SEAPerch Rocks Virginia! Seven Seas Delivered TWIC'd: MIT Grad Students Denied

MARINE TECHNOLOGY REPORTER

May 2008
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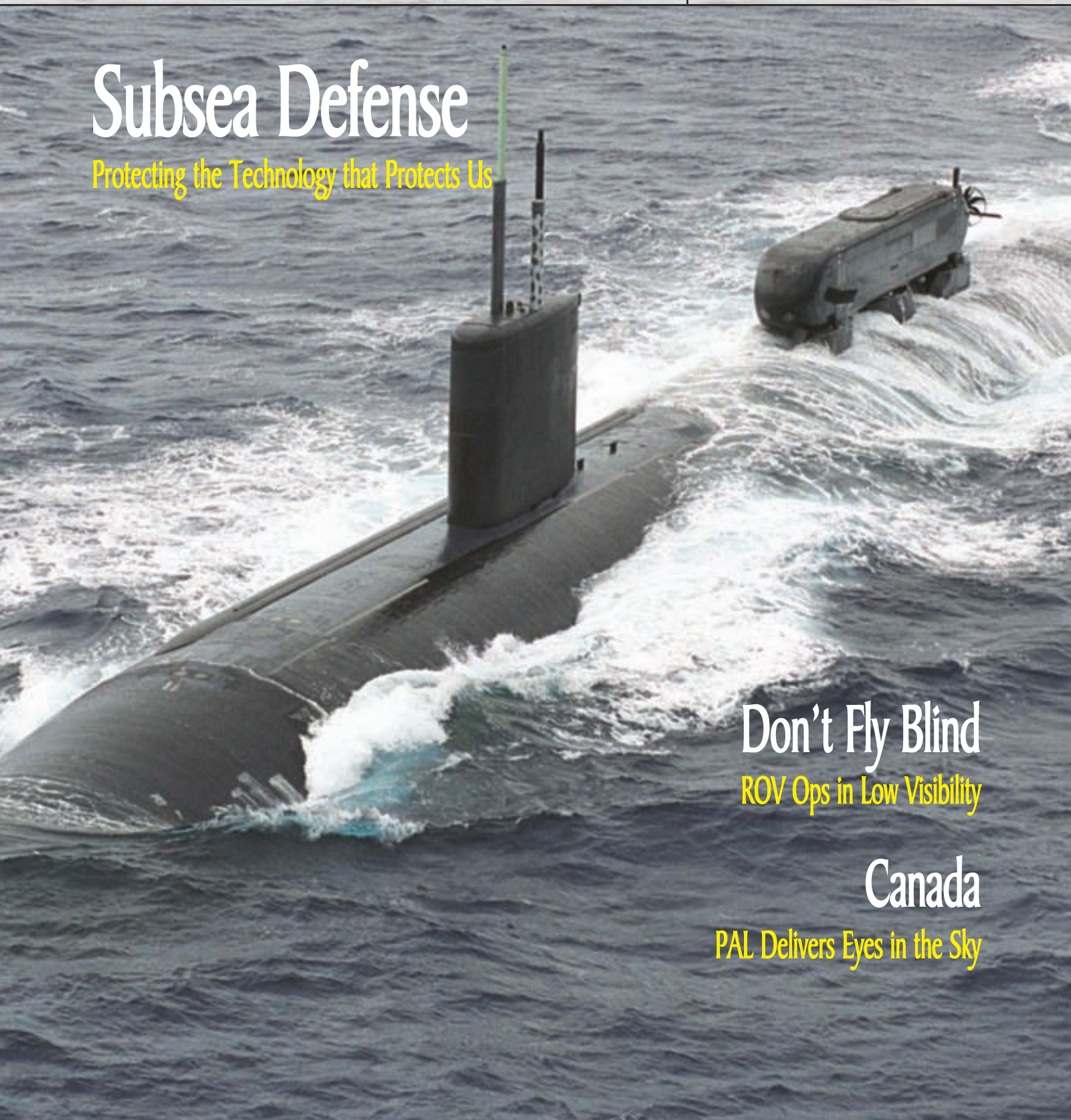

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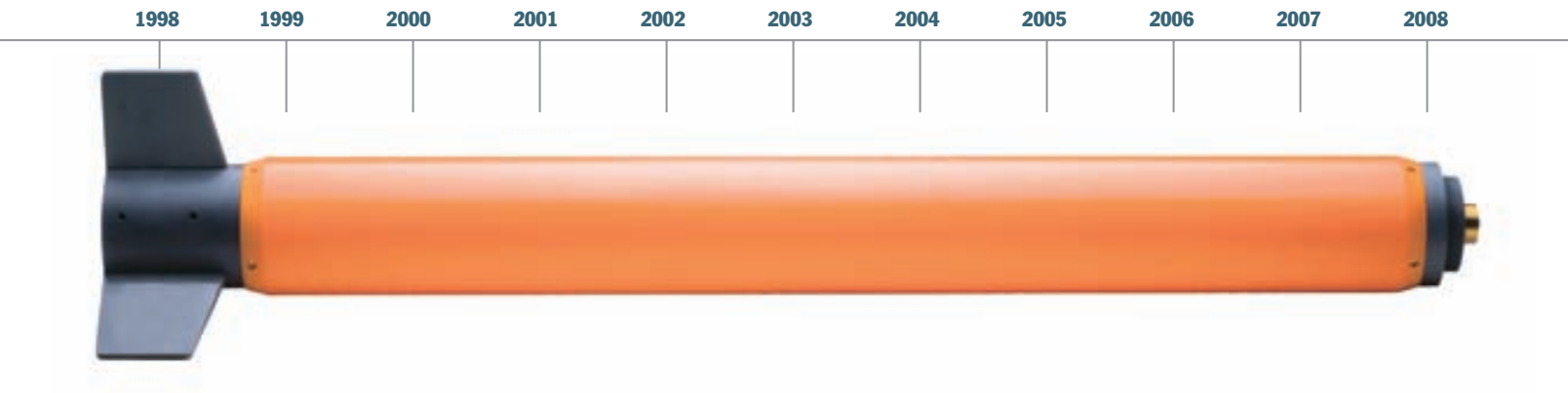

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May 2008

contents

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Pictured in the background is the final standings for the "innovative Design" award at the recent SEAPerch subsea robot competition, held April 26 in Virginia. Turn to page 12 for the full story.

The SEAEYE JAGUAR electric
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on the Cover

On this month's cover is the Advanced SEAL Delivery System (ASDS) program, which with support from Northrop Grumman, achieved a significant milestone in late March 2008, operating for the first time from one of the U.S. Navy's newest transformational platforms, the Ohio-class cruise missile submarine USS Michigan (SSGN 727). See story on page 42.

also in this Edition

the Authors

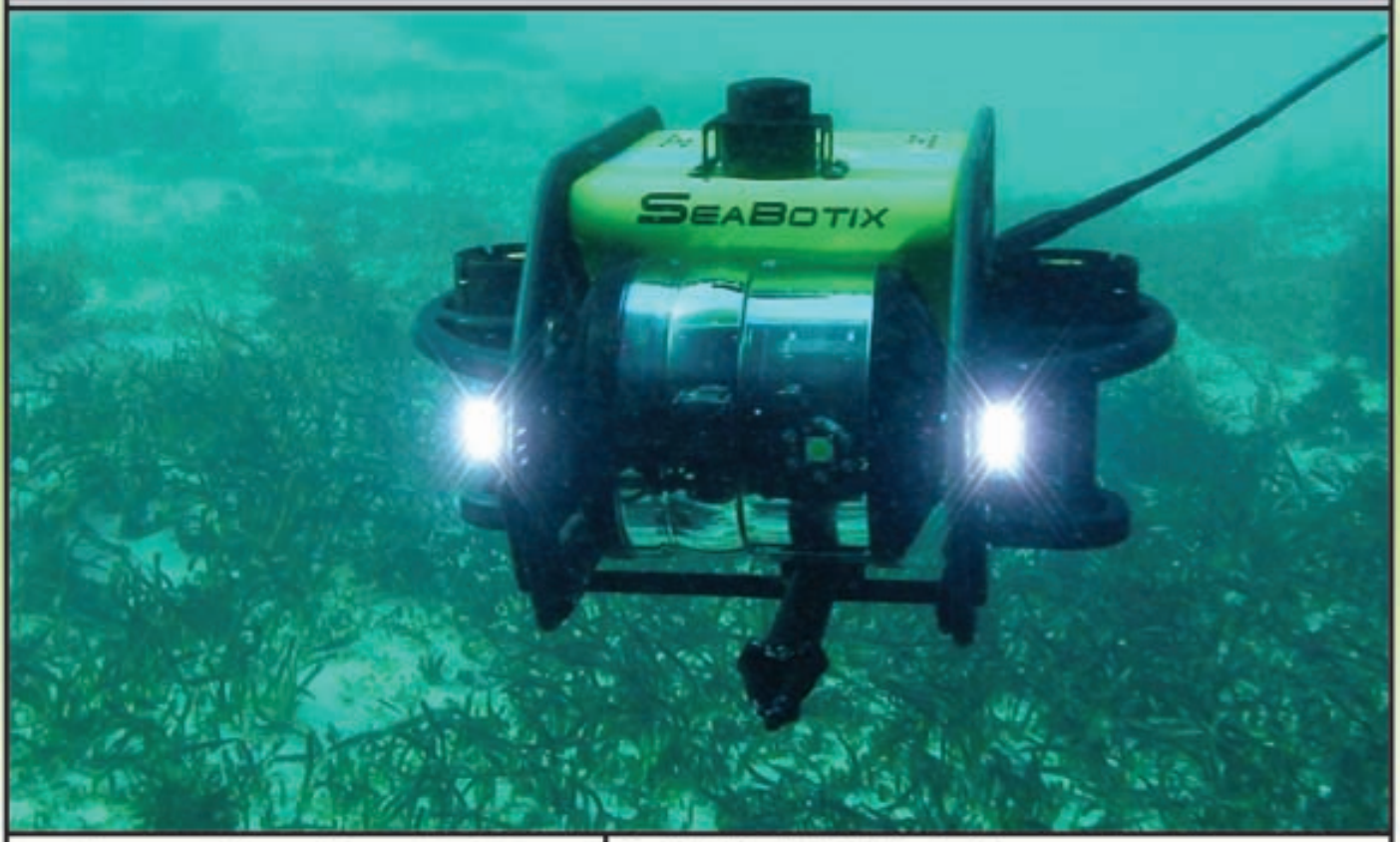
Jeff Snyder is the President of SeaVision (SeaVision) Marine Services LLC, based in Naugatuck, CT. He can be contacted at jsnyder@seavisionmarine.com or 203-605-8959.
His article starts on page 24.

Paul Singer joined Securewest International in 2003 following 10 years service as a Special Constable with the police force in the United Kingdom and a successful business career. He is now responsible for Securewest International's technical support and worldwide marketing. Visit www.securewest.com
His article starts on page 36

Barbara Linney is a partner in the Washington D.C. office of the law firm of Blank Rome LLP, practicing in the area of international trade and transactions. She regularly advises both U.S. and foreign clients regarding U.S. export controls and international economic sanctions, defense trade and security regulations, and other international trade and business issues, including foreign investment review, mergers, acquisitions and financings. Additional information on Blank Rome may be found at www.BlankRome.com
Her article starts on page 40.

Size doesn't have to sacrifice stability!

SeaBotix



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"Young people are fitter to invent than to judge ... and more fit for new projects than for settled business"

Francis Bacon

(Source: www.quotecosmos.com)

I have seen tomorrow, and despite a generally dour attitude regarding the supply of capable youth to fuel this industry's future, I don't think the problem is as bad as projected. This is not to say that there are not issues to address, as statistics clearly show that the U.S. is being soundly throttled by China and India, to name two, in the development and production of young people with an engineering aptitude. My optimism is based not on an intensive study of educational and testing score trends in U.S. secondary schools; nor is it based on a collection of insights from a diverse panel of experts. It is based solely on a gut feeling; a gut feeling created by the recent SEAPerch event held in Virginia. More specifically, it is based on a conversation with Battlefield High School Team #3 (pictured), a quartet of kids who seem well on their way to succeed, in whatever future endeavor they may choose.

