot wins contract to develop LANdroid communication robot.

2010
- iRobot celebrates 20 years
- More than 3,500 iRobot PackBot robots delivered worldwide.
- More than 5 million iRobot home robots sold worldwide.
- **iRobot Seaglider helps monitor Gulf of Mexico oil spill.**

Source: iRobot

OceanTech Expo

Explore the business of Ocean Technology

2011

Newport, R.I.

May 17-19, 2011

You build your products to be used in the water, so get out and show and sell them in the water at the 5th Annual O.T.E.

Technology Represented at OTE

Acoustics
AUV's
Bathymetry
Cables
Charting
Data acquisition & mgmt.
Environmental impact studies
Geology
Geophysics & geotechnics
Hydrography
Instrumentation
Meteorology
Modeling & prediction
Navigation
Oceanography
Platforms
Pollution monitoring
Remote sensing
ROV's
Sensors
Sonar
Survey

Contact Rob Howard @ 561-732-4368 or howard@marinelink.com to reserve your demo and booth space today!

oceantechexpo.com

OceanTech Expo

Explore the business of
Ocean Technology
2011

Back in and on the water
Newport Yachting Center
Newport, R.I. May 17-19, 2011

OceanTech Expo welcomes you back
May 17-19, 2011 we return to the Newport Yachting Center in beautiful Newport RI. The location brings us right to the water's edge. Exhibitors will be showcasing their latest gear in a casual business atmosphere designed to highlight the technology on display while allowing attendees live access. This interactive atmosphere provides attendees the knowledge they need to make informed buying decisions about the systems and services available within the industry that address their needs.

In addition Newport delivers many opportunities to network with peers and customers along the waterfront in the many restaurants and pubs that line the wharfs and we will be highlighting this feature with our Sunset Exhibitor Reception. Being able to step out of the booths and onto the boats for live demos combined with our exclusive Industry Outlook Sessions, Expo and Social Events gives our attendees and exhibitors an event unlike any other in North America making OceanTech Expo the must attend event in 2011. So please join us this spring in Newport to "explore the business of ocean technology"!

See you in Newport!

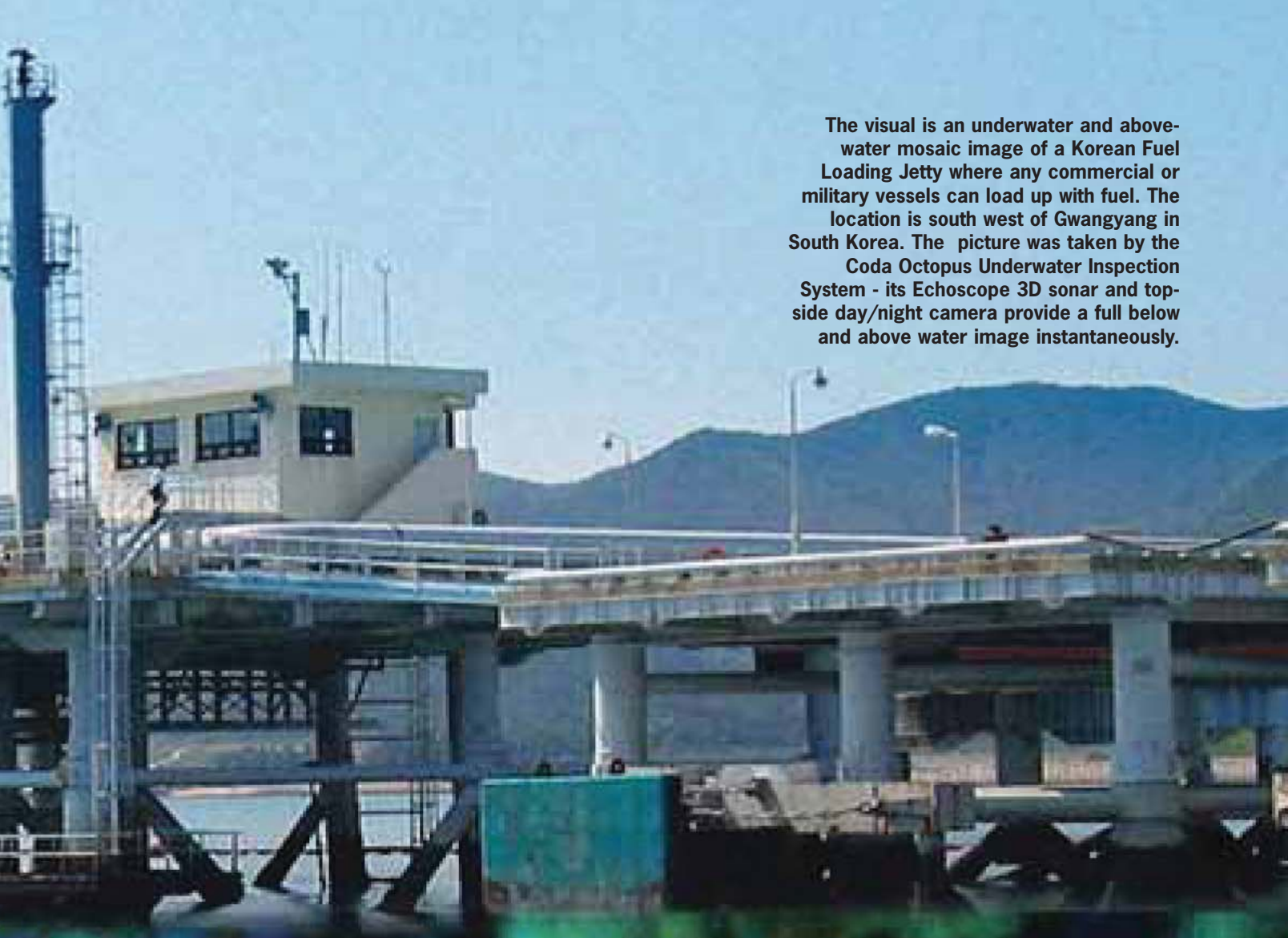
Rob Howard
Show Director
OceanTech Expo

oceantechexpo.com

Presented by:
MARINE TECHNOLOGY REPORTER

Underwater S

Photo Credit: CodaOctopus



The visual is an underwater and above-water mosaic image of a Korean Fuel Loading Jetty where any commercial or military vessels can load up with fuel. The location is south west of Gwangyang in South Korea. The picture was taken by the Coda Octopus Underwater Inspection System - its Echoscope 3D sonar and top-side day/night camera provide a full below and above water image instantaneously.

ecurity Threats

Detecting ... Deterring ... Defeating

by Rear Admiral Chris Parry

Current and emerging threats to ports, harbors, offshore installations and shipping from underwater attack can only be deterred and defeated through constant vigilance and the intelligent use of advanced technologies.

Our globalized world and its economic prosperity and growth are critically dependent on the use of the oceans, with 96 percent of global trade by volume carried by sea.

The sea is, in effect, the physical equivalent of the world-wide web and the freedom to use the seas in peace and security remains a vital priority for states and companies. As a result, terrorist and criminal elements have recognized that they can achieve enormous impact, profile and leverage if they can threaten or disrupt international sea-lanes and major maritime hubs.

Recent attacks on ships in harbor and in maritime straits in areas of poor governance – most notably those on the USS Cole and the MV Limbourg – have shown the scale of threat from terrorists. As well as this, operations by the now-defunct Tamil Sea Tigers and the notorious attack on Mumbai by Islamic terrorists have demonstrated there is considerable potential for an increase in operations launched from the sea against coastal cities and wider maritime targets.

Similarly, the extended reach of Somali pirates over 1,000 nautical miles into the Indian Ocean through the use of fishing vessels employed as 'mother ships', shows the potential scope and scale for further criminal activity at sea. Terrorists and criminals will, of course, have seen the disruption and impact caused – and publicity generated – by the Deepwater Horizon rig explosion in the Gulf of Mexico.

As a result of the greatly increased awareness, especially in the United States, with its many harbors and ports, all U.S. states whose boundaries include maritime harbors and ports are taking decisive steps to put in place surveillance and security measures to deter, detect and defeat the threats associated with criminal and terrorist activity at sea.

As Israel, India and other countries have discovered, it is clear that in the face of growing terrorist and criminal interest, sophisticated, integrated surveillance systems will be required to cope with risks and vulnerabilities in their increasingly complex littoral regions, along with more robust and comprehensive key point and harbor protection schemes.

Even so, in future, attacks from the sea by terrorists — and possibly criminals — against urban and vulnerable economic and prestige targets in areas of poor governance and insufficient security look set to continue, together with operations against isolated offshore platforms and installations.

One aspect currently overlooked — and for which there

is significant under-investment in countering — is the potential for covert underwater attack against ports and other coastal targets. The most immediate threat – which has a long history of success – is that of mines or improvised explosive devices that can be laid from a wide variety of commercial and recreational vessels.

These devices might come from redundant or surplus military stocks available in a global black market or from Underwater Improvised Explosive Devices (UWIEDs) that can be laid on the sea-bed or attached to structures and vessels.

As well as the hazards from explosives, the underwater threat posed by smugglers and traffickers seeking lucrative access points is growing.

It is already, for example, common practice for drugs, illegal materials and arms to be smuggled in externally mounted pods ('parasites') below the waterline of ships' hulls. The examination of hulls before arrival in port or while in harbor is a time-consuming and operationally restricting exercise, often involving excessive and commercially prohibitive delays and the use of divers in near-zero visibility and sometimes dangerous conditions.

An emerging issue relates to the threat caused by mini-submarines and semi-submersible vehicles. Mini-submarines and underwater vehicles (usually for covert and Special Forces operations) have proliferated rapidly over the past decade, with notable examples fielded by Iran and North Korea. However, drugs traffickers — operating between South America and the U.S. — have developed and put into use improvised semi-submersible vessels, capable of penetrating conventional coastal and key point surveillance and detection systems. Indeed, these so-called 'narco-subs', comprising light-weight, low detection materials and commercially sourced components, have acquired steadily increasing levels of reliability and performance.

Further exploitation of the underwater environment by terrorists and criminals is likely. Already, recreational and research mini-sub variants, with operationally useful depth and endurance characteristics, are on the market. The opportunities for covert insertion, attacks on urban targets, energy installations and shipping accessible from the sea and the laying of mines or improvised explosives are evident.

Consideration also needs to be given to the possibility that terrorists might attempt to introduce chemical, biological and radiological (or even nuclear) devices through these means. The precautions needed to contain this sort of threat or incident in a busy commercial port (such as Long Beach, California) or naval bases (such as San Diego, California, or Norfolk, Virginia) would be prohibitively disruptive and expensive.

These risks only increase when one reflects on the vast scale of infrastructure that exists in our crowded and littoral regions — the U.S. alone has more than 95,000 miles of coastline. This region is full of artificial structures, coastal communities, industrial plants, energy installations and renewable projects.

Admiral Thad Allen, who was, until May 2010, the Commandant of the US Coast Guard, has written that the challenge of defending coasts is 'enduring'. He also remarks:

"We again find ourselves operating in an environment where piracy, illegal migration, drug smuggling, terrorism, arms proliferation and environmental crimes are carried out by anonymous, loosely affiliated perpetrators. (From the Foreword to the 2007 US Coast Guard Maritime Security Strategy.)"

Indeed, the Maritime Transportation Security Act of 2002 delivered comprehensive port security legislation in the U.S., but this has been only sporadically implemented because of resource and enforcement limitations. This shortfall leaves U.S. ports exposed to actual attack and to hoaxes. In order to sustain economic vitality, ports and offshore installations rely on uninterrupted access and guaranteed security of operation. Needless to say, a successful attack on a major port is likely to lead to operational and commercial disruption on a large scale, possibly leading to losses of millions or billions of dollars. Even a credible threat or hoax would fundamentally dislocate and restrict the operations of a port or other critical shore side infrastructure.

Deterring – and dealing effectively with and defeating – underwater intruders and mines/UWIEDs depends on an integrated system of surveillance, detection and classification.

Effective responses to real or spurious underwater threats require the ability to make informed and rapid decisions based on unambiguous information and visual clarity. In broad terms, it is necessary for authorities to map and understand the features of their underwater seascape and to record the precise features (both natural and man-made) that exist in their area of control.

This understanding can only be achieved through routine, regular route and harbor surveys using high-definition, multi-beam sonars, especially in areas where the

Effective responses to real or spurious underwater threats require the ability to make informed and rapid decisions based on unambiguous information and visual clarity. In broad terms, it is necessary for authorities to map and understand the features of their underwater seascape and to record the precise features (both natural and man-made) that exist in their area of control.

This understanding can only be achieved through routine, regular route and harbor surveys using high-definition, multi-beam sonars, especially in areas where the seabed is highly textured or cluttered.

seabed is highly textured or cluttered. Only then can anomalies and intrusive devices — such as bottom-laid mines, attachments to structures and UWIEDs — be quickly and accurately detected, ahead of subsequent removal, and the veracity of hoaxes checked. The same technology can be used in surface vehicles or unmanned underwater vehicles to ensure that ships' hulls are free of underwater 'parasites'.

Similarly, protection of critical infrastructure and other installations from underwater approaches by divers and submersible vessels can be achieved through statically mounted arrays of high-definition sonars that can be continuously operated or activated in conditions of high threat.

As states and ports introduce more effective, integrated systems for protecting their offshore zones, access and infrastructure, vulnerabilities are likely to evolve in response to improved security techniques and the character of emerging threats. This means technology companies that have the capacity and technological agility to anticipate future trends and continue to provide leading-edge products will be vital to ensuring the integrity of coastal and offshore installations.

Very few acoustic devices are able to deliver the definitional accuracy, visual clarity and speed of classification required to give assurance in this critical area of maritime security. The level of detail and classification requires a multi-beam system, with sophisticated processing power, that can be easily deployed and deliver instantly recognizable results.

The Echoscope UIS (Underwater Inspection System) developed by maritime security enterprise Coda Octopus, can be rapidly deployed in a static location or on vessels ranging in size from 20 ft. (6 m) in length upwards and on unmanned surface and underwater vehicles. The system offers operators 'the ability to detect underwater threats of any kind, including UWIEDS, in the port environment, on ships' hulls or in the vicinity of other fixed structures.

The Echoscope UIS does not require special operator skills or training, or prior experience or knowledge of sonar techniques. Also, unlike other types of sonar, the 3D real-time data requires no interpretation or post-processing of the image because the system has been designed with interoperability and integration with existing systems in mind.

Data from the Echoscope system can therefore be used for rapid decision-making through display in a wide range of formats that can easily be fused with existing databases and with sophisticated command and control software. It provides unusually distinct images and clarity of vision that enable the detection of devices or intruders by relatively inexperienced personnel with a minimum of training and specialist familiarity in the underwater environment.

It is clear that port, coastal and offshore installations represent significant opportunities for attack, disruption and exploitation by terrorists and criminals. As authorities and agencies introduce more sophisticated surface surveillance and intercept capabilities, terrorists and criminals are likely to seek to exploit the underwater environment in their attempts to conduct attacks against prestige targets and expose vulnerabilities - and increase costs and overheads - in national infrastructures and in the international trading system.

The provision of high-definition technologies that allow real-time visual clarity, instant classification and rapid risk reduction will be central to deterring and detecting future attacks and in providing continuous assurance to port operators, shipping companies and major investors.

MARINE TECHNOLOGY REPORTER

The international authority for business news and information from the marine technology and ocean science community.

Marine Technology Reporter 2011 Editorial Calendar

JANUARY / FEBRUARY — **AD CLOSE DATE: JANUARY 22**

FEATURE: Marine Salvage & Recovery

MARKET: Naval Underwater Warfare
PRODUCT / DIRECTORY: Commercial Diving Equipment & Services

BONUS DISTRIBUTION:
Underwater Intervention
February 22-24

MARCH — **AD CLOSE DATE: FEBRUARY 12**

FEATURE: Subsea Vehicles: AUV, ROV, UUV Annual

MARKET: Sonar Systems & Seafloor Mapping Solutions
PRODUCT / DIRECTORY: Ocean Business 2011 Exhibitor Guide

BONUS DISTRIBUTION:
Ocean Business - April 5-7

APRIL — **AD CLOSE DATE: MARCH 12**

FEATURE: Oil & Gas SubSea Monitoring

MARKET: Seafloor Engineering
PRODUCT / DIRECTORY: Deck Machinery, Winches & Cranes

BONUS DISTRIBUTION:
OTC
Offshore Technology Conference-
May 2-5

MAY — **AD CLOSE DATE: APRIL 16**

FEATURE: Subsea Defense Edition

MARKET: Renewable Energy: Wind, Wave & Tidal Power
PRODUCT / DIRECTORY: OceanTech Expo

BONUS DISTRIBUTION:
OceanTech Expo - May 17-19
UDT - June 7-9

JUNE — **AD CLOSE DATE: MAY 14**

FEATURE: Hydrographic Survey

MARKET: Communications, Telemetry, Data Processing
PRODUCT / DIRECTORY: Instrumentation: Measurement, Process, Analysis

JULY / AUGUST — **AD CLOSE DATE: JULY 23**

FEATURE: MTR100 Edition

MARKET: Work Class ROV & Auxiliary Systems
PRODUCT / DIRECTORY: Umbilicals, Cables, Connectors & Power Supply

BONUS DISTRIBUTION:
Offshore Europe - Sept. 6-8

SEPTEMBER — **AD CLOSE DATE: AUGUST 13**

FEATURE: Ocean Observation

MARKET: Environmental Monitoring & Pollution Control
PRODUCT / DIRECTORY: Training & Education Institutions and Facilities

BONUS DISTRIBUTION:
Oceans 2011 MTS/IEEE
September 18-23
OTC Brazil - Oct. 4-6

OCTOBER — **AD CLOSE DATE: SEPTEMBER 10**

FEATURE: Ocean Engineering & Design

MARKET: Underwater Imaging
PRODUCT / DIRECTORY: Scientific Deck Machinery

BONUS DISTRIBUTION:
MAST Americas - Nov. 14-16

NOVEMBER / DECEMBER — **AD CLOSE DATE: NOVEMBER 19**

FEATURE: Fresh Water Monitoring and Sensors
(lakes, rivers, reservoirs)
MARKET: 2012 Market Planner
PRODUCT / DIRECTORY: Shallow Water Survey

CONTACT US @ SEADISCOVERY.COM OR EMAIL US AT INFO@MARINELINK.COM

MARINE TECHNOLOGY REPORTER

The international authority for business news and information from the marine technology and ocean science community.

Advertisers have unmatched oppotunities for their PR, Recruiting and Advertising needs.

IN PRINT

MTR delivers timely editorial content and relevant industry information combined with the world's largest BPA audited circulation.