Battlefield HS Team #3

I served as a "Notebooks" judge at the April 26 SEAPerch event, a subsea robotic competition which brought together hundreds of kids from dozens of schools to put through their subsea projects and vehicles through the paces. Through interviewing several teams regarding their project notebooks and designs, a number of thoughts came to me in relation to the industry's push to develop the coming generation:

• **Mentors:** Simply put, the students that had the luxury of interested, involved teachers, were themselves interested and involved; those that did not, were not. Organizations that serve this industry and wish to secure their future should investigate sponsorship and mentoring opportunities with local schools or organizations; a small investment with potentially large dividends.

• **Relevance:** Today's generation — as have every generation past — speaks its own language and depends on communications media not conceived of just a decade ago. Learn them; use them. Lockheed Martin, to name one, did a wonderful job at SEAPerch in attracting kids to its table, using interactive video games presented on two large flat-screen monitors.

• **Listen:** Battlefield High Team #3's collective knowledge, enthusiasm, interest and execution were outstanding. During their interview they clearly explained the trials and tribulations of building, redesigning and re-building their vehicle, even unwittingly experimenting with a tunnel thruster. Their project was presented clearly and concisely during the interview, complete with 3D CAD drawings. It was from this one 10-minute chat with four engaging and intelligent students from Battlefield High that I saw tomorrow. It looks pretty good.

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TWIC'd

Grad students seeking to go to sea deemed 'Security Threats' by DHS

Efforts by the Department of Homeland Security to institute Transportation Worker Identification Cards (TWIC) have largely been lamented in the maritime industry, as port and shipboard workers work feverishly to receive appropriate documentation which allows them to continue making a living. TWIC, a direct result of the September 11 terrorist attacks, has been besieged with technical and logistical problems. Eight MIT graduate students with student visas learned first-hand of the frustrations, as they were denied TWIC credentials, and after their department appealed the decisions on their behalf, the DHS declared at least two of the students "security threats," according to a report in The Tech Online Edition, MIT's Student Newspaper

Without the credential, the students will soon have a harder time boarding and leaving ships at U.S. ports, including the three research ships at the Woods Hole Oceanographic Institute, where the students work.

The situation was reportedly known to WHOI, but it only came to MIT's attention when a German student forwarded to colleagues in the Earth, Atmosphere, and Planetary Sciences Department a letter from the Department of Homeland Security. according to the report. The letter reportedly said in part: "I have personally reviewed the Initial Determination of Threat Assessment, your reply, accompanying information, and all other information and materials available to the TSA. Based upon this review, I have determined that you pose a security threat and you do not meet the eligibility requirements to hold a Transportation Worker Identification Credential (TWIC)." A British graduate student reportedly received a similar letter.

WHOI reportedly will continue to try to obtain the credential for the students.

(Source: The Tech Online Edition, MIT's Student Newspaper & Staff Reports)

Subsea 7 Wins Total E&P Contract

Subsea 7 won a $60m, five-year contract by Total E&P UK Ltd (TEP UK) for Inspection, Repair and Maintenance (IRM) works in the Northern and Central sectors of the North Sea. Subsea 7 is contracted to provide a complete range of IRM services to TEP UK, which includes onshore support comprising project management, engineering and general support for underwater operations through to post-job reporting. Offshore services will include diving, remotely operated vehicles (ROVs).

Tyco Wins Turnkey Contract

Main Street Technologies announced the award of the turnkey supply contract for the Main One Cable System to Tyco Telecommunications.

The cable system will span 14,000 km and provide high capacity for international and internet connectivity to countries between Portugal and South Africa on the West coast of Africa.

The submarine cable project is designed in two phases, both of which are scheduled for completion in May 2010.

NOAA Begins Ocean Data Integration Effort

NOAA launched a major initiative to link ocean observation data from a variety of federal and non-federal sources. The project is designed to make ocean temperature, salinity, water level, current, wind and wave data gathered by NOAA and other organizations easier to access and use.

"NOAA is proud to lead this national effort to link ocean observations in an easy-to-use, standard format that provides accurate and timely information so people can make informed business and recreational decisions," said Zdenka Willis, director of the NOAA Integrated Ocean Observing Program. "NOAA and our partner organizations will use the integrated data to improve forecasts of severe weather and natural hazards, enhance pollution tracking models, and create a more complete picture of our ocean planet."

NOAA will begin the effort by linking online databases maintained by the NOAA National Data Buoy Center, NOAA Center for Operational Oceanographic Products and Services, and the NOAA CoastWatch Program using Web services and standards developed by Open Geospatial Consortium (OGC), Inc.

"We are pleased to support NOAA in its effort to improve access, integration and use of important ocean observations collected and managed by many organizations," said OGC President and CEO Mark Reichardt. "The use of interoperable standards to study the ocean ecosystem will help to yield a range of environmental, social and economic benefits."

OGC is comprised of more than 350 companies, government agencies, research organizations, and universities participating in a process to develop interoperable web-based specifications and make them publicly available.

Serpent Project Up for EU Award

The SERPENT Project, (Scientific & Environmental ROV Partnership using Existing Industrial Technology) of which, Subsea 7 is a founding partner, has been nominated as one of only a handful of finalists at this year's prestigious EU European Business Awards for the Environment (EBAE) from a selection of 86 UK entries.

The project makes use of camera equipped Remotely Operated Vehicles (ROVs) owned and operated by Industry Partners in connection with offshore oil and gas engineering and intervention operations. Within the industry, it is recognized that there are periods of standby time during operational activity, it is during this timeframe that ROVs are encouraged to assess the marine life on and around the deep-water sites allowing unique stills and spectacular video footage to be taken, collated and passed onto the scientific community for their review and interpretation in order to enable a greater understanding of the marine environment. These impressive images are also used to involve local communities working on the projects including being used for educational purposes with local school children.

Keith Dewar, Senior Environmental Advisor at Subsea 7, comments: "We are very pleased about being nominated as finalists in this prestigious award

ceremony. From its humble beginnings in a small area of the UK Continental Shelf the project has grown and developed and has now turned into a thriving global operation, bringing together the commercial and academic worlds. Being recognised as one of the most innovative green projects in Europe has really bowled us over."

JV Wins Subsea Pipeline Contracts

Technip and Subsea 7 announced that its joint venture company, Technip Subsea 7 Asia Pacific Pty Ltd (TS7), won two contracts for subsea installation and pipeline supply projects in New Zealand and Vietnam.

- Shell Todd Oil Services Limited (STOS), a company jointly owned by Shell Petroleum Mining and Todd Petroleum Mining, awarded TS7 a fast track contract for the provision of diving support services for the Maui maintenance project offshore New Zealand in water depths to 110 m.
- MISC Berhad, a maritime transportation and logistics provider and emerging major owner and operator of floating production units, has awarded TS7 a lump sum flexible supply contract for the Ruby FPSO(1) project located in approximately 50 m of water offshore Vietnam. The contract includes the supply of 880 meters of 10-in. flexible risers, 440 m of 6-in. flexible risers, 1,900 m of 10-in. flexible flowlines and associated buoyancy. Delivery is estimated for the fourth quarter of 2008.

SEAPerch *Rocks* Virginia!

By Greg Trauthwein

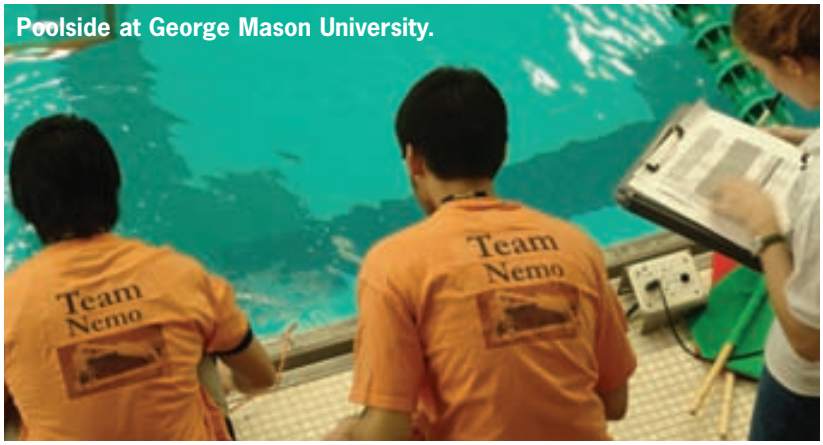
It is difficult to pick up a marine or subsea industry publication these days and not find a dire article regarding the dearth of qualified candidates to fill technical positions. While there is, indeed, a drastic current and looming shortage, there is a glimmer of hope on the horizon, as evidenced by the recent success of the SEAPerch program.

"The fact that close to 600 students, over an eight-week period, followed a newly-created curriculum focusing on engineering and design concepts including buoyancy, propulsion, design, tool safety, and most importantly that they needed to work together in small teams to complete the project, documenting the process all along, was the first win," said Susan Giver, SNAME's Marketing and Communications Director, and the director of SNAME's Outreach efforts.

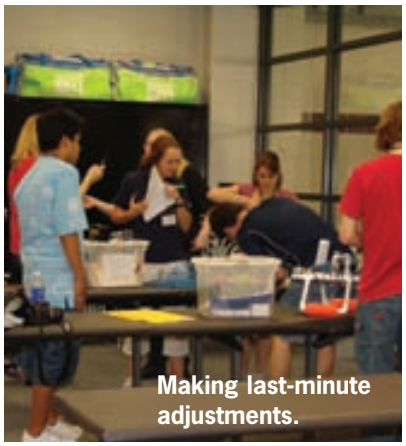
SEAPerch is an innovative program designed to encourage students to consider careers in engineering, an initiative developed by MIT, teaming with the Society of Naval Architects and Marine Engineers (SNAME), made possible through a grant from the National Naval Responsibility Initiative/Office of Naval Research.

Late last month a broad and diverse group from industry, government and academia teamed to deliver an outstanding day-long SEAPerch — the Prince William County

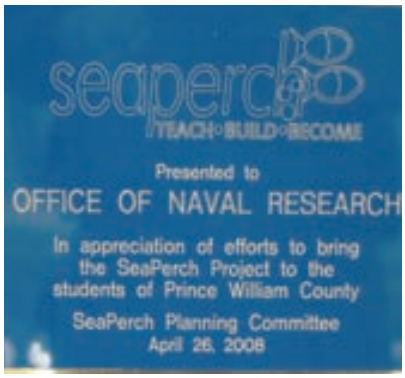
All Photos courtesy of Ken Santucci



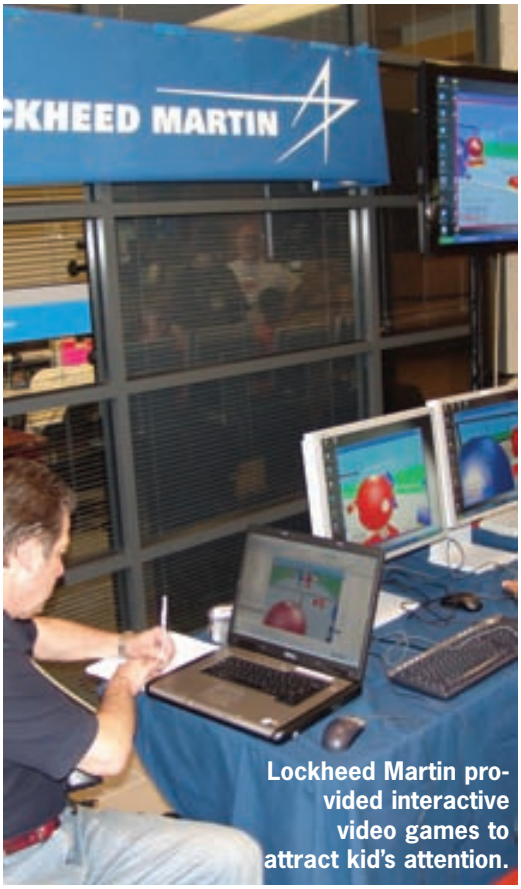
Poolside at George Mason University.



Making last-minute adjustments.



ONR played a pivotal role in making SEAPerch a success.



Lockheed Martin provided interactive video games to attract kid's attention.

SEAPerch Final Standings

April 26, 2008
George Mason University, Fairfax Campus

Overall (School)
1st: Battlefield HS (BHS)

Maneuvering Game
1st: WHS-5 (James Olphan, Eric Portillo)
2nd: BHS-4 (Nick Nelson, Isaiah Richburg, Allesio Touma, Cuu Godfrey)
3rd: BHS-6 (Cody Burke, Zavier Stringfellow)

Recovery Game
1st: BHS-6 (Cody Burke, Zavier Stringfellow)
2nd: BHS-9 (Enrique Diaz, Jose Mora)
3rd: WHS-5 (James Olphan, Eric Portillo)

Collaboration Game
1st: HHS-3/BHS-6 (AJ Habib/Cody Burke, Zavier Stringfellow)
2nd: BDHS-6/HHS-1 (Erik Kelley/Reynaldo Cervantes)
3rd: BDHS-1/FPHS-5 (Tatiana Zenalz/ Constantine Ferrara)

T-Shirt Design
1st: BHS-3 (Eric Saenz, Tristan Lora, Mike Pesce, Cody Tewell)
2nd: BHS-2 (Andrew Riley, Cody Key)
3rd: BHS-9 (Enrique Diaz, Jose Mora)

Research Paper
1st: BDHS-4 (Jacob Katuin, Dylan Mohammed, . . Andrew Erwin)
2nd: BHS-5 (Dalton Briand, Andrew Castles, Matt Barrett, Michael Pulice)
3rd: BHS-4 (Nick Nelson, Isaiah Richburg, Allesio Touma, Cuu Godfrey)

Design Notebook
1st: BHS-5 (Dalton Briand, Andrew Castles, Matt Barrett, Michael Pulice)
2nd: BHS-4 (Nick Nelson, Isaiah Richburg, Allesio Touma, Cuu Godfrey)
3rd: FPHS-1 (Megan Gazzelli, Nathan Tabbert)

Innovative Design
1st: BHS-3 (Eric Saenz, Tristan Lora, Mike Pesce, Cody Tewell)
2nd: FPHS-1 (Megan Gazzelli, Nathan Tabbert)
3rd: SWHS-1 (Beckie Broussard, Olivia Humphreys)

Robot Strategy
1st: BHS-6 (Cody Burke, Zavier Stringfellow)
2nd: BHS-3 (Eric Saenz, Tristan Lora, Mike Pesce, Cody Tewell)
3rd: BHS-4 (Nick Nelson, Isaiah Richburg, Allesio Touma, Cuu Godfrey)

Overall (Teams)
1st: BHS-5 (Dalton Briand, Andrew Castles, Matt Barrett, Michael Pulice)
2nd: BHS-4 (Nick Nelson, Isaiah Richburg, Allesio Touma, Cuu Godfrey)
3rd: BHS-3 (Eric Saenz, Tristan Lora, Mike Pesce, Cody Tewell)

Schools SEAPerch ROV Competition Day — an event that attracted 150 students forming 42 teams from nine schools, held April 26, 2008 at the George Mason University, Fairfax (Va.) campus. This was reportedly the first-ever subsea robotic competition in the state of Virginia.

"SEAPerch offers schools a low-cost, hands-on project that takes maritime engineering out of the textbook and into the water, which is exactly the kind of approach we need to let students find inspiration in places where they previously saw only difficulties," said Duane S. Mason, Systems Engineer, SAIC - Defense and Maritime Solutions.

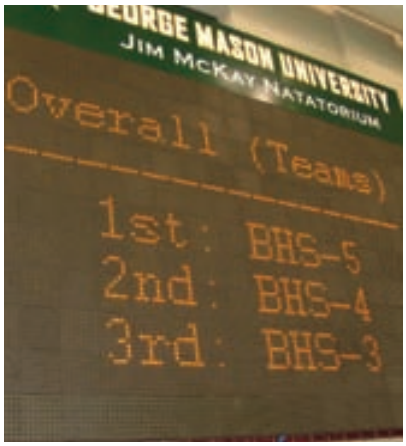
"The culmination of the project was the Sea Perch Challenge," said Giver. "When you have hundreds of 9th graders from all across a large county gather to showcase and compete with their vehicles they themselves built together, and present their designs to a committee of engineers and scientists, you empower the student in so many ways."

'It takes a village'

As impressive as the student turnout was, so too was the participation of more than 100 volunteers from the schools, the local community, government and corporations serving this industry — led by such ubiquitous names as Northrop Grumman, Lockheed Martin, Raytheon, Fulcrum Corporation to name but a few, as well as the Office of Naval Research — who came out to ensure that the day's events ran smoothly.

"One of the most exciting surprises was the number of industry leaders, as well as high-ranking military officials, who showed up on that Saturday to participate as judges and volunteers," said Giver. "The positive result was that the students were able to interact

Pictured below: Battlefield 3 won the 'innovative design' award and showed incredible enthusiasm and aptitude for their project during the interview phase.



with these individuals, and continue the dialogue about potential careers in the industry. The fact that these busy people, over 130 of them, found the time to commit their Saturday to this project was incredible."

"These days, the demand for good engineers is much greater than the supply, but programs like SEAPerch can help reverse that trend in the future," said Mason. "Technology companies and government organizations alike should clearly see the long-term benefits of supporting these initiatives."

Taking the program forward, Giver said that there are many ways in which corporations and organizations of all sizes can participate.

"There is always room for a company who wishes to participate," Giver said. "Certainly funding will be important, as the project will need to be self-sustaining going forward. In addition to, or instead of, funding, mentors are needed to assist in the classrooms, and to help design the events. Some companies who did not provide funding provided valuable support in allowing several employees to mentor, and that proved to be invaluable."

For additional information regarding the SEAPerch program, contact Susan Giver at sgiver@sname.org

All is quiet now, but April 26 was packed with unbridled enthusiasm non-stop activity from participants and volunteers.

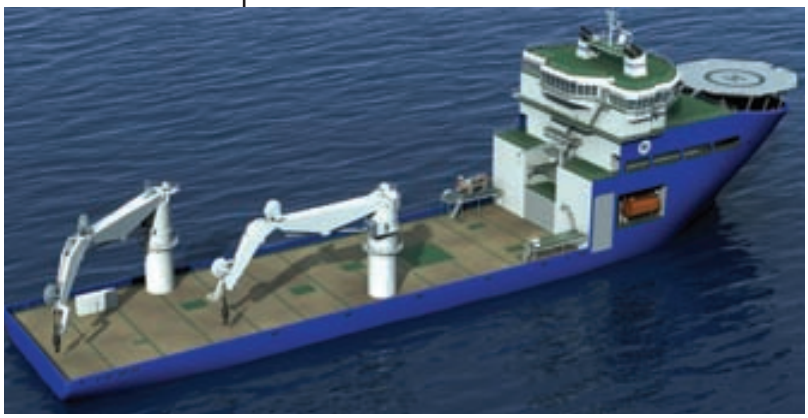
Canadian Navy Trials Active Towfish

ISE's Aurora Active Towfish was successfully towed for the first time from existing route survey equipment belonging to the Canadian Navy aboard a Maritime Coastal Defense Vessel (MCDV) off the coast of Vancouver Island. Built in the 90's for coastal defense, the Canadian Navy's MCDVs were equipped with Route Survey System (RSS) payloads consisting of a high performance multibeam sonar built into a variable depth actively controlled towfish, and a shipboard handling system. However, over the years, the operation of the variable depth active towfish has become problematic. As the Navy's successful Interim Remote Minehunting and Disposal System (IRMDS) currently incorporates ISE's Aurora variable depth towfish, there was an opportunity to integrate the Aurora towfish with the existing RSS handling device and demonstrate the resulting towing performance from an MCDV. The integration of Aurora with the RSS handling system was straightforward, requiring minimal modifications to the towfish docking mechanism, as shown above.

This towing trial is part of the Route Survey System Life Extension (RSSLE) project's definition phase. During the three days of towing, over 20 hours of towing was completed in conditions including 25 to 30 knot winds and sea states up to 4. The Aurora towfish provided very stable performance during unfamiliar handling maneuvers, launch and recovery, and operations with both faired and un-faired cabling at a variety of cable scopes, speeds, and depths.

VSPs Power Offshore Construction Vessel

Norway's North Sea Invest AS recently ordered a 145 x 30 m Offshore Construction Vessels (OCV) from Astilleros Barrera in Vigo, Spain, with commissioning scheduled for 2010. The OCV is a multi-purpose ships for the oil and gas industry, to be used for the installation of platforms and extraction systems, as well as for the laying of pipelines.



The new OCV can accommodate more than 120 crew members, and it is the largest, most powerful ship ever fitted with Voith Schneider Propellers (VSP) as its main propulsion systems. Three VSP are installed in the stern, and two in the bow — all five of them type VSP 36R6 EC/280-2. The ship is driven by five electric motors with a total output of 19,000 kW (26,000 hp).

The OCV has two heave compensated cranes that adapt hydraulically to prevailing sea movements, as well as a helipad. During long-term duty on sea, boat and crew can therefore be supplied from the air.

Among the special features of the ship is a redundant dynamic positioning system (DP2) keeping the ship at a given working position, as well as the Voith Roll Stabilization (VRS), which reduces rolling

motions when seas are high. Both devices enable the crew to work on board, even under bad weather conditions. The maximum sailing speed of the ship is 16 knots, which corresponds to almost 30 km/h.

"The ultimate reason for the OCV being fitted with Voith components is the performance that we can achieve with the VSP in combination with our roll stabilization system," says Project Manager Ivo Beu of Voith Turbo Schneider Propulsion. As the search for new oil and gas fields is increasingly extended to sea areas and, most of all, greater and greater ocean depths, it is essential for ships to have such equipment. "This OCV is, for example, ideal for the laying of pipelines.

It has a large deck surface for preparatory work," said Beu, and names a possible area of application. "Only recently, new oil reserves have been discovered in 3000 meters depth in the Santos Bay just outside Rio de Janeiro. In order to set up appropriate extraction sites, OCVs such as this one will be indispensable."

For more information, visit www.voithturbo.com/marine

Ocean Pioneer Heads to Trinidad

Deep Marine Technology's 205 ft., four-point dive vessel, the Ocean Pioneer, recently headed to work for Capital Signal in Trinidad. Working in water depths to 3,000 fsw, Ocean Pioneer will be perform primarily survey work. The Ocean Pioneer contains a 10-ton Petibone Pedestal Crane, Skagit RV 90 waterfall winch with level winders, with (4) 5,000 ft. anchor cables, and accommodations for 36.

Seven Seas Inaugurated

Modern pipelay ship packed with technology

Subsea 7 continues to build its subsea engineering and construction capabilities, last month inaugurating its new state-of-the-art deepwater Flex/J-lay vessel, Seven Seas. The Seven Seas' pipelay equipment includes a vertical lay system with top tension capability in excess of 400t, combined with a storage capacity for flexible pipe based on two 1250t carousels below deck and a 3000t carousel or multiple reels on deck. The vessel has a 400t deepwater crane, a built-in deepwater ROV spread and a comprehensive survey system. The vertical lay tower is also designed to enable operation in J-lay mode for rigid pipe and the ability to install large structures associated with deepwater riser systems.