ONLINE

Seadiscovery.com leads the underwater technology community with the largest online audience and weekly industry favorite MTR E-News.

INDUSTRY'S LARGEST TOTAL QUALIFIED CIRCULATION: 25,576

9,136
Commercial diving, commercial vessels owner/operator dredging, marine geodesy, marine salvage, meterology, oceanexploration/ survey, oceanography,offshore oil & gas exploration and production, owner/operator under water vehicles (manned/unmanned) search and survey vesselchartering

3,617
Education/Training (marine/ocean), information technology marine research, software engineering and development services, systems integration

836
Others Allied to the Field

4,923
Marine consulting, marine engineering naval architecturesubsea engineering

4,906
Environmental monitoring/pollution control marine construction offshore structures pipeline contractors port/waterway/ coastal/ harbor authority, ship/boat building and repair services, submersibles

2,158
AUV manufacturer,instrumentation manufacturer (marine/oceanographic) manufacturer of marine machinery maritime security, ROV manufacturer subsea robotics underwater vehicles manufacturer (manned/unmanned)

Only Marine Technology Reporter's targeted circulation delivers the entire market.

Circulation figures based on June 2015 BPA Statement
BPA WORLDWIDE

Constantly updated, Seadiscovery.com is the #1 source online for industry professionals and the engine that drives the MTR E NEWS. Seadiscovery.com and the MTR E NEWS give you the largest audience for your online advertising.

PageView/Month: 43,802
Visits/Month: 24,998
Unique Visitors/month 19,210

ONLINE BUSINESS ADVERTISING OPPORTUNITIES

CUSTOMIZED BANNER ADS

Constantly updated, SeaDiscovery.com is the #1 online source for up-to-the-minute business news and information aimed at the marine technology and ocean science community. We cover the technology used in offshore drilling, oceanography, hydrographic research, commercial diving, underwater construction, salvage and undersea defense.

E-NEWS BANNER ADS

58,000 Subscribers
Space is limited:

336 x 60 -$1200
3 available

150 x 150- $750
3 available

MTR ENews delivers the latest industry news and information every week-direct to 58,000 inboxes. Advertising in MTR ENews is an affordable and efficient marketing tool to help your company reach the largest audience in the global ocean science and technology community.

CONTACT US @ SEADISCOVERY.COM OR EMAIL US AT INFO@MARINELINK.COM

Bowtech Makes Executive Appointments

Stephen Bowring Managing Director (far left) and Mike Winstanley, Sales Director (far right) congratulate Michael Parkin (center left) and Brian Hector (center right)

Bowtech Products announced the appointment of Brian Hector as Technical Director and Michael Parkin as Engineering Manager. Hector joined Bowtech over 16 years ago following his graduation from Robert Gordon's University where he studied for his BEng in Electronic and Electrical Engineering. Since then he has also obtained a Mechanical Engineering qualification. He and his team have designed systems for inspection of most hazardous areas including Offshore, Oceanographic, Military and Nuclear industries, all ensuring the safety of the crews and the valuable assets they operate. In the last 5 years, as Head of Engineering, he has been instrumental and guided his engineering team to bring the introduction of the company's highly successful range of Aqua Vision professional underwater cameras and LED lights. Taking over the management of the Engineering Department will be Parkin. He has been a valued member of the Engineering team for over six years.

OES Holds Committee Elections

The Oceanic Engineering Society (OES) of IEEE recently held elections. Jerry C. Carroll of Picayune, MS, was elected President of OES for 2011 and 2012. Serving with Mr. Carroll on the Executive Committee are Dr. Albert (Sandy) J. Williams III of Woods Hole Oceanographic Institute as Vice President for Technical Activities; Dr. Archie (Todd) Morrison III of Woods Hole Oceanographic Institute as Vice President for Conference Operations and Dr. Christian de Moustier of San Diego as Secretary.

The following individuals were elected to the OES Administrative Committee for the term from 2011 through 2013:

- Robert T Bannon, PA
- Pamela J Hurst, Newport, RI
- James M Gant, Torrance, CA
- Dr. Rene Garello, Brest, France
- Dr. Jean-Pierre Hermand, Brussels, Belgium
- Edward Gough, Jr., Waveland, MS

Davino Recognized by Navy League Council

Premier Exhibitions, Inc. said that CEO Chris Davino was presented with the Roosevelts' Science Award from the Navy League Council for his work over the summer in helping to preserve the legacy of the RMS Titanic. The award ceremony took place November 16, 2010, at the Marriott Marquis in New York City. This past August, Davino brought together a team of archaeologists, oceanographers, and scientists for a

20-day excursion to the RMS Titanic wreck site. Having partnered on the mission with Woods Hole Oceanographic Institution and the Waitt Institute, the trip has become known as "a mission of firsts" as revolutionary technologies were employed, including acoustic imaging sonar and exceptionally high-resolution 3-D imaging, to produce the first comprehensive view of the entire RMS Titanic wreck site. The team was able to map the site with greater accuracy than that achieved on any previous wreck site exploration.

Richard Heller, the New York Navy League Dinner Chairman, said that it was Chris Davino's energy and focus that brought about the recent successful dive of the RMS Titanic. "By bringing together individuals from each of these prestigious organizations to digitally map wreckage of the RMS Titanic like never before, Chris has helped to

create a data base that will be studied for years to come. He well deserves this award."

Gowdy Joins Global Diving & Salvage

Seattle-based Global Diving and Salvage hired Renee Gowdy as Lead Estimator, responsible for developing estimates and proposal production within Global's Marine Construction Division for Federal, State, Local and civil customers as well as other key markets. He was previously employed by General Construction and Kiewit Bridge and Marine.

TSS: New Facility

Teledyne TSS opened a new facility that enables its TSS 440 pipe and cable trackers to be precisely calibrated for specific targets. Samples of pipe or cable provided by the customer can now be analyzed in the new facility so that an error matrix can be created for the user's own TSS 440. This makes it possible for burial depths of a particular pipe or cable to be measured to an accuracy of five centimetres or five percent of range so that compliance with installation contracts can be verified. The first tests undertaken at the new facility were carried-out for DeepOcean, the subsea division of the Trico Marine Group. The company had supplied samples of armored three-core cable that is being installed on a wind-farm project in the German sector of the North Sea.

Sea-Bird, WET Labs Graduate Student Equipment Loan Program

WET Labs and Sea-Bird are soliciting innovative proposals from outstanding graduate students studying in the U.S. for study of environmental variables in oceans, estuaries, rivers, lakes, or laboratories. Award recipients will receive loan of Sea-Bird and/or WET Labs equipment for up to a 1-year study period. Proposals can be submitted for either/both of the following:

Annual grant proposals are due December 31, 2010; grants will be announced February 15, 2011. Sea-Bird and WET Labs may also issue an RFP for a specific field of study; the RFP will contain submission and award timelines.

Proposals will be judged on:

- Scientific merit
- Innovation
- Demonstrated need for equipment
- Ability to obtain quantifiable results within defined period

It is expected that 4 awards will be made during the 2011 calendar year.

www.seabird.com/StudentGrants.htm
or
www.wetlabs.com/StudentGrants.htm

Dr. James E. Eckman
New California Sea Grant Director

California Sea Grant announced the selection of its new director, Dr. James E. Eckman, a biological oceanographer and longtime senior science administrator at the Office of Naval Research in Arlington, Va. "Jim Eckman brings a fine mix of stellar leadership skills and excellent research credentials that will enable Sea Grant to continue its upward momentum," says Scripps Institution of Oceanography Director Dr. Tony Haymet. "We look forward to a new era with Jim at the helm."

Dr. Eckman comes to Sea Grant having led ONR's flagship Marine Mammals and Biological Oceanography Program (and its predecessor programs) for the last 13 years. The marine mammal program, with an annual budget of about $14 million, supports basic and applied research related to understanding the effects of sound on marine mammals and the interactions between marine biota and sound or light.

Dr. Eckman has also, in recent years, led ONR's participation in the federal, multi-agency National Oceanographic Partnership Program, which coordinates the nation's oceanographic research and education programs and promotes partnerships among academia, business and federal agencies.

Prior to working at ONR, Dr. Eckman was a professor at the Skidaway Institute of Oceanography in Savannah, Georgia (1984-97) and held adjunct faculty positions at the University of Georgia in Athens (1988-99) and University of South Carolina in Columbia (1985-99). Much of his research activities during this time focused on benthic ecology and its relationship to the physical environment, particularly boundary layer flows and sediment transport. His official first day at the helm of California Sea Grant will be Jan. 3, 2011.

Teledyne Odom Hydrographic enlists SONARTRONIC

Teledyne Odom Hydrographic retained the consulting services of Henning Pedersen of SONARTRONIC, located in Aarhus, Denmark. Pedersen will be assisting with the company's market development activities throughout Europe and the Middle East.

Before establishing SONARTRONIC, Pedersen served as the Sales Manager of RESON; the Sales Director and part-owner of MARIMATECH and previous to that the Project Manager and later Sales Manager of NAVITRONIC. Collectively, Pedersen has more than 25 years of experience within the hydrographic industry.