Seven Sea's naming ceremony was performed by Anabela Fonseca, Board Member of Sonangol, Angola's national oil company. Seven Seas is designed to perform highly specialized subsea pipe laying, construction and engineering work for the deepwater global offshore oil and gas industry. The vessel was designed and constructed by Merwede Shipyard in Hardinxveld-Giessendam, the Netherlands. The flexible pipelay equipment and 400-ton deepwater

The Seven Seas' pipelay equipment includes a vertical lay system with top tension capability in excess of 400t.

crane were designed and manufactured by Huisman in Rotterdam. The vessel combines state-of-the-art technology with industry leading safety standards and is capable of operating in water depths of up to 3,000 m.

"This project has been achieved due to successful alignment of the interests of Subsea 7 and its key shipbuilding and pipelay suppliers," said Mel Fitzgerald, CEO at Subsea 7. "The

Seven Seas Main Particulars

Length, o.a. . . . . .153.24 m
Breadth . . . . . .28.4 m
Depth to Maindeck . . . . . .12.5 m
Draft . . . . . .7.5 m
Cargo Deck Area . . . . . .1750 sq. m.
Deadweight . . . . . .10130 t
Gross Tonnage . . . . . .18,250 t
Net Tonnage . . . . . .5,475 t
Active heave compensated . .400/350t offshore crane
ROVs . . . . . .2 x Workclass ROVs rated to 3,000 m
Moonpool . . . . . .7.5 x 8.5 m
Carousel's . . . . . .2 x 1250 t carousels below deck
. . . . . .3,000 t carousel or multiple reels on deck
Thrusters . . . . . .3 stern mounted azimuth thrusters
. . . . . .2 bow retractable azimuth thrusters
. . . . . .1 bow tunnel thruster
Service Speed . . . . . .13 knots+
Accommodation 120

Maneuvering and Propulsion Systems

Generators . . . . . .6 x 3360 kW (Diesel Electric)
Propulsion . . . . . .
. . . .3 x 2950 kW stern azimuth thrusters (Wärtsilä)
. . . . .2 x 2400 kW bow azimuth thrusters (Wärtsilä)
. . . . . .1 x 2200 kW bow tunnel thruster (Wärtsilä)
Total thruster power . . . . . .15,850 kW

Dynamic Positioning Systems

DP Classification DP (AA) (Class II)
DP System . . . . . .Kongsberg Simrad SDP 22
Reference Systems . . . . . .2 x Veripos DGPS
. . . . . .2 x HiPAP 500
. . . . . .1 x taut wire
. . . . . .1 x fanbeam

Tank Capacities (100%)

Marine Gasoil . . . . . .2480 cu. m.
Fuel Oil . . . . . .1227 cu. m.
Potable Water . . . . . .655 cu. m.
Ballast Water . . . . . .4530 cu. m.
Anti-Heel Tanks . . . . . .1538 cu. m.
Stabiliser Tanks . . . . . .716 cu. m.
Technical FW (in WB Tanks) . . . . . .685 cu. m.

Deck Cranes

Huisman Main Deck Crane . . . . . .
. . . . . .Offshore 350 t @ 13 m (double fall)
. . . . . .200 t @ 25 m (single fall)
Auxillary Hoist . . . . . .20 t
Auxiliary Deck Crane II (Stbd Midships) 12 t @ 25 m
Auxiliary Deck Crane III (Ramp Top) . . . . . .20 t

A massive traction winch for the Seven Seas.

Seven Seas was built by Merwede Shipyard in Hardinxveld-Giessendam, the Netherlands.

unique, integrated agreement between all three parties has resulted in the design, construction, commissioning and on-schedule delivery of the vessel in just over 24 months, which is an excellent team effort."

Seven Seas is the fourth in a series of seven new vessels to be added to the Subsea 7 fleet over a 24 month period and represents an investment of $200m, from a total investment of over $1bn in new assets and equipment between 2006 - 2008.

Main features of the vessel include:

ROV Systems

The vessel is fitted with two over side launched work class ROVs — built to Subsea 7's design and subcontracted to SMD Hydrovision — rated to 3000 m. Preinstalled service points allow easy installation of additional work-class and observation class ROVs.

Pipelay Systems

The vessel is fitted with a pipelay tower designed for flexlay, J-Lay and moonpool deployment operations. The tower consists of two aligner chutes (one port, one starboard), a retractable electric driven upper 170 t flex ten-

sioner, a retractable electric driven main tensioner (260 t flex rated, 400 t rigid rated) and an enclosed welding station for J-Lay operations. Two hold carousels with a storage capacity of 1250 t each are provided. A 450 t and a 125 t A+R winch are provided The moonpool hatches have a capacity of 750 t SWL.

Helideck

The vessel is fitted with an approved and certified helideck suitable for Sikorsky S92 and Super Puma operations. Kongsberg HMS 100 is fitted.

Communications Systems

The vessel is fitted with an extensive communications system including a dual KU / C band Vsat satellite communication system, 2 x Inmarsat C and Inmarsat F systems.

For more information, visit
www.subsea7.com

ROV Ops in Low Visibility

3-D Models and Inertial Navigation

By Jeffrey Z. Snyder, SeaVision Marine Services LLC &
Matthew Cook, SeaView Systems Inc.

Inspection-class ROVs provide an excellent option for confined access underwater investigation, particularly when the project locations, operational depths, and access conditions preclude investigation or intervention by divers. Such situations are frequently encountered in flooded tunnels and pipelines.

When operational conditions such as poor visibility, and complicated structural layouts with expected potential obstructions combine to present a strong likelihood for entanglement, exceptional demands are placed on the concept of situational awareness during the deployment and operation of inspection-class ROVs in these environments.

On a recent project in a flooded mine in northern Canada, SeaView Systems and SeaVision Marine Services teamed with Nuytco Research Limited to develop a world-class inspection-class ROV solution to investigate the mine in water depths exceeding 1400 feet. By developing fully-georeferenced 2D and 3D models of the mine tunnel system and outfitting a SeaEye Falcon with a Doppler-velocity log-aided Inertial Navigation System, the team used this combination of models and real-time navigation inputs to successfully negotiate a complicated underwater tunnel geometry in order to penetrate approximately 450 feet from the launch point to investigate the tunnel conditions during two separate missions.

This strategy of 3D Modeling and aided-Inertial Navigation combined to provide a real-time navigation and operational solution that provided a dramatic improvement in situational awareness under harsh operating conditions. Though applied in an inshore setting, this approach can provide the foundation for similar low-visibility, confined access conditions in the offshore as well.

Blind man's bluff might be a fun children's game that can hold the attention of some youngsters for about an hour or so. Most anyone who has worked commercially as

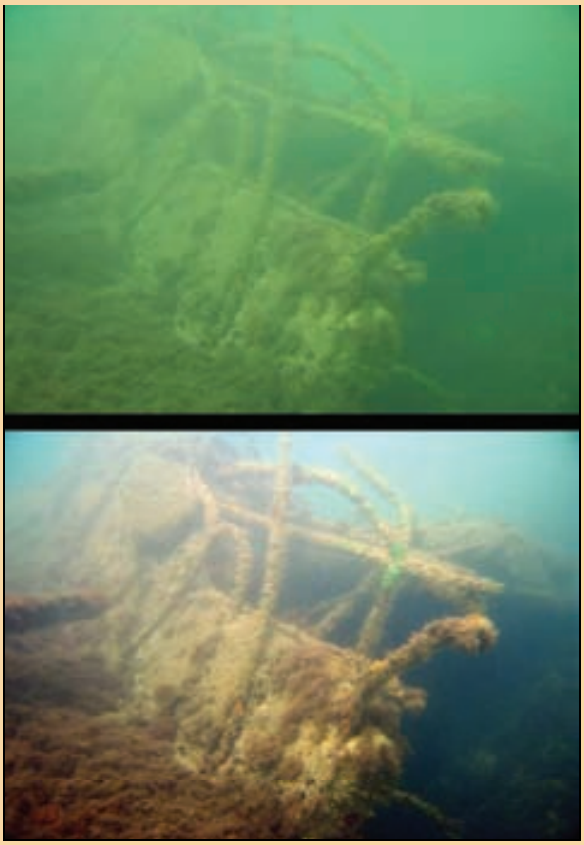
an ROV-pilot or diver, unfortunately, has had the experience of attempting to navigate through difficult surroundings with poor visibility.

In some respects, divers have the advantage of utilizing tactile feedback to feel their way through a project site. Armed with an understanding of their surroundings prior to a dive, and communications with the surface during a dive, it is possible for divers to overcome poor visibility and use their hands (and feet, and knees, and heads) to navigate around a project site.

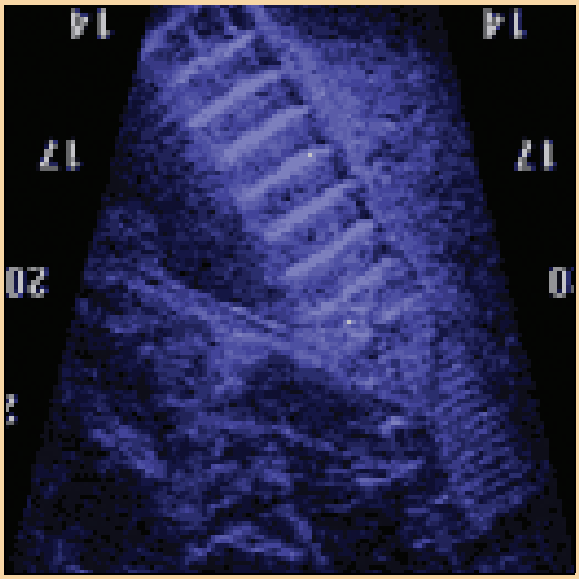
ROVs, however, do not afford the luxury of providing tactile feedback to the operators. Even if armed with a manipulator arm, it may not be possible for an ROV to "turn around, face your rig, and take up your slack as you come back" in order to free an entangled umbilical. Instead, ROV operators rely on operational strategies and a growing suite of technologies to improve or supplement their situational awareness and operate in poor visibility environments.

Low light cameras, improved subsea lighting systems, and visual enhancement technologies serve to improve the visual quality in video feeds available to ROV operators. Varying grades of high definition, high-resolution scanning/imaging sonars are common on ROVs from large work-class machines to small mini-ROVs, providing operators with improved awareness that is not impacted by the quality of visibility. Real-time positioning is often provided by acoustic positioning systems such as ultra-short baseline (USBL) and long-baseline (LBL) systems.

These improved visual and acoustic technologies are excellent options for providing better real-time, nearfield observations. Range limitations prevent them from providing an understanding of "big picture" situational awareness. This may be acceptable when the access and egress pathways are easily located and utilized. Open water projects often afford the opportunity to complement these observation systems with acoustic positioning from USBL and LBL systems which can aid the operators in understanding their immediate surroundings and help them to develop a strong sense of situational awareness. What do we do when a project demands remoteinspection or intervention, and poor visibility, complicated structural layouts, and challenging tasks combine to decimate any sense of situational awareness? How can we go beyond the information provided by visual inputs from cameras or sonar imagery and operate in areas where acoustic positioning is not available, so that we can successfully navigate an ROV in a poor-visibility, confined access environment? With a limited of amount of fundamental but



Visual enhancement technologies, such as those being developed by LYYN AB, help to improve visibility in turbid subsea environments. (Image from http://www.lyyn.com)



High resolution imaging sonars, such as the SoundMetrics DIDSON, provide excellent subsea imagery with surprising levels of detail. Pictured above is a collapsed oil rig. (Image from http://www.soundmetrics.com)

A view down Cigar Lake Mine Shaft 1. The actual floor to be investigated was 1500 feet below the ground surface; water had flooded to within 60-feet of the ground surface.

The SAAB SeaEye Falcon DR, outfitted for deployment in the Cigar Lake Mine. Note the SoundMetrics DIDSON sonar mounted below the primary camera, the additional DSPL Lights on the starboard side of the ROV, and the Teledyne-RDI DVL on the instrument skid. Also note the additional syntactic foam installed on the Falcon to maintain neutral buoyancy. The Outland Pan/Tilt cameras were installed immediately after this picture was taken.

accurate

structural layout information available, it is possible \ to develop useful three-dimensional concept models that can be managed, in real time, in order to provide a general understanding of the location and orientation of an ROV. These models can vary in complexity, from the custom full-physics training models that are becoming more popular in the ROV industry, to much more simple on-the-fly models that can be developed using off-the-shelf software. The technology exists, in the form of Doppler Velocity Log-aided inertial navigation systems, to provide adequate positioning and orientation information for the ROV that can be fed into the models; these models can then be utilized to supplement real-time inputs from video and sonar sensors to enhance overall situational awareness.

Flooded Mine: A Challenging Environ

For the purposes of this article, we shall focus on a confined access environment with poor visibility where water depths and access required remoteinvestigation: specifically, a flooded mine with water depths approaching 1500 feet. The Cameco Corporation is a large producer of uranium based in Canada. In October 2006, the main mine at their developmental Cigar Lake facility in northern Saskatchewan suffered a roof cave-in resulting in the mine flooding at a rate of approximately 15,000 to 20,000 gallons per minute.

The mine had been designed to contain such an event with the installation of two 12-foot diameter highpressure bulkhead doors located within the mine so that, when closed, the doors would isolate the ore body floors (in development) from the mill/production facility area (near completion), allowing the mine to flood, but to protect the mill/production assets. During evacuation, one door was closed successfully but the other failed to seal despite heroic efforts on the part of the miners. After several attempts, and with frigid water flooding through the door and increasing in volume at an alarming rate, it became apparent that the door was not going to able to be closed. Reluctantly, the miners evacuated the mine.

The failed bulkhead door was located approximately 1500 feet below ground surface. By the time flooding had stabilized, water had completely flooded the mine and risen within the single vertical access shaft to within 55-feet below ground surface.

Given the estimated $19 billion value of the mine, no time was spared by Cameco in starting on a recovery program. They decided upon a two pronged approach

towards rehabilitation. The main rehabilitation plan was to bring in two land-based drill rigs which were to drill down to the site of the rockfall area, pump grout to form a large plug in the fall. Once set in place and proved to be sealing, the mine could be dewatered on the downstream side so that rehabilitation could proceed. The second approach involved Cameco contracting Nuytco Research, in Vancouver, BC, to provide a robotic option to perform a condition assessment of the mine in the region of the open bulkhead door and of the door itself. To support them in this undertaking, Nuytco contracted SeaView Systems to provide their SeaEye Falcon DR remotely-operated vehicle (ROV). Together the two companies took a 'white paper" development approach with the only restriction to the problem being the state-of-the-art of applicable underwater technology. As visibility was expected to be near zero, the need for the best available real-time remote imaging equipment and accurate navigation was identified as being a critical requirement for the successful completion of the project.

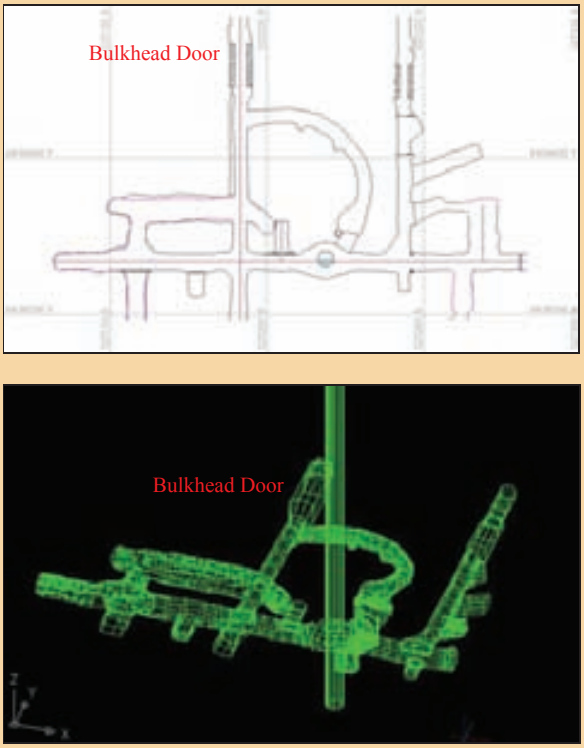
To address the issue of real-time imaging equipment in poor visibility situations, Nuytco and SeaView identified:

(1) A SoundMetrics DIDSON imaging multibeam sonar, mounted to on a tilt platform to track the primary Falcon camera
(2) A CDL MiniPulse profiling sonar
(3) An Imagenex 881a imaging sonar
(4) Two Outland Technology Pan & Tilt cameras
(5) Two 150W DeepSea Power and Light halogen lamps to be deployed in addition to the standard low light SeaEye Camera.

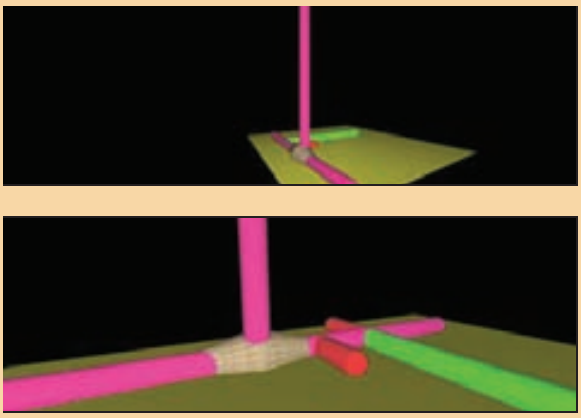
To address the issue of real-time navigation, an inertial navigation system was necessary. Having had earlier experience with deploying a Doppler-velocity log-aided Inertial Navigation System (INS) on the ROV, Mr. Matthew Cook at SeaView Systems recommended that the ROV be positioned using a CDL Minipos INS system and that Nuytco contract SeaView's historical partner in INS operations, SeaVision Marine Services LLC in Connecticut.

Aided Inertial Navigation

The CDL MiniPos is an INS that is built around a Kearfott T16 Ring Laser Gyroscope (RLG). A monolithic RLG provides highly accurate heading, pitch, and roll information in real time at a rate of nearly 20 Hz. This information, when paired with the data from linear accelerometers in three dimensions (x, y, and z) can produce an accurate dead-reckoning position for the INS in



The base plans for the mine tunnel complex in the vicinity of the shaft. The top image is a 2-D base plan view of the mine complex. The bottom is a 3-D oblique view of the same base plan. The long vertical shaft is the access Shaft 1.



SeaVision utilized the Hypack 3-D Terrain Viewer to develop the georeferenced conceptual model of the Cigar Lake Mine. The purple Shaft 1 descends to the gray shaft chamber. From there, an eastbound horizontal tunnel, or "drift" and a westbound drift depart the chamber. The bulkhead door was located at the end of the green horizontal drift in the model. Additional spurs off of the primary westbound drift were color-coded red so that we would avoid mistakenly turning down those drifts.

A view from the perspective of the Falcon, from within the Shaft 1 chamber alongside the elevator that carried the deployment garage to the 480-meter level. SeaVision color-coded the different spurs off of the primary drift so that the SeaView's ROV operator knew which tunnel was the target. The spur tunnels do not actually come into the interior of the main drift; rather, that is an artifact of the 3DTV shapes used to develop the concept model for the project.

Approaching the bulkhead door and an abandoned scoop loader.

three dimensions. The inner-workings of an INS can seem a bit "blackbox". However, if we think back to our college-level physics, an instantaneous measured acceleration can be integrated with respect to time to generate a velocity. Removing the calculus notation, the equation is:

$$v_t = v_0 + (a_t \cdot \Delta t)$$

This is read as: the velocity at any time t is equal to a starting velocity plus change in velocity due to an acceleration applied over an incremental change in time t. A second integration can generate a displacement.

$$x_t = x_0 + (v_t \cdot \Delta t)$$

such that the location x at time t is equal to a starting location plus a change in location due to the velocity over an incremental change in time t.

Unfortunately, a stand-alone INS has a tendency to drift because it does not sense constant velocity drift. Without aiding from an external source, an INS can only generate its own values for the constant velocity (the v0 member of the equation above). The INS struggles to accommodate three-dimensional longterm drift, so Kearfott aides the INS in the MiniPos by providing it with a Teledyne-RD Instruments Doppler Velocity Log (DVL) and, in this case, a DigiQuartz pressure/depth sensor. The DVL provides real-time constant velocity measurements that aid the INS to account for horizontal (xy) drift. The DigiQuartz pressure sensor, accurate to nearly 0.01% of actual depth, provides a vertical correction to aid the INS. These inputs, combined with the dead-reckoning solution from the RLG and linear accelerometers, are fed through onboard hardware and firmware that run a series of Kalman filtering algorithms that generate the aided inertial navigation solution.

The pairing (the INS and the DVL) mounted to an ROV instrument skid are run through a "training" or calibration routine prior to the actual survey so that the Kalman filters can be taught how to combine the information from the INS and the DVL to generate a highly accurate positioning solution. For this project, SeaVision teamed with Nuytco to accept delivery of the instrumentation at Nuytco's offices in Vancouver, install the MiniPOS INS and the Teledyne-RDI DVL to the tooling skid, and perform the training calibration routines from a survey vessel near Port Coquitlam, British Columbia.

After calibration, the result was an instrument skid that was ready to be mounted to the underside of the ROV (in our case, the SeaEye Falcon), powered from the ROV, and capable of outputting a single data stream that contains the x,y,z positioning, the heading, pitch, and roll and the velocity of the ROV in real-time at an update rate of

between 10 Hz and 20 Hz.

So long as we could know the real-world location (in coordinates) of our starting point, we would be able to use the aided INS to generate a displacement from the start-point that takes into consideration the entire course traveled, because each position solution is a function of the previously recorded position. The added benefit of the aided INS is that, with an RLG at its core, it could provide very accurate heading and attitude referencing to correct for the attitude of the ROV.

INS Combined with 3D Model

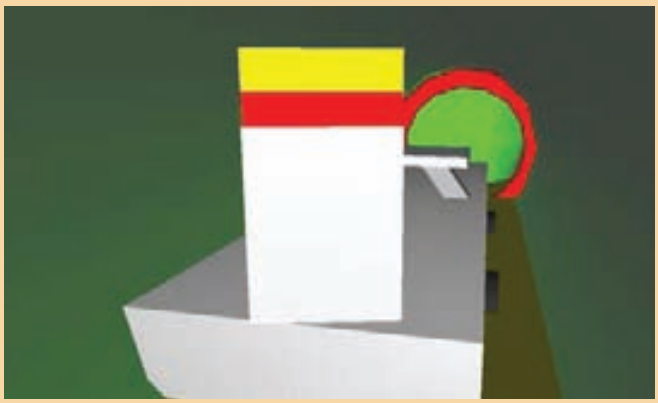
Due to the low visibility anticipated in the Cigar Lake Mine, it was necessary that a means of navigating the ROV be developed that would not only position the ROV in real-time but also provide an expedient means of mapping any debris or obstructions as they were identified in order to minimize the risk of entrapment.

To this end, SeaVision set to developing a virtual 3D model of the mine system based on drawings provided by Cameco. SeaVision selected Hypack, a hydrographic survey software popular throughout North America, as the platform for developing this model. As a survey software, it would provide userfriendly inputs for importing the real-time positioning and attitude information from the INS on the SeaEye Falcon ROV. A recently added feature to the software, the 3-D Terrain Viewer (3DTV) would provide the ability to view the real-time position of the ROV in plan-view as well as in a 3-Dimensional Viewer.