BioSonics, EchoView Host Hydroacoustic Workshops

Representatives from BioSonics and Echoview will offer a hydroacoustic training opportunity in January 2011 in Seattle. BioSonics' next three-day hydroacoustic workshop will occur January 24-26 immediately followed by a three-day Echoview training workshop, featuring senior Echoview consultant Ian Higginbottom, on January 27-29, 2011. Both companies recognize that time is money and also appreciate that proper training is critical to get the most from your acoustic data. So the idea was born to provide a single, convenient location where hydroacoustic users could take advantage of a comprehensive training program that includes theory, application, data collection and processing techniques. The BioSonics workshop will cover hydroacoustic theory, hands-on experience in data collection and processing techniques. Echoview's workshop will cover the essentials of acoustic data processing and also the advanced features of the software. Both BioSonics and Echoview are offering special tuition incentives and information is available at either company's website.

www.biosonicsinc.com
www.echoview.com

Bluefin Wins Economic Impact Award

Bluefin Robotics was named a Gold Winner in MassEcon's (The Massachusetts Alliance for Economic Development) Seventh Annual Team Massachusetts Economic Impact Awards, the award which recognizes companies from across the state that have made outstanding contributions to the Massachusetts economy. Over the last year, Bluefin has renovated a 54,000 sq. ft. building in Quincy's Fore River Shipyard into a state-of-the-art facility for its business. Bluefin will move its Cambridge headquarters and East Boston marine operations outfit to the new South Street address in November. On November 15, 2010, Bluefin moved its HQ and marine operations facilities to a new location just outside Boston. The new address is: Bluefin Robotics Corporation, 553 South Street, Quincy, Massachusetts 02169; T. +1 (617) 715-7000, F. +1 (617) 498-0067.

Fathoms Surveys for Marine Renewable Sites

Fathoms recently undertook two comprehensive surveys for the European Marine Renewable Energy Test Center (EMEC) based in Orkney. The results of these surveys have enabled EMEC Ltd. to extend its capabilities in the marine renewables sector, generating electricity from devices moored to the seabed. The first survey covered two specific areas; one in Scapa Flow and the other further to the north in Shapinsay Sound. The former will be used for testing wave energy devices and the latter is more suited to tidal stream devices. Both areas required detailed and precise surveying so that designers and engineers responsible for mooring the devices could fully understand the seabed morphology and thus come up with the best mooring solutions.

Although some data was available before these surveys were undertak-

en, Fathoms helped the EMEC staff with the selection of the most suitable areas within the general location. This involved a considerable amount of desk-top study work with existing data and possible options. Furthermore, the decision on the choice of equipment and methodology was very much a joint one, with EMEC relying on the input and experience of the skilled Fathoms staff.

Adil Wins Bridge Energy Contract

ADIL, the independent energy consultancy, won a contract with Bridge Energy ASA to manage the development of the Vulcan East gas field, in the Southern North Sea. ADIL will provide people and systems to manage all development activities linking a subsea tie-back to existing infrastructure in the vicinity of the field which is located in block 49/21. Vulcan East was discovered in 2006 and Bridge Energy ASA anticipates first gas in the second half of 2011.

Schlumberger Inaugurates Brazil Research, Geoengineering Center

Schlumberger inaugurated a new research and geoengineering center in Rio de Janeiro, Brazil. The Brazil Research and Geoengineering Center is designed to promote the integration of geosciences and engineering to improve hydrocarbon production and recovery from the complex deepwater reservoirs and pre-salt carbonates offshore Brazil. The Brazil Research and Geoengineering Center covers

Joining Forces

TDW, Offshore Independents

TDW Offshore Services AS (TDW) joined forces with Offshore Independents BV to offer integrated solutions for companies keen to retain a full range of pipeline services and emergency pipeline repair systems from a single source. The two companies agree that there is a gap in the market for an organization that offers pipeline recertification and project management services, in addition to core inspection, repair and maintenance services, and expertise in emergency pipeline repair systems. "Together we offer a truly comprehensive range of special services to the world's pipeline industry," said Dirk Rook, Commercial Director of Offshore Independents. "TDW has an excellent reputation globally for its pipeline pressure isolation technology that they have used with great success to facilitate the safe repair of pipelines onshore and offshore. TDW's products and services are the perfect complement to our range of pipeline recertification, project management and engineering services. This gives us the opportunity to better assist our clients as they strive to prepare for the unexpected," he added. Expro Inks Deal with Petrobras Expro announced its Latin America Connectors & Measurements team has been awarded a new master service agreement (MSA) from Petrobrás for subsea electrical systems. As part of the contract, valued at $2.5m over three years, Expro will provide on-site field support for all Petrobrás projects using its market-leading Tronic connectors for medium and high-powered subsea systems.

Rook

Sim

Crowley Recognized by NOAA

Crowley Maritime Corp. was selected as a 2009 Company Award Winner for the U.S. National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service's Voluntary Observing Ship (VOS) program. The selection was based on Crowley's 38 vessels providing 15,798 timely weather observations for the U.S. VOS program in 2009. Particularly impressive was Crowley's Resolve, a pusher tug residing in Alaskan waters, whose crewmembers alone made 1,738 observations last year, ranking her the fourteenth-highest highest reporting vessel in the entire program.

The VOS program, which was established in 1853, relies on volunteer crewmembers on nearly 1,000 ships around the world to monitor the weather at their locations and submit the observations to national meteorological services. This data is used to create marine weather forecasts and is archived for future use by climatologists and other scientists.

"Our vessels' crewmembers have been contributing first-hand weather data to VOS for decades," said Ed Burdorf, manager of marine operations for Crowley. "Crowley is proud of our history with the program and we are committed to continuing to support it. We see the impact it has each day on our own vessel operations, and we are very appreciative of this recognition."

10,000 sq. m. in floor area, and is the first such Schlumberger facility in the southern hemisphere. When fully staffed, up to 300 scientists, engineers and technical staff working in multidisciplinary, collaborative teams will work on the development of innovative solutions to the technical challenges associated with the complex formations found deep offshore Brazil. Continuing a theme that now runs across all Schlumberger research centers, the new Brazil facility is located close to the leading academic expertise of the Federal University of Rio de Janeiro, and is located on the same campus that houses the Petrobras CENPES Research Center.

Technip Wins North Sea Deal

Technip won a contract worth approximately $95m by Total E&P UK Limited, as operator of the Islay Gas Field, to deliver a full EPCI project in the UK North Sea. The Islay field is located in the North Sea, 440 km north-east of Aberdeen, in 120 m of water depth. The contract will involve **the world's first subsea implementation of Technip's reelable, electrically trace heated pipe-in-pipe (ETH-PIP) technology.** Technip Wins Pipelay Contract Offshore Ghana Technip was awarded by GNPC a lump sum contract for phase 1 of the Natural Gas Transportation and Processing project, 60 km offshore Ghana.

Small Submarine Incorporates HD LBV

SeaBotix teamed with SEAmagine Hydrospace Corp., manufacturers of one-atmosphere submersibles, to

MTNW Wins Award from US NSF

Measurement Technology NW (MTNW) won a contract from the National Science Foundation (NSF) and the University-National Oceanographic Laboratory System (UNOLS) to upgrade winch monitoring technology across 15 federally funded research vessels. This award brings new MTNW hardware and software technology to the support of winch operations.

"The recent change in the operating safety standards for UNOLS vessels has required a technology upgrade on every active vessel," said Tom Rezanka, Managing Director of MTNW's Line Control Instruments. "Our technology exceeds the newly-adopted standards and will both increase safety for personnel and enhance marine sensor deployments."

create a system for Mike Caplehorn. The Deep-C, number 9 in SEAmagine's lineup, is its latest two-man Ocean Pearl model which is ABS-Classed and rated to a depth of 320m. SeaBotix worked with SEAmagine engineering, including President Will Kohnen, to integrate its 320m-rated LBV300 HD including a purpose-built Tether Management System (TMS) with ROV garage and a tractor drive to deploy and retrieve the LBV. One feature, a SeaBotix Guillotine Cutter, was added at the drum. Since the primary use for the LBV is to film in and around shipwrecks, the ability to cut the LBV tether should Deep-C be irreversibly entangled was critical to achieve ABS Class for the submersible.

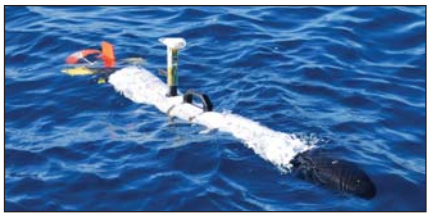
The LBV300 HD employs a Sony block camera installed within the camera enclosure, and it has the same 180-degree tilting capability as the standard cameras. The video feed is via SeaBotix' 8mm fiber-optic tether with 100Kg working load. By building the system into the LBV Camera Enclosure without changing the vehicle profile, HD LBVs can also carry and simultaneously run other large sensors on a lower Tool Skid.

Email: info@seabotix.com

Tritech Completes Distributor Seminar

Tritech International completed its third annual Distributor Seminar. International guests representing part of Tritech's Global Distributor Network attended the week-long Seminar at the company's design and production site in Ulverston, Cumbria. As part of the Seminar, Tritech held on-water demonstrations of new and established products at The Dock Museum, Barrow-in-Furness. This included the SeaKing Hammerhead DST sonar, Tritech's high resolution, 360-degree mechanical scanning imaging sonar. Deployed on a tripod targets captured by the SeaKing Hammerhead included the steps of an original Victorian graving dock, the dry-dock site the Museum is built on.

Iver2 for California Polytechnic State U.



OceanServer Technology said that Cal Poly agreed to purchase a second Iver2 AUV for research purposes. The first Iver2 AUV was purchased in 2008 and has been used for a variety of research applications including one project that required the vehicle to operate under the ice in the Arctic. The new vehicle will also be a multi use platform in a number of research efforts including marine life tracking (such as sharks). The EP42 vehicle will be outfitted with a DVL for precision navigation and acoustic current profiling, along with a dual port camera system and a low-power acoustic modem.