Fortunately, Cameco had developed very accurate three-dimensional survey drawings of the subterranean mine well before the flooding accident. These drawings had been geographically referenced to a coordinate system directly related to the Universal Transverse Mercator (UTM) grid, so that simple translations could bring these electronic drawings (in AutoCad format) into the UTM geographic coordinate grid.

Using the drawings as background information, SeaVision utilized the Hypack 3DTV Utility to develop a conceptual, fully georeferenced model of the principle features of the mine that would be encountered during the ROV missions to the open bulkhead door. Using simple geometric shapes like pipes and shells, SeaVision matched the general three-dimensional layout of the mine and generate a conceptual model of the mine.

Hypack can be configured to accept the position and attitude inputs, in real-time, from the INS so that the ROV can be displayed within both the 2-D plan view lay-



A view of the SeaEye Falcon (yellow, red, and white rectangular prism) navigating within the 3-D conceptual model of the tunnel. The object under the ROV is a concept of a scoop loader, which had been abandoned directly adjacent to the narrowed sidewalls that lead to the bulkhead door (marked in the background as the red toroid). Note that the ROV is hovering above the scoop loader and that a roof over the scoop loader operator station may be either an obstacle or an entanglement hazard.

A second view of the scoop loader in the vicinity of the bulkhead door, look back to the south towards the main drift (purple).

out and the 3-D concept model. The 3-D inertial positioning, as well as the heading, pitch, and roll information, our output directly from the subseahoused INS to a fiber-optic multiplexer on the ROV and transmitted topside across the umbilical. From the topside fiber-optic multiplexer, text strings of data from the INS are transmitted across an RS-232 port which can be easily read into Hypack and parsed according to the respective data fields. SeaVision also developed a simple representative model of the SeaEye Falcon with the reference point set to match the reference point of the INS. Prior to the missions, SeaVision also developed conceptual models of known large obstructions in the tunnel, particularly a scoop loader (a low-profile front-end loader) and a bobcat skid-steer and a scissor lift. Using this information, the ROV was to be flown through the virtual space much like a video game, using sonar primarily for obstacle avoidance and tunnel mapping duties. The 2-D and 3-D models could be viewed by the ROV pilot, in real-time, in order to navigate safely from the access shaft to the bulkhead door and back to the access shaft.

ROV Ops in a Flooded Mine

The portion of mine to be investigated, at the 480 m level (480 m below ground surface, or approximately 464 m in depth), had been near completion. As such, it was full of utility lines along the ceiling and sidewalls. During the evacuation that followed the accidental rock fall and subsequent flooding, the miners (all of whom escaped safely) abandoned toolboxes and heavy equipment. The exact location of these items was not known. Access could only be gained from the vertical access Shaft 1, which would require that the SeaEye Falcon DR be lowered within a deployment garage to the level to be investigated. By integrating the deployment garage into the elevator system, the Falcon and the garage could be lowered to the elevator shaft chamber at the deployment level. The positioning and orientation of the garage required that, upon arrival at the deployment level, the entire system (the ROV with all auxiliary systems and the garage) was required to remain in place foe a period of time (less than 30 minutes) in order to allow the INS to settle and to program the INS with the starting coordinates of assumed at the center of the garage within the shaft.

After calibrating the INS, positioning and orientation required that the ROV back out from the garage towards eastbound drift, circle 180 degrees around the garage, and then navigate to the westbound drift. After 100-ft. of penetration down the westbound drift, passing an oversized tool storage closet and arriving at an intersection of tunnels, the ROV had to turn 90-degrees to the north and perform an additional 230-feet penetration to get to the bulkhead door to be inspected.

Accomplishing this required that the ROV negotiate past a Bobcat skid steer tractor, a number of cables, pipelines and other infrastructure hanging from the tunnel ceiling, and finally maneuver past a scoop loader (low profiler tractor used in mines) that the miners had been using to try to pull the bulkhead door shut immediately prior to evacuation from the flooding mine. Finally, the ROV was to take a video survey of the bulkhead door which, due to the poor visibility, required that the camera be positioned very close to the door and associated slings.

In approximately 1525-ft. of water, with near zero visibility, the imaging sonars were necessary for general obstacle avoidance, and the additional pan/tilt cameras provided improved field of vision, but the 2D and 3D models in Hypack, with the real-time navigation input from the INS, provided the SeaView Systems' ROV operator with a real-time global picture of the progress of the venture from the deployment garage to the targeted bulkhead door. Leaving the garage, it soon became apparent that the 3-D virtual guidance was a great aid to the pilot and lived up to its promise in allowing the mission to be flown in virtual space as the ROV traveled in real space. The navigation and obstacle avoidance was complimented by the three sonars also carried aboard the ROV.

Hypack's 3-D Terrain Viewer also added the flexibility of changing the viewing perspective, such that you can view progress in the 3-D environment from several different camera settings. We found that operating from within the survey vessel (in this case, the ROV), or from just behind and above the ROV, to observe challenging, precise maneuvering, to be the most valuable approaches.

Also, to avoid entanglement, SeaVision was able to maintain the overall tunnel in two critical ways: first, to place concept models of large obstructions into the model so that they could be avoided during egress, and second, to record the track taken into the tunnel in order to develop a "Hansel-and-Gretel" trail that could mimicked on egress. Both capabilities provided specific additional means of umbilical management to complement the overall dramatic improvement in situational awareness in this confined access situation fraught with entanglement hazards.

Continued improvements in video and sonar technology are helping to improve the quality of visual feedback in

low-visibility subsea environments. Low light cameras, better lighting systems, and visual enhancement technologies, as well as high-resolution multibeam imaging sonars, provide exciting new options for performing nearfield visual observations when visibility is poor. However, certain scenarios demand much more "big picture" situational awareness due to complex structures and entanglement hazards that are exacerbated by poor visibility. In such circumstances, a real-time 3-D model can be fed high-quality position and attitude information from an inertial navigation system to provide a real-time, virtual world that an ROV operator can utilize to supplement his/her suite of sensory inputs. In the case of a flooded mine in northern Canada, we encountered a confined-access, low visibility environment with a high likelihood of misguidance or entanglement. The deep waters and confined access disqualified the utility of positioning through acoustic methods, and the need for a robust, real-time, integrated positioning and attitude system demanded that a high quality inertial navigation system be used. The obstacles and entanglement risk required that the data from that navigation solution be fed into a 3-D model for real-time monitoring.

In the project, we demonstrated that we could pull together a host of off-the-shelf hardware and software to develop a unique, high-value navigation solution and a real-time, adaptive 3-D virtual environment to maximize the situational awareness for the ROV operational team. The solution, combined with advanced video and sonar observational tools, provides a comprehensive approach to avoiding a game of blind man's bluff with an ROV asset.

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Port Security

Increased Vigilance Required

By Paul Singer, Vice President, Securewest International

It is, perhaps, an understatement to say that port security is in somewhat of a state of flux at present. First, in the U.S. for example, there was a warm reception at the end of 2006 to the announcement by the Department of Homeland Security of approximately $110m being ring-fenced for port security grants under Round 7 of the Port Security Grant Program, offering some hope to ending consistent criticism regarding poor levels of port security funding both before and after 9/11.

In addition, favorable noises have come from the U.S. Coast Guard's International Port Security Program (IPSP) with related Port Security Advisories previously listing only four countries having port facilities that are failing to fully implement the required measures in the ISPS Code. And yet global port security was called into question most recently by the U.S. Government's own Accountability Office (GAO) in a report that criticized the disparate levels of security throughout the global port supply chain system.

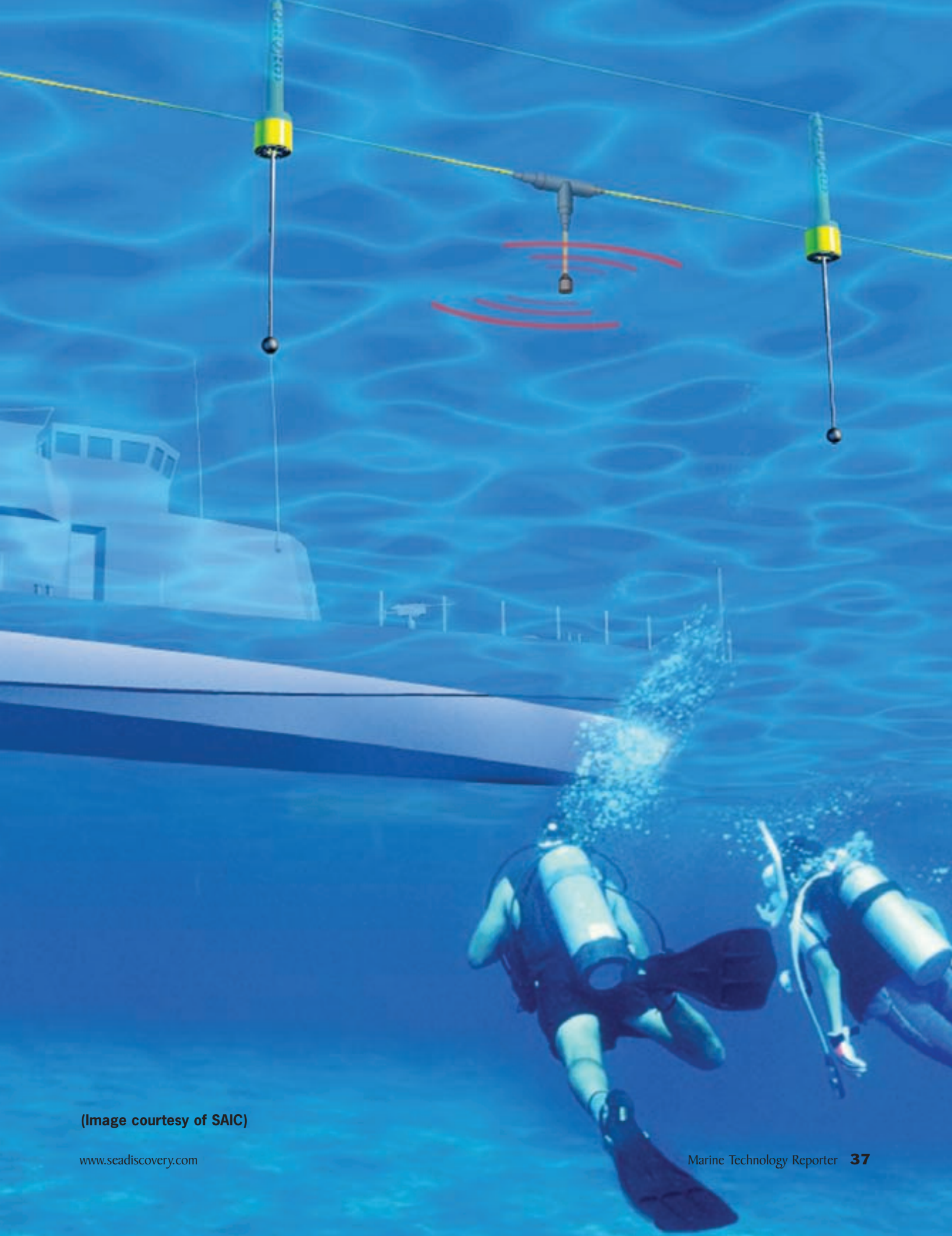
The GAO's investigators visited a range of foreign ports, with some deploying cameras, fences, guards and identification checks, while others rarely made thorough checks and ignored holes in the perimeter fences.

Sadly too, it seems that some of those positive forward steps from 2006 are being retraced following the announcement in March that U.S. port security financial aid will be halved next year with proposed White House grants down around $120m on 2008, a point not lost on angry port bosses.

Set against all of this mixed messaging there is one overarching constant. In the 'league table' of maritime security importance port security should be battling for top spot. With 85% of goods being moved around the globe by ship, the world's economies continue to remain dependent on commercial traffic passing in and out of thousands of port facilities each day. Therefore, ports intrinsically represent a potential Achilles heel in the security of the world supply chain and have always traditionally been seen as vulnerable and comparatively weak.

Proposed methods of strengthening any holes in this first line of defense have been particularly numerous in recent years. But a major sticking point for any proposed practical maritime security improvements, be they regulatory or technological is the potential for serious interference with the flow of commercial trade. Some may say that this is a price worth paying for a secure network but there has to be a balance for the good of the global supply chain.

U.S. Customs and Border Protection now wants importers and shipping companies to submit additional information about their cargo before it leaves foreign ports. This will add to the requisite information that shippers will need to supply and some companies are already voicing the same concerns about delays and interruptions to the flow of commerce. For 'delays' read 'increase in costs'.



(Image courtesy of SAIC)

With the cash injections into the port security sector comes a plethora of solutions to threats and the debate is often on where the money should be spent? To answer that question we have to analyse the threats. Are they real or have some been 'floated' by companies simply so that they can then sink them with their new products?

There has been propensity to focus on container security. Yes, containers do present a clear target for terror organisations but quantifying exactly what is and where the main threat to ports will come from is a much more complicated matter. Directing the majority of security funding budgets towards container security initiatives in turn leaves other areas of port security (such as port surveillance) starved of vital financial backing.

Indeed, does the strongest threat come from external terror forces using mines and small boats to attack multiple ports in order to disrupt the economies of the world?

The latter is certainly there for all to see and determining how best to track, and alleviate the risks posed by the millions of small boats that regularly operate in U.S. waters alone is a major headache. Across the world's seas, terrorists continue to favor small boats to attack shipping and maritime facilities through the instigation of suicide missions and rocket assaults - demonstrated by the attack in Aqaba, Jordan. Requests too by the Department of Homeland Security for funding to conduct detailed surveys of prominent ports are an indication of the worries concerning terrorist mines. The perceived randomness of mining instills fear, and surface attacks are financially and practically effective. This is the reason why these methods have been mimicked by various terrorist organizations.

We should also be thinking about resiliency here. Vessels are frequently held to ransom by 'pirate' groups and so by definition we cannot rule out the use of captured vessels as a 'Trojan horse'. Auditors at the GAO have stated recently that the U.S. Coast Guard can't currently meet its own security standards when it comes to protecting vessels transporting liquefied gas or crude oil from terrorist attack. Therefore, this places an increasing importance on actions taken in ports.

Many ports view themselves not as a target per se and at the worst, they will only be the 'conveyor' of any threat. Fear and finances aside, terrorists are also motivated by instigating attacks that bring the biggest possible spotlight to their cause - not necessarily the taking of hundreds of lives. In this respect, ports provide rich pickings. Consider the chaos and financial impact of any port closedown for any period of time due to the deliberate use of a vessel to block entry, and also how ports might ensure recovery of potentially a whole port area contaminated by CBRN material. Clean up times can last for weeks or months.

One major concern for ports is knowing who exactly is on site at any given time. TWIC in the U.S. has been devised as a counter to this particular problem and it remains to be seen if it will be a credible solution. The successful implementation of Felixstowe's RHIDES project (UK) is a good example in the UK. RHIDES is biometric chip card system that effectively countered past issues of access control at the port and the problems associated with the varying nationalities of drivers, and ID substitution.

True, the wider use of technology in all ports can only assist in the prevention of security breaches. Seals, tracking devices, nano technology developments and screening initiatives all help, but it is legislation that underpins the whole structure of port security.

True, the wider use of technology in all ports can only assist in the prevention of security breaches. Seals, tracking devices, nano technology developments and screening initiatives all help, but it is legislation that underpins the whole structure of port security.

There has been a consistent criticism of legislation introduced post 9/11 to assist with security at port facilities. Some is justified, but any attempts to safeguard from terrorist attack the millions of shipping containers that cruise the world each year should have some positive security impact.

ISPS has been a definite step in the right direction but the name of the game here, as with any legislation, is that it can only work if compliance overcomes complacency. On the positive side, ISPS has reduced stowaway boardings and armed robberies in ports. BIMCO have stated that, of the ISPS reporting forms received from BIMCO members, only about 10% indicate shortcomings with ISPS compliance at port facilities.

The problem is that these successes still don't negate the

seaward threat to ports. At Securewest International we monitor over 16m tonnes of international shipping and we issue on average one to two alerts every day.

The trend in port security initiatives has been a definite move towards pushing borders out - better cooperation among intelligence and law-enforcement agencies, and inspection of shipping containers before they leave foreign ports for American shores (CSI) are all measures designed as 'forward defence' of seaports.

The CIS 'study' is due to conclude not long before this item goes to press, but even with results still pending, Washington has hailed the initiative as a success. For others it only serves to reinforce the belief that the CSI doesn't solve the container security problem, it merely moves the terrorism threat elsewhere.

A key phrase here is 'maritime domain awareness' - knowing what is out there. Ports in general do not really need to know what is beyond the horizon but, with legislation concerning Long Range Identification and Tracking (LRIT) systems entering into force on 1 January 2008 (applying to ships constructed on or after 31 December 2008 with a phased-in implementation schedule for ships constructed before 31 December 2008), there is a value in ports also being able to 'see' what is inbound at ranges not necessarily reached by radar or AIS. Any holes in the domain awareness 'shield' are a potential gateway for the terrorist.

In addition, history dictates that actually threats come not from the vessels we know about (and that are ISPS compliant), but from those numerous small craft that are not. This is why more and more authorities are looking at tracking everything in a port or harbour area.

However, this is not an easy task and there are costs associated with this. AIS base stations have their limitations and are dependent on weather / height etc. The combination of AIS Type B, AIS Type A on ISPS compliant vessels, and a long range base station can provide cost effective awareness for port / harbour area, as could the use of integrated software solutions currently available that permit all this information, plus radar and even CCTV, to be displayed together.

The challenge for ports is to integrate all this data and ensuring it is being used correctly - monitored and made available to the right authorities and agencies in a given port, especially in response to any alert or emergency when other outside agencies may need to be involved in pre planning or reaction (post incident).

Its not all about portside initiatives, gadgets and gizmos. We should not loose sight of the fact that vessels too have a responsibility towards security whilst both at sea and also in port. Although the lines of responsibility can be somewhat blurred here, effective cooperation and a sensible approach to security tasking is always the best solution. Port security measures vary alarmingly from one country to another and so leaving the job to others and expecting the application of strict security to be carried out as a matter of routine is a risky habit to fall into. We are not just talking about the terrorist as the threat here - stowaways are still a constant drain on resources.

Port security itself is far from being a simple issue, encompassing a variety of solutions to a variety of threats. According to IMO figures around 50,000 vessels called at over 4,000 ports across the world during 2007, and in the process 85% of the global trade was moved. Yet, despite the obvious significance of ports in relation to world economics, port security is often not high enough on the security agenda.

About the Author

Paul Singer joined Securewest International in 2003 following 10 years service as a Special Constable with the police force in the United Kingdom and a successful business career. He is now responsible for Securewest International's technical support and worldwide marketing.

Visit www.securewest.com

U.S. Regulatory Control of Undersea Defense Technology

Protecting the Technology that Protects Us

*By Barbara D. Linney**

As the U.S. Coast Guard increasingly relies on undersea technology and equipment to bolster port security, other U.S. government agencies continue their mission of ensuring that critical technology and equipment deployed in the war on terror do not fall into the wrong hands. Companies competing in the undersea defense space must be cognizant of all of these regulations in order to comply with the controls imposed on their products and technology. This article summarizes the key regulations in this area and highlights some of the products and technology affected.

The Office of Foreign Assets Control of the U.S. Department of the Treasury (OFAC) administers trade embargoes against various countries (such as Cuba, Iran, and Sudan), entities, and individuals identified as terrorists, supporters of terrorist governments, or otherwise as threats to U.S. national security. In most cases, these embargoes prohibit all U.S. companies, citizens and residents from engaging in any direct or indirect trade or transactions with such countries, entities and individuals.

Two other agencies administer most of the U.S. export control programs. The Bureau of Industry and Security of the U.S. Department of Commerce (BIS) is responsible for implementation of the Export Administration Regulations (EAR), which regulate the export of commercial items, technology and software. The vast majority of these products are not subject to country-based license requirements, but for those with "dual-use" capabilities, export licenses may be required (and in some cases will be denied) depending upon the intended destination of the export. However, the export of all items, technology and software subject to the EAR must be vetted for compliance with various end-use and end-user prohibitions and associated license requirements or denial policies.

The export of defense articles and related technical data and defense services is regulated under the International Traffic in Arms Regulations (ITAR) which are enforced by the Directorate of Defense Trade Controls (DDTC) of the U.S. Department of State. Unlike in the commercial export arena, most defense trade is subject to export licensing requirements. In addition, the ITAR requirements apply to controlled components as well as end items.

Another agency whose mission includes protection of national security is the Committee on Foreign Investment in the United States (CFIUS), an inter-agency committee chaired by the U.S. Department of the Treasury. CFIUS is charged with review of foreign investment in the United States that could have an adverse impact on national security. Proposed foreign acquisitions of companies that produce equipment and technology that is critical to homeland security or are key suppliers to the U.S. Government will be subjected to careful scrutiny, and foreign buyers may be required to agree to restrictions designed to protect against unauthorized foreign access to such products and technology.

Companies competing in the undersea defense space must be cognizant of all of these regulations in order to avoid inadvertent violations. Many companies who sell only to the U.S. government or other U.S. based customers believe that they do not export and need not concern themselves with export compliance. To the contrary, both the EAR and the ITAR define an export as including the release of technology to foreign nationals anywhere in the world, including in the United States. This means that companies whose products and technology are subject to export controls must have in place plans designed to protect their technology against unauthorized disclosure to foreign nationals, including foreign national employees or customer representatives, plant visitors,

recipients of electronic, telephonic and other forms of communications, and so on.

The starting point for such a compliance program must be an accurate determination of the export classification of the company's products and technology - are they subject to the EAR or the ITAR, and what category of the Commerce Control List (if subject to the EAR) or the U.S. Munitions List (if subject to the ITAR) do they fall under? Many companies fall prey to the temptation to jump to the conclusion that their products and technology are "commercial" and thus subject to the EAR. However, many products and related technology that may not appear to be "munitions" are in fact listed on the U.S. Munitions List and subject to the ITAR - including certain harbor entrance detection devices, underwater and other electronics, cameras, diving and underwater breathing apparatus, concealment and detection equipment, and related components and technical data. Furthermore, products, components and technologies that do not appear to be explicitly listed on the Munitions List but were developed with U.S. Government funding or for military programs may also be subject to the ITAR. If a company has concluded that the ITAR does not apply to its products and technology, it should still carefully review Category 8 of the Commerce Control List, which subjects various items designed for underwater use and related software and technology to destination controls under the EAR.

A clear understanding of the applicable export classification and regulations also is essential for any company planning to sell its products and technology internationally, as the export license requirements and lead times vary considerably depending upon which export control regime governs.

Failure to comply with U.S. export control regulations can have serious repercussions. Companies who violate these rules can be subject to millions of dollars in civil and criminal penalties and fines, government imposed compliance programs and monitors, denial of export privileges, and debarment from participation in U.S. government contracts. Company directors, officers and employees who participate in criminal violations may also be sentenced to imprisonment.

An understanding of the export controls applicable to their products and technology also is critical for companies in the undersea defense market who may become attractive targets for foreign buyers. While companies who do not approach negotiations with a potential foreign buyer with knowledge of whether CFIUS review will be required do not expose themselves to fines and penalties, they do risk subjecting themselves to intense Congressional and media scrutiny and losing potential deals. Companies who plan ahead for export compliance avoid shipment delays, costly enforcement actions, unwanted publicity, and stalled deals.