The EP42 Expandable Payload (EP) platform includes a dedicated user CPU with disk to enable the installation of a user-selected operating system, sensor drivers and behavioral software.

In addition, the EP vehicle ships with a well-documented

OceanServer Wins Navy AUV Contract

OceanServer Technology delivered two multibeam sonar equipped AUV's to the Navy Special Warfare(NSW) Command. These AUV's were competitively procured and operationally tested prior to delivery to the NSW Command at the Stennis Space Center in September of 2010. Additionally the Office of Naval Research (ONR) has contracted with OTI for a third vehicle to be delivered in December 2011. This is the fifth such award to OceanServer Technology (OTI) over the past three years and represents the most sophisticated vehicle developed by OTI to date. It is fully equipped with Side Scan Sonar (SSS), Doppler Velocity Log (DVL), Acoustic Doppler Current Profiler (ADCP), Conductivity, Temperature and Depth (CTD) sensor, and Multibeam Imaging sonar.

Underwater Maintenance in GOM

Hydrex recently carried-out a full inspection and remove all fouling from two drilling vessels in the Gulf of Mexico to reduce the weight and drag of the vessels and increase their available cargo capacity. An inspection team and two cleaning teams, each consisting of seven members, were mobilized by Hydrex. The scope of work consisted of a comprehensive UWILD inspection of both drilling vessels, an inspection of the weld seams in particular, replacement of anodes wherever needed, blanking all overboard lines in order to enable inspection from the inside and hull cleaning the underwater parts of the units.

ROS Introduces MANTIS HD Camera

Remote Ocean Systems introduced the MANTIS HD, a color zoom camera designed to provide high definition video in true 1080i resolution for near or far underwater inspection and monitoring. The MANTIS HD has a 10:1 optical zoom lens (12x digital), a wide 86 degree diagonal field of view underwater, tele-macro capabilities and auto focus for viewing without additional focal adjustments. The MANTIS HD outputs in HD-SDI format. Depth rated to 4000m (13,000 ft.), the MANTIS HD allows the user to remotely control all of the camera's many options via RS-485. The camera is designed to be mounted to a fixed surface or as an integral part of a lighting and positioning system.

Email: sales@rosys.com

Hong Kong Marine Department Upgrades to EM 3002

Hong Kong Port is one of the busiest container ports in the world. In terms of vessel arrivals and departures, cargo and passenger throughput, it is also one of the major ports of the world and is a gateway serving the southern parts of Mainland of China. The Hong Kong Marine Department is the administrator of the port, with the principal functions to ensure safe operation of the port and all Hong Kong waters as well as to operate the Hong Kong Shipping Register and safeguard the quality of Hong Kong registered ships. In the context of navigational safety, the Hong Kong Hydrographic Office (HKHO) - an establishment under the Hong Kong Marine Department, has taken on a role primarily as provider of nautical information for port users. To achieve this, the HKHO carries out hydrographic surveys continually to gather relevant data which include water depths and seabed nature. The hydrographic survey requirements for a port this size are extremely demanding and for this reason in 1998 the HKHO purchased a dual head EM 3000 high resolution multi-beam system for one of the three survey vessels carrying out the above mentioned tasks. In July 2010 Kongsberg Maritime's Singapore office was officially awarded the contract to upgrade the HK Marine Department EM 3000 system to the latest EM 3002 high resolution multi-beam system.

The HKHO survey vessel shown here fitted with dual head EM3000 high resolution multibeam system, which is being upgraded to the EM3002.

High-Pressure and Seawater Resistant LVDT Position Sensors

Macro Sensors, specialists in the manufacture of LVDT-based linear position sensors, custom designs High-

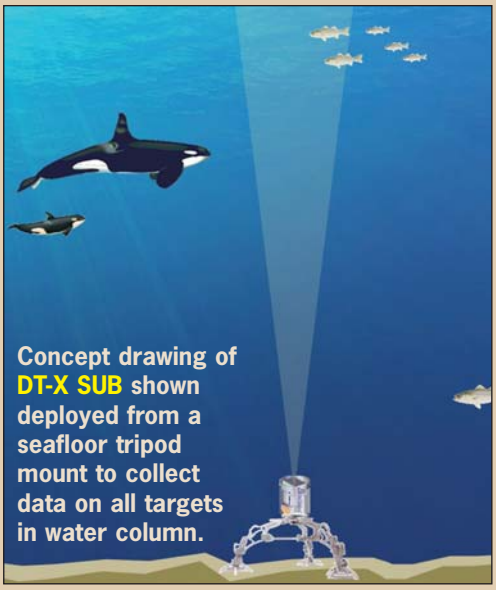
YSI: Oil-in-Water Sensor Adapter Kit

The YSI Sensor Adapter expands water quality monitoring to include a Turner Cyclops-7 submersible sensor. By plugging the sensor adapter into an optical port on a YSI sonde, hydrocarbons can be added to water quality parameters in profiling or continuous monitoring applications. Hydrocarbon monitoring in water is of growing importance near oil platforms, marinas, and spill-affected waters. Turner sensors have been used in the coastal industry to detect hydrocarbons. The crude oil sensor is useful for detecting oil throughout the water column in offshore monitoring. Closer to shore, where CDOM interference is likely, the refined fuels sensor has a built-in rejection filter to maximize signal response. Because the Turner probe is seamlessly integrated into the YSI instrument, hydrocarbon data are logged and transmitted along with water quality data.

DT-X SUB: New Autonomous Submersible Echosounders

Seattle-based BioSonics debuted its DT-X SUB, a self-contained, programmable echosounder for scientific data collection. The system consists of a scientific echosounder with data storage and power systems integrated and packaged in a compact, waterproof housing. It is designed to be lightweight, and has no external cabling. It is intended for monitoring and assessing all types of aquatic organisms, from zooplankton to marine mammels. According to the company, increasing demand for information on aquatic animal's temporal behavior and distribution over time drove development of the DT-X SUB. The unit offers solid state RAID storage and fully programmable duty cycle and echosounder configuration.

Email: emunday@biosonicsinc.com



Concept drawing of DT-X SUB shown deployed from a seafloor tripod mount to collect data on all targets in water column.

Pressure and Seawater Resistant LVDT Position Sensors for incorporation into sub-sea measurement systems used to monitor structural movement for long-term Finite Element Analysis of offshore platforms, pipelines, derricks, moorings and other critical high-stress members on offshore oil platforms. The High-Pressure and Seawater Resistant LVDT Position Sensors can also be used to measure the position of the valves, called chokes, on sub-sea oil well control towers (called Christmas trees), located at the wellhead, as well as controlling or measuring position of robotic arms and actuators.

As seawater applications often require a design service life of as much as 20 years while being exposed to seawater pressures up to 7500 psi, Macro Sensors High-Pressure and Seawater Resistant LVDT Position Sensors are designed from 316SS and Inconel 625 for pressure and corrosion resistance. Macro Sensors High-Pressure and Seawater Resistant LVDT Position Sensors also resolve the problem of getting a signal back to the surface for monitoring, recording and/or controlling some physical action taking place on the surface or sea water, even in great water depths.

To minimize the number of pressure-sealed connections and I/Os, a 4-20mA two-wire, loop-powered I/O can be utilized, which is then, converted to a RS485 signal for transmission to the surface. Typically, a digital converter is contained in a high-pressure sealed bottle located nearby. A 4-20mA I/O also minimizes any noise over long transmission lines. Offsets can be easily made in the data acquisition system on the platform above.

www.astsensors.com

FlowQuest 600H Long-range Horizontal Acoustic Current Profiler

LinkQuest added a new member in its FlowQuest acoustic current profiler family. The new FlowQuest 600H long-range horizontal Acoustic Current Profiler is designed to precisely measure water velocities and water level in horizontally-oriented installations. It can be installed on an irrigation channel bank, a bridge abutment, a river bank or a fixed platform. The specified range of the system is 120m with velocity accuracy of 0.25% +/- 2 mm/s and surface tracking (water level) accuracy of 0.25% +/- 1 mm/s. It is designed with the capability of significantly longer range, high accuracy and highly competitive cost.

Email: sales@link-quest.com

HPA Chooses RESON Sonar

After having tested different suppliers Hamburg Port Authority (HPA) chose RESON to supply sonar solutions for its four survey vessels. A contract for three large sonar solutions was placed and included RESON's latest developed product, the SeaBat 7125SV2 which will be installed soon. The contract also includes two upgrades for 8101 and 7101 as well as three 210 degree options.

www.reson.com

Aquavision Underwater Lighting

Bowtech Products Ltd. announce the expansion of its AquaVision range of underwater vision and lighting systems. The LED-6000-AC is its brightest 120VAC underwater LED light to date. The bright 6000 lumens white light produced is ideal for color video inspection or viewing tasks. The hard anodized aluminum housing is available in either 3000 or 6000 meter depth rating. It is retrofittable to existing 120V AC systems.

The LED-1600-IR is its new infra-red LED light, ideal for non-intrusive observations of marine ecosystems This light features the latest LED technology; it is fitted with a cluster of Near

LED 6000

Oculus High Definition Camera

Hadal Technologies released its Oculus High Definition camera. The Oculus HD camera is designed for straightforward integration on any fiber optic equipped subsea system. Oculus provides a broadcast video standard HDSDI (High Definition Serial Digital Interface) signal over fiber optic cable directly from the camera, with no need for additional signal conversion. Requiring only power and serial control, the Oculus provides uncompressed 1080i video, 10x optical zoom, and complete auto or manual camera control all in a compact eight inch long, four inch diameter, 6000 meter depth rated package.

Email: sales@hadaltech.com

BARTT

Diver Interception Tool for Sonardyne Sentinel

Sonardyne International added new functionality and capability to its Sentinel Intruder Detection Sonar System. The Bearing and Range to Target (BARTT) device can be used to provide security boat crews with guidance to the position of an underwater target being tracked by the Sentinel system. Information is supplied to the crew via simple, clear graphical and textual displays on a large touch-screen smart phone or similar device. The data is provided via a GPRS connection with the Sentinel command workstation and now provides a vital link to ensure that once detected, intruders can be deterred or apprehended. The new BARTT system is designed to be more effective and secure than boat guidance provided over radio. The Sentinel operator simply selects an intruder track to be intercepted and the track position data is then automatically transmitted to the BARTT mobile device and updated every sonar ping. The mobile device then uses its own position provided by its built-in GPS receiver to calculate range and bearing to the intruder. This updates continuously as the patrol boat approaches the intruder's position. The mobile device also sends its own position back to Sentinel, where it is displayed on the command workstation. The Sentinel operator can, in this way, monitor the movement of both the target and the intercepting vessel.

www.sonardyne.co.uk

LED 430

IR LED's with a wavelength of 850nm which produces a high output of IR light with better transmission through the water column. The new LED-1600-UV "Black Light" is for oil leak detection. It features the latest LED technology to produce and emit only UV light. As a result, far more usable UV is present for your inspection task without the requirement for heavy and costly ballasts and filters as is the case with outdated Mercury Vapour discharge lamps.

The LED-430 is the smallest in its range of LED lamps, measuring less than 130mm and weighing only 146g. It delivers a bright white light of 430 lumens and is rated for use up to 300m depth, ideal for colour video inspection or viewing tasks especially for diving and inspection ROV applications.

Email: Bowtech@bowtech.co.uk

CSIP's Lightweight Electric Manipulator Arm 5E

Since the launch of the market's first 5-Function Electric Underwater Manipulator Arm, CSIP has developed a lightweight version of the product following a customer requirement. CSIP claims this to be the only 5-Function Electric Manipulator Arm available globally. With the ability to design and manufacture systems that are specific to the needs of its clients, CSIP were commissioned to design and engineer a lightweight arm to be fitted to an AUV. Using mostly 6082 T6 anodized aluminum alloy to construct the arm, it weighs just 12KG in water, 4.5KG lighter than the original arm launched in 2009. The upper arm has been designed with a sandwiched closed cell foam core structure, adding buoyancy, and all component voids are retained as atmosphere air spaces as opposed to the more traditional oil filled and compensated spaces.

OSIL Offer New Slick Sleuth for Hazardous Environments

OSIL (Ocean Scientific International Ltd.) and InterOcean Systems, Inc. launched a new oil spill detection system, the Slick Sleuth SS300-EX, for use in ATEX Zone 1 / Class 1 Division 1 locations. Slick Sleuth Autonomous Oil Spill Detection Stations (ADS) were originally launched in 2008 by InterOcean, and proved extremely popular and successful at providing instant detection and notification of oil spills. The latest model

Kongsberg 'SiteCom' Gains Traction

Kongsberg Oil & Gas Technologies entered into an agreement with Statoil to extend the use of the Kongsberg SiteCom real-time drilling data solution, Discovery Web data browser and SmartAgent calculation tools across all of the leading global energy company's well operations. The new agreement, signed in August 2010, is for three years, with an option to extend for an additional two years. SiteCom has been designed to facilitate safer, faster and better informed drilling decisions. It achieves this by integrating real-time data, historical data, reports, files and chat from all sources on the rig and makes them available to a wider community of professionals and stakeholders at the company offices or in other remote locations anywhere in the world. All this is done through a single, fast and user-friendly web-based interface. Statoil expanded its use of SiteCom by deploying Discovery Web and SmartAgents alongside SiteCom. Discovery Web is a vizualization tool that makes all curves, survey data, mud log data, rig activity, image logs and key performance indicators available in a user-friendly, web-based browser. SiteCom SmartAgents are easy-to-connect custom modules designed to perform real-time calculations required for better interpretation, to check data quality and to help manage the performance of the vendors and service companies working on the project.

www.kongsberg.com

Turner Designs Launches PhytoCyt

Turner Designs introduced PhytoCyt Flow Cytometer, a cell analysis system specially designed for marine applications and developed in partnership with flow cytometry innovator Accuri Cytometers, Inc. Compact (23"W x 17"D), lightweight (less than 30 pounds), sturdy, easy-to-use and with no special power requirements, the PhytoCyt is designed to work as well on board a ship as in a traditional laboratory. Its design enables Turner Designs to offer the PhytoCyt at a substantially lower price than most other flow cytometers available today. The PhytoCyt is also efficient to maintain and service, resulting in a very affordable overall cost of ownership. The PhytoCyt Flow Cytometer includes blue and red lasers, two scatter detectors, and four fluorescence detectors. The optical filters and lasers used in the system have been optimized for the detection of the endogenous fluorophores common to phytoplankton including phycoerythrin, chlorophyll, and phycocyanins. One of the detectors has been optimized for green fluorescence detection which allows labeling with exogenous reagents, if desired. The unique peristaltic pump system used for sample delivery allows the volume sampled, and thus absolute counts of populations, to be determined while still maintaining the advantages of hydrodynamic focusing for small particle detection.

www.accuricytometers.com

enables them to be used in hazardous environments. Manufactured to IEC/ATEX requirements, the intrinsically safe housing is made from flameproof cast aluminum. Suitable for the most rugged environments, the unit can be powered by a solar recharge system, or via plant AC or DC. Mounted above the water level (typically 1.5 m), the Slick Sleuth SS300-EX is easy to operate and maintain.

Email: sales@osil.co.uk

H2000 ROV

DOER Marine announces the Ocean Explorer H2000 ROV: a high power, versatile yet compact system for depths to 2000m with a 1000m option. Standard equipment includes a hydraulic valve network comprised of dual six function valve packs. A typical configuration supports a five function manipulator with one spare, leaving seven available valve stations each with 3500 PSI @ 3GPM capability. These can be used for a wide variety of functions including bio boxes, sample trays, rotary cleaning brush, releases, light bar actuation, or other custom tooling. Image and data collection is supported by three simultaneous video signals, six data channels (2x RS485 and 4x RS232), Ethernet, and is HD fiber ready. The six thrusters, quad configuration plus dual verticals, provide 327 pounds of forward thrust. Payload is 160 pounds (72kg) with a shaft output of 7.5 hp.

Email info@doermarine.com

MS-310e Microsalinometer

RBR released the next version of its microsalinometer, the MS-310e. The latest is the addition of an Ethernet interface to remotely control the measuring cycle. Using the RBR software, Ruskin, and the network connection, the MS-310e is capable of measuring directly from sample bottles, pipelines, saltwater reservoirs, fish tanks, and calibration baths without the operator being present at the measurement site. Through the Ethernet connection the MS-310e is commanded to fill or flush the measuring cells remotely. The number of cycles of fills and flushes before a measurement is defined by the operator.

Email: info@rbr-global.com

IXSEA for UAE Navy Deal

UAE Systems Integrator Company Abu Dhabi Systems Integration LLC (ADSI) has chosen, on behalf of UAE Navy, IXSEA navigation equipment for work it is doing for the country's navy. ADSI is the Combat System Integrator (CSI) of 12 Ghannatha-class missile boats, which will use IXSEA's MARINS Inertial Navigation Systems (INS), and upgrading 12 Ghannatha-class transport boats, which will use PHINS systems.

Saab Seaeye Expands

Saab Seaeye will take responsibility for the Saab group's underwater vehicle division which currently forms part of Saab Underwater Systems in Motala, Sweden. International sales and marketing functions and equipment manufacture will move from Sweden to be integrated into Saab Seaeye's center of operations at Fareham, UK. An engineering capability for the underwater vehicle defense market will be created within Saab Dynamics in Linkoping, Sweden to become the Swedish office of Saab Seaeye. "The combined resource will create a powerful platform for growth that will better serve both the civilian and military market," says Dave Grant, MD, Saab Seaeye.

Log onto SeaDiscovery.com to explore these new job openings.

STAFF ACCOUNTANT

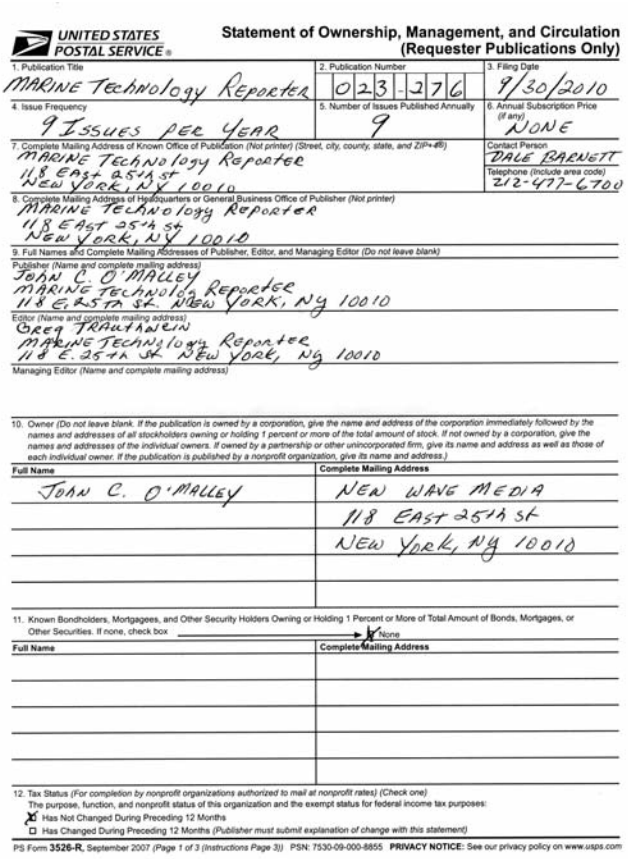
Job Location: USA,
Hydroid seeks a highly motivated Staff Accountant who will perform assigned accounting and related clerical support functions. This position's primary responsibilities include project budget maintenance, review of cost allocations to ensure accurate controls and reporting of project performance, research and data management.
This position may be considered entry level however the successful candidate must be detail oriented and be proficient in Microsoft Office Excel spreadsheet program. Familiarity with manufacturing ERP programs a plus.
BS degree in Accounting or Finance preferred. Equivalent experience in a manufacturing environment will be considered.
Applicants selected may be subject to a government security investigation and must meet eligibility requirements for access to classified information.
Hydroid offers an attractive starting salary and competitive benefits package including medical, dental and 401K with match.
All qualified candidates should send their resumes, including salary requirements, to:
Hydroid, Inc.
6 Benjamin Nye Circle
Pocasset, MA 02559
Attn: Human Resources
Or, email to hr@hydroid.com
HYDROID is an Equal Opportunity Employer, M/F/D/V
Visit us at www.hydroid.com for information.
Human Resources
Hydroid, INC.
6 Benjamin Nye Circle
Pocasset, 02559
Email: hr@hydroid.com

PROPOSAL COORDINATOR

Job Location: USA,
Hydroid is seeking a Proposal Coordinator to join our growing marketing & sales department. The successful candidate will support marketing and sales in all pricing and proposal efforts. Prior experience required in estimating, preparing technical and cost proposals, quotations, database management, development of pricing, maintaining pricelists, and sales statistics.
Candidates must have; a Bachelors Degree plus 5 years experience or equivalent in estimating and proposals; excellent oral and written communication skills; the ability to handle multiple tasks in a fast-paced, deadline-oriented environment. A high level of proficiency with MS Office Suite and other software applications is expected.
We offer an attractive starting salary and competitive benefits package including medical, dental and 401K with match.
All qualified candidates should send their resumes, including salary requirements, to:
HYDROID, INC
6 Benjamin Nye Circle
Pocasset, MA 02559
Or, email to hr@hydroid.com
HYDROID is an Equal Opportunity Employer, M/F/D/V
Human Resources
HYDROID, INC
6 Benjamin Nye Circle
Pocasset, 02559
Email: hr@hydroid.com

ELECTRO-MECHANICAL ASSEMBLER

Job Location: USA,
The successful candidate will have electro-mechanical assembly experience with the ability to follow assembly drawings/process sheets - able to trace electronic circuits and wiring diagrams. Must be proficient using hand tools and possess soldering skills; certification is a +. Will train candidates for this position with related experience.
Position requires good communication skills, documented computer skills with Office Suite, IE, and ERPs. The ability to work within a dynamic group of highly motivated individuals is necessary. 2-3 years of previous electronics experience is mandatory.
Position may require heavy lifting and boating. Water safety skills are a plus. The ability to obtain a security clearance is required.
Hydroid offers an attractive starting salary and competitive benefits package including medical, dental and 401K with match.
All qualified candidates should send their resumes, including salary requirements, to:
HYDROID, INC
6 Benjamin Nye Circle
Pocasset, MA 02559
Or, email to hr@hydroid.com
HYDROID is an Equal Opportunity Employer, M/F/D/V
Human Resources
HYDROID, INC
6 Benjamin Nye Circle
Pocasset, MA 02559
Email: hr@hydroid.com



UNITED STATES POSTAL SERVICE®

Statement of Ownership, Management, and Circulation (Requester Publications Only)

1. Publication Title: MARINE Technology Reporter
2. Publication Number: 0 2 3 - 2 7 6
3. Filing Date: 9/30/2010
4. Issue Frequency: 9 ISSUES PER YEAR
5. Number of Issues Published Annually: 9
6. Annual Subscription Price (If any): NONE
7. Complete Mailing Address of Known Office of Publication (Not printer) (Street, city, county, state, and ZIP+4®): MARINE Technology Reporter, 118 EAST 25TH ST, NEW YORK, NY 10010
Contact Person: DALE BARNETT
Telephone (Include area code): 212-477-6700
8. Complete Mailing Address of Headquarters or General Business Office of Publisher (Not printer): MARINE Technology Reporter, 118 EAST 25TH ST, NEW YORK, NY 10010
9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor (Do not leave blank)
Publisher (Name and complete mailing address): JOAN C. O'MALLEY, MARINE Technology Reporter, 118 E. 25TH ST. NEW YORK, NY 10010
Editor (Name and complete mailing address): GREG TRAUTHWEIN, MARINE Technology Reporter, 118 E. 25TH ST. NEW YORK, NY 10010
Managing Editor (Name and complete mailing address)
10. Owner (Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)

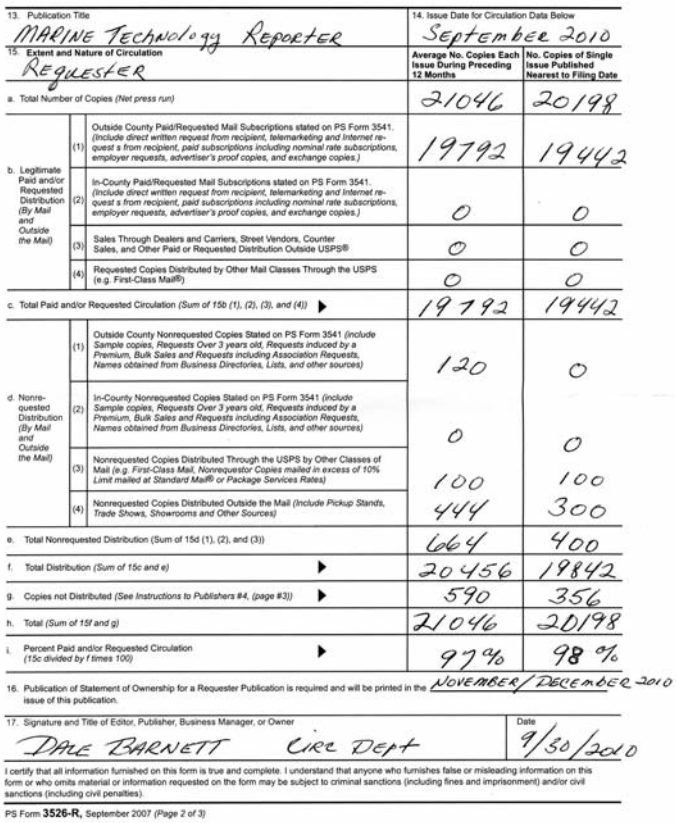
Full Name	Complete Mailing Address
JOAN C. O'MALLEY	NEW WAVE MEDIA 118 EAST 25TH ST NEW YORK, NY 10010

11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box → X None

Full Name	Complete Mailing Address

12. Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)
The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
☒ Has Not Changed During Preceding 12 Months
☐ Has Changed During Preceding 12 Months (Publisher must submit explanation of change with this statement)

PS Form 3526-R, September 2007 (Page 1 of 3 (Instructions Page 3)) PSN: 7530-09-000-8855 PRIVACY NOTICE: See our privacy policy on www.usps.com



13. Publication Title: MARINE Technology Reporter
14. Issue Date for Circulation Data Below: September 2010

15. Extent and Nature of Circulation: REQUESTER			Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (Net press run)			21046	20198
b. Legitimate Paid and/or Requested Distribution (By Mail and Outside the Mail)	(1)	Outside County Paid/Requested Mail Subscriptions stated on PS Form 3541. (Include direct written request from recipient, telemarketing and Internet request s from recipient, paid subscriptions including nominal rate subscriptions, employer requests, advertiser's proof copies, and exchange copies.)	19792	19442
	(2)	In-County Paid/Requested Mail Subscriptions stated on PS Form 3541. (Include direct written request from recipient, telemarketing and Internet request s from recipient, paid subscriptions including nominal rate subscriptions, employer requests, advertiser's proof copies, and exchange copies.)	0	0
	(3)	Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid or Requested Distribution Outside USPS®	0	0
	(4)	Requested Copies Distributed by Other Mail Classes Through the USPS (e.g. First-Class Mail®)	0	0
c. Total Paid and/or Requested Circulation (Sum of 15b (1), (2), (3), and (4)) ▶			19792	19442
d. Nonrequested Distribution (By Mail and Outside the Mail)	(1)	Outside County Nonrequested Copies Stated on PS Form 3541 (Include Sample copies, Requests Over 3 years old, Requests induced by a Premium, Bulk Sales and Requests including Association Requests, Names obtained from Business Directories, Lists, and other sources)	120	0
	(2)	In-County Nonrequested Copies Stated on PS Form 3541 (Include Sample copies, Requests Over 3 years old, Requests induced by a Premium, Bulk Sales and Requests including Association Requests, Names obtained from Business Directories, Lists, and other sources)	0	0
	(3)	Nonrequested Copies Distributed Through the USPS by Other Classes of Mail (e.g. First-Class Mail, Nonrequestor Copies mailed in excess of 10% Limit mailed at Standard Mail® or Package Services Rates)	100	100
	(4)	Nonrequested Copies Distributed Outside the Mail (Include Pickup Stands, Trade Shows, Showrooms and Other Sources)	444	300
e. Total Nonrequested Distribution (Sum of 15d (1), (2), and (3))			664	400
f. Total Distribution (Sum of 15c and e) ▶			20456	19842
g. Copies not Distributed (See Instructions to Publishers #4, (page #3)) ▶			590	356
h. Total (Sum of 15f and g)			21046	20198
i. Percent Paid and/or Requested Circulation (15c divided by f times 100) ▶			97%	98%

16. Publication of Statement of Ownership for a Requester Publication is required and will be printed in the NOVEMBER/DECEMBER 2010 issue of this publication.
17. Signature and Title of Editor, Publisher, Business Manager, or Owner: DALE BARNETT, CIRC Dept — Date: 9/30/2010

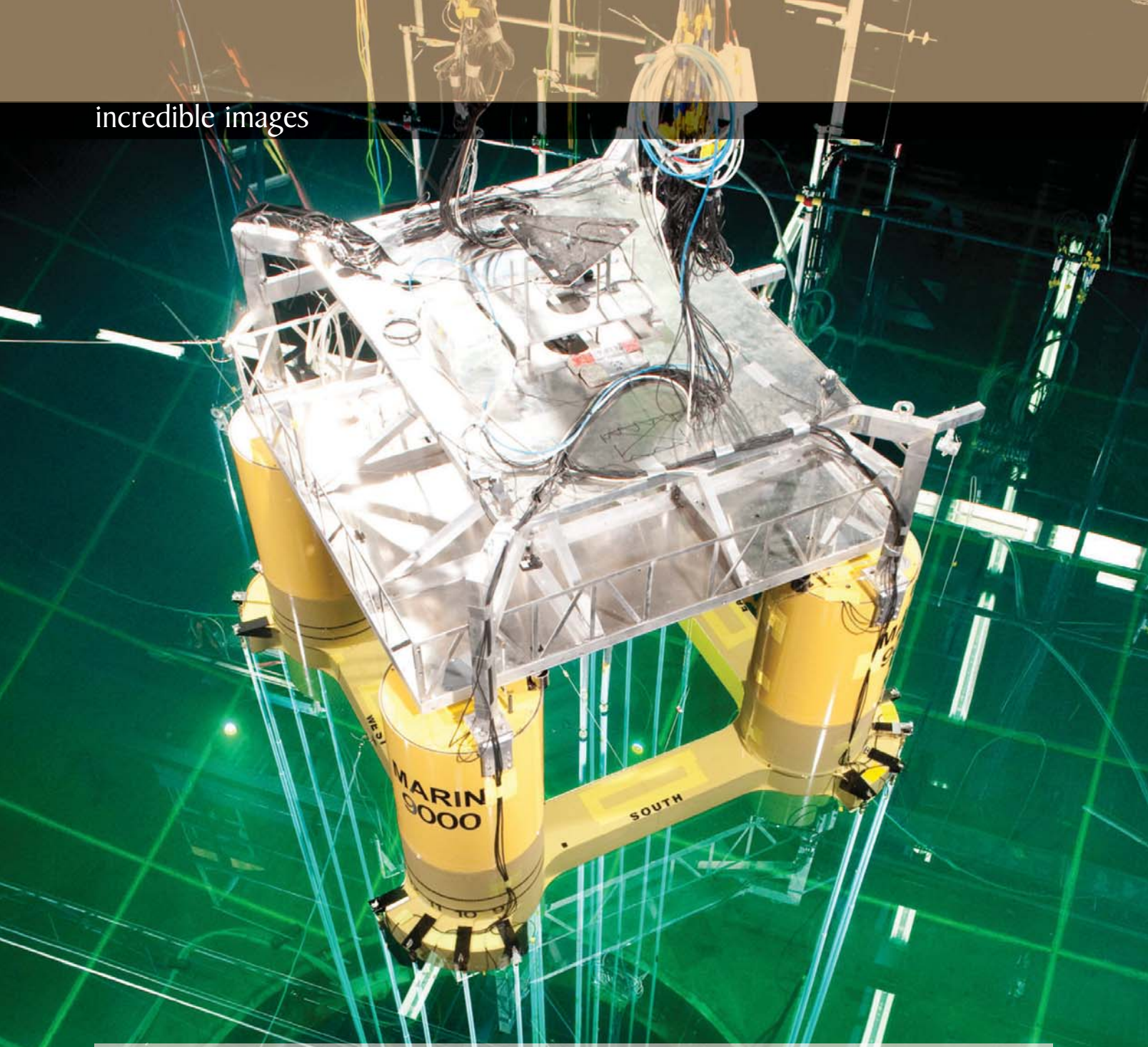
I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

PS Form 3526-R, September 2007 (Page 2 of 3)

Advertiser's Index

For Fast, Free Information from Advertisers visit www.maritimeequipment.com/mt

Page	Company	Website	Phone#
11	AIRMAR Technology Corporation	www.airmar.com	(603) 673-9570
60	American Society of Naval Engineers	www.navalengineers.org/launch2010	Please visit us online
1	Channel Technologies Group	www.channeltechgroup.com	(805) 683-1431
3	C-Nav	www.CnavGPS.com	(337) 210-0000
3,61	DeepSea Power & Light	www.deepsea.com	(800) 487-3775
4	General Oceanics, Inc.	www.generaloceanics.com	(305) 621-2882
19	Innomar technologies GmbH	www.innomar.com	49 (0) 3 81 44 079 0
4	LYYN AB	www.lyyn.com/rozalia	Please visit us online
15	Marine Sonic Technology, Ltd.	www.marinesonic.com	Please visit us online
13	Marine Technology Society	www.mtsociety.org	(410) 884-5330
23	Markey Machinery	www.markeymachinery.com	(800) 637-3430
45	Ocean Business	www.oceanbusiness.com	Please visit us online
17	OceanServer Technology, Inc.	www.ocean-server.com	(508) 678-0550
38-39	OceanTechExpo	www.oceantechexpo.com	(561) 732-4368
C3	Reson	www.reson.com	Please visit us online
2	Saab Seaeye	www.seaeye.com	Please visit us online
19	Shark Marine Technologies Inc.	www.sharkmarine.com	(905) 687-6672
C4	Sub-Atlantic	www.sub-atlantic.com	(713) 329-8730
5	Subconn	www.subconn.com	(781) 829-4440
7	Teledyne Odom Hydrographic	www.odomhydrographic.com	(225) 769-3051
C2	VideoRay LLC	www.videoray.com	(610) 458-3000
9	YSI, Inc.	www.ysi.com/hydrocarbon	(800) 363-3269



MARIN's 9,000th Test Model

World's Deepest TLP

Earlier this year, the world deepest TLP (5,187 ft) was tested at MARIN for Chevron U.S.A. Inc. and FloaTEC. The 'Big Foot' TLP represents MARIN's 9,000th test model since the maritime research institute opened in 1932. Extended Tension Leg Platform (ETLP), designed by FloaTEC, will be located at the 'Big Foot' Field development at the Walker Ridge Block 29 in the Gulf of Mexico. The platform will be a local host with Dry Trees and the associated Top Tensioned Risers (TTRs), with full drilling, workover and sidetrack capability on the topsides. Chevron is the operator of Big Foot and the co-owners are Statoil USA E&P and Marubeni Oil & Gas (USA) Inc.

(Source: MARIN)

PROFESSIONAL GEAR FOR UNDERWATER EXPLORERES

Sonar solutions *developed, produced, comissioned, tested, sold and serviced* **by**

RESON

SeaBat 7125SV2

Powerful things come in **small packages**

Mojave is the most powerful observation ROV for its size. Compact, ergonomic design and light weight construction allow for rapid set up and deployment using any domestic power supply. With world beating subCAN control & diagnostics system and proven thruster reliability, Mojave sets the standard by which the competition will be judged.

- **300m Depth Rating (1000m Option)**
- **LED lighting as standard**
- **5 x SPE-75 DC Thrusters**
- **80 – 260V Domestic Input**
- **Free Swimming or Garage TMS**
- **Auto Position Option**
- **Excellent payload options available**
- **Graphic User Interface (GUI) Control**
- **63Kg Horizontal 26 Kg Vertical Thrust**
- **Choice of Manipulators / Tooling**
- **Auto Heading and Depth**
- **Simple maintenance and operation**

Mojave can be supplied with a complete range of specialist tooling / sensor skids for use Offshore or Inshore Oil & Gas, Scientific, Port Security, Military, Civil Engineering and numerous other applications.

MOJAVE

sub-Atlantic

MOJAVE COMANCHE MOHICAN SUPER MOHAWK MOHAWK NAVAJO

Sub-Atlantic Ltd.
United Kingdom, Aberdeen
T: +44 (0) 1224 798660
E: sales@sub-atlantic.co.uk

Sub-Atlantic Inc.
USA, Houston, Texas
T: +1 713 329 8730
E: sales@sub-atlantic.com

Sub-Atlantic Asia Pacific
Singapore
T: +65 6576 4320
E: lina.hamed@perrymail.com

A MEMBER OF THE TRITON GROUP

www.sub-atlantic.com
www.subatlantic-mojave.com