**This article reflects developments through April 4, 2008, the date of submission for publication. The views expressed herein are those of the author, do not necessarily reflect the opinion of the firm or other members of the firm, and should not be construed as legal advice or opinion or a substitute for the advice of counsel. Please contact Barbara Linney (Linney@BlankRome.com) at (202) 772-5935 if you have questions or desire assistance.*

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www.BlankRome.com

Seal Delivery System Demos Mission Capability

The Advanced SEAL Delivery System (ASDS) program, with support from Northrop Grumman, achieved a significant milestone in late March 2008, operating for the first time from one of the U.S. Navy's newest transformational platforms, the Ohio-class cruise missile submarine USS Michigan (SSGN 727). The ASDS vehicle was hosted on the USS Michigan during the SSGN's recent Follow-on Test and Evaluation period (FOT&E), which included as its final phase the operational evaluation of SSGN with ASDS. During the test, the ASDS vehicle was launched and recovered by the USS Michigan across the full range of operational conditions. All test activities associated with the combined operations of ASDS and the SSGN class submarine were successfully completed. The ability to host an ASDS on the SSGN was enabled by Northrop Grumman's design, manufacture, and delivery of a set of "universal pylons" that are designed for Los Angeles class, Ohio SSGN class and ultimately the Virginia class submarines. Previously, hosting the ASDS was limited to two Los Angeles-class submarines - USS Greeneville (SSN 772) and USS Charlotte (SSN 766) -

using transport and latching pylons that were designed specifically for that class of submarine. The flexibility of the universal pylons was demonstrated during the operational test and evaluation. The ASDS' ability to provide

BioSonics: Underwater Acoustic Sentinel

The Underwater Acoustic Sentinel (UWACS) is a sonar surveillance system, designed to automatically detect and identify underwater intruders from several hundred meters away. The system features specialized, active acoustic sensors placed at strategic underwater locations. The sensors are networked together and cabled to a shoreside control station. The system is capable of automatically detecting and classifying physical objects, aquatic life and potential threats that enter the zone of surveillance. In the event a potential threat, such as a diver or surface swimmer is detected, the system is able to provide an alarm and the location of the threat for interdiction. A common problem in underwater threat detection is false alarms due to an inability of the system to classify detections. The UWACS system has unique target classification capabilities that minimize the occurrence of false alarms and offer a clear advantage when compared to other underwater threat detection systems. UWACS technology is based on the BioSonics DT-X digital scientific echosounder. These systems are capable of determining the precise location of targets detected within the acoustic beam and are able to track target movement to assess direction of travel, velocity and behavior. This technology has been utilized by government researchers and scientists to count and track aquatic species in a variety of complex marine environments for over twenty years. The acoustic transducer developed for this system features a very low side-lobe, focused beam design, to enable target detection at great ranges (500m +) with minimal interference from boundary reverberation. The acoustic signal is digitized within the transducer itself to further maximize signal-to-noise by reducing signal loss due to long analog cable runs.

The resulting system has an extremely high dynamic range (> 160 dB) and a very low noise floor (-140 dB typical) allowing unsurpassed target detection in difficult environments.

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clandestine undersea mobility will significantly expand the range of options available in the war on terrorism. "The ASDS success during the test with USS Michigan is just another 'first' in a long stream of 'firsts' that ASDS has been involved in. This first-of-its-kind system provides an operational capability to our SEAL forces in any environment," said Dennis Gallimore, Northrop Grumman's ASDS Program Director. "ASDS is a transformational system that provides our naval forces, and our highly trained and valued SEAL personnel, with the most technologically advanced equipment in order to survive and succeed in critical special combat missions." The ASDS is a combat submersible developed by Northrop Grumman for the Special Operations Command (SOCOM). The ASDS Program is a joint program between Northrop Grumman Electronic Systems and Northrop Grumman Shipbuilding - Newport News, bringing together world class submarine, manned submersible, and undersea systems capabilities to ensure the reliability and mission readiness of the ASDS.

EdgeTech Gets UK MoD Contract

EdgeTech's 2200-S 850 kHz Dynamically Focused Side Scan System will be installed on the Hydroid REMUS 600 AUVs recently ordered by the UK Ministry of Defence. The 850 kHz dynamically focused frequency provides extra high resolution imagery at longer ranges which makes it a tool for Mine Countermeasure (MCM) surveys. The EdgeTech 2200-S systems will also be used by the Royal Navy for hydrographic surveys and environmental assessments.

The EdgeTech 2200-S System is designed specifically for small AUVs and comes available with a choice of dual simultaneous 120 & 410 or 230 & 540 kHz frequencies or 230 with 850 kHz dynamically focused frequency. Other frequency combinations are also possible.

For additional information, visit www.edgetech.com

Saab Seaeye: ROVs Make Military Inroads

Technological development is increasing the use of ROVs in the defense world. The Russian Navy for instance set up a rapid response air transportable Saab Seaeye ROV system to support stricken submariners.

Another of their ROVs helped locate a crashed helicopter, then carried out a video survey before supporting divers in its recovery.

Other navies use ROVs in the range of salvage work such as torpedo recovery; and portable versions, like the Seaeye Falcon, being used for rapid deployment from an exposed RIB or light launch. A number of Falcons have been sold to the British, American, Russian, Italian, Chinese, Rumanian and New Zealand armed forces.

The Finnish Navy Research Institute chose one because different equipment could be easily added and changed as needed. In particular they fitted a Tritech super-seeking sonar and altimeter, together with an Ore ROV tracking system and single function manipulator. They reportedly also liked the ease by which this portable ROV can be transported and deployed from a mother ship. Now a new generation of ROVs is emerging.

These are offering defense forces more power and operational capability, yet with more rapid mobility. Packed with technological innovation, this particular vehicle is the most advanced of its type in the world. Deep-swimming, it can handle a range of vital tasks including object recovery, deep water survey and salvage. Its new simplified control system, with built-in intelligence, means new pilots can be trained faster, and the conversion of experienced pilots made easier. Vital for defense operations is finger-tip maneuverability in difficult conditions, including holding steady in strong cross currents. This matters in an ROV, whether it be a large and powerful or fully portable.

Fiomarine 'Buoyed' by U.S. Navy

Fiomarine Industries Pty Ltd. is a small Tasmanian company that specializes in underwater security and retrieval products. Its signature product, the Fiobuoy, was designed specifically to assist the Royal Australian Navy and now supports not only the Australian defence force, but others around the globe. Fiomarine's largest customer is the U.S. Navy, which has recently received its second major order of Fiobuoys - and order that represents a 340% sales growth in less than three years for the company. Currently, the Fiobuoy is being used to support marine research exercises as well as the oceanographic and hydrographic industries. In the future, the offshore oil and gas industry, as well as fishing and aquaculture may also benefit.

Above: US deploying Fiobuoy for mine retrieval exercise. Below: Fiobuoy in the water

Fiomarine was created in 1997 to eliminate potentially dangerous surface obstacles and increase safety in the sea. According to the manufacturer, Fiobuoy is the world's first submersible marine marker buoy and retrieval system. It is unique in that it combines an acoustic release, a line of retrieval and a marker buoy in one complete system. It allows equipment or assets to be secured and 'hidden' underwater and then safely retrieved. In defence it allows sensitive equipment to be covertly secured underwater and at deeper depths than previously possible.

"Our goal is to see the Fiobuoy used in all areas of the marine industry," said John Fiotakis, Fiomarine CEO and Fiobuoy inventor. "As a security and retrieval tool that improves safety in the sea, hopefully one day the Fiobouy will be a household name." Tethered to underwater equipment, Fiobuoy remains 'hidden' underwater and invisible from the surface. Before deployment, a release time and date is programmed into the Fiobuoy via an infrared signal. An acoustic command model is now available, offering on-demand release and greater flexibility in retrieval. Once the command is received, the Fiobuoy releases itself, unwinding to the surface to complete its marking function. Although Fiomarine supplies mostly to the defense industry, the idea for the Fiobuoy originated out of a boating incident. Fiotakis was on a fishing trip with some mates off the southern coast of Tasmania. They were sailing at night when their motors got entangled in five Crayfish pot lines and surface marker buoys. They were able to avert a potentially fatal accident and free a motor before the boat crashed onto a cliff face. The incident got John thinking about how it may have been avoided, and how the buoy could be kept underwater. Once a prototype was developed, it was tested in the Derwent River and was spotted by some Royal Australian Navy (RAN) divers in the area who recognized its potential. Fiomarine then collaborated with the Defence Science & Technology Organization (DSTO) to design the Fiobuoy to suit military specifications.

The Fiobuoy was designed specifically to assist the RAN and now supports defence forces in Australia, the US, Singapore and Japan. The Australian Hydrographic Service as well as Mine Warfare units have been using Fiomarine's technology for almost 10 years.

Having recently received its second major order of Fiobuoys, the US Navy is now Fiomarine's largest customer. "The US took five years to sign the first deal, so this is a big deal for us," Fiotakis said.

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PAL delivers
Eyes in the Sky

By Greg Trauthwein

Ask the theoretical "man on the street" in St. John's, Newfoundland, his knowledge of Provincial Aerospace Ltd. (PAL), and the odds-on response is a description of that "little regional airport," Provincial Airlines.

While that is correct, it does not even scratch the surface of PAL's business endeavors, as it is a world pioneer and leader in Maritime Domain Awareness.

"We are a special mission maritime surveillance company that is not platform specific," said Keith Stoodley, Vice President Marketing & Sales, during a recent interview at PAL's office in its St. John's headquarters.

PAL is a privately held company based in St. John's, Newfoundland, with more than 34 years of fixed wing operations; more than 25 years of marine surveillance operations; more than 100,000 hours of flying time and today, more than 600 employees. While the general public sees only the regional airline side of PAL — amazing when you consider the close-knit nature of this city of 120,000 — the company derives only 35% of its annual revenue from passenger air service, with the remaining 65% coming from aerospace and defense.

The company's surveillance operations were born out of necessity, in step with the development of St. John's offshore oil and gas Exploration and Production industry. With the task of drilling for oil and gas in the middle of 'iceberg alley' on the Grand Banks, it was imperative to track and better understand iceberg floes.

Enter PAL, who stakes the claim as the world's first private operator of digital X-bank anti-submarine warfare radar, according to Stoodley.

"The owner of PAL went to Litton to acquire a X-band radar, and the natural question was 'what in the hell does a Newfoundland company want with X-band radar?" said Stoodley. The answer was a simple one: the high tech tool was need for the detection of icebergs to get the offshore industry going.

PAL is a privately held companywith more than 34 years of fixed wing operations; more than 25 years of marine surveillance operations; more than 100,000 hours of flying time and today, more than 600 employees.

PAL is not platform specific, and the company is currently involved in an R&D venture with Memorial University to evaluate UAV's for maritim surveillance missions.

While maritime surveillance for the home market assuredly jump-started the company's unique business, PAL did not rest on this alone to power its future growth, spreading its wings — so to speak — in maritime surveillance around the world with a broad and diverse client base in both the private and government sectors.

One of PAL's large clients was the U.S. State Department, according to Stoodley, back when the war on drugs was red-hot and the war in Iraq wasn't commanding government spending. For and on behalf of the State Department, PAL delivered 15 custom-fitted maritime surveillance airplanes to a number of South American countries, complete with training on operations and maintenance.

Vertical Operation

To understand the nature of PAL's operation and success is to understand St. John's, Newfoundland itself. Given its geographic location, PAL has evolved into a vertical organization whereby the company performs nearly every function itself, from stripping modifying the airplanes; to engineering new technologies and solutions, to actually flying the planes.

"Newfoundland offers some unique challenges," Stoodley said. "We can't go across the tarmac and ask an integrator to do work for us. This forced us to become a totally vertical and integrated company."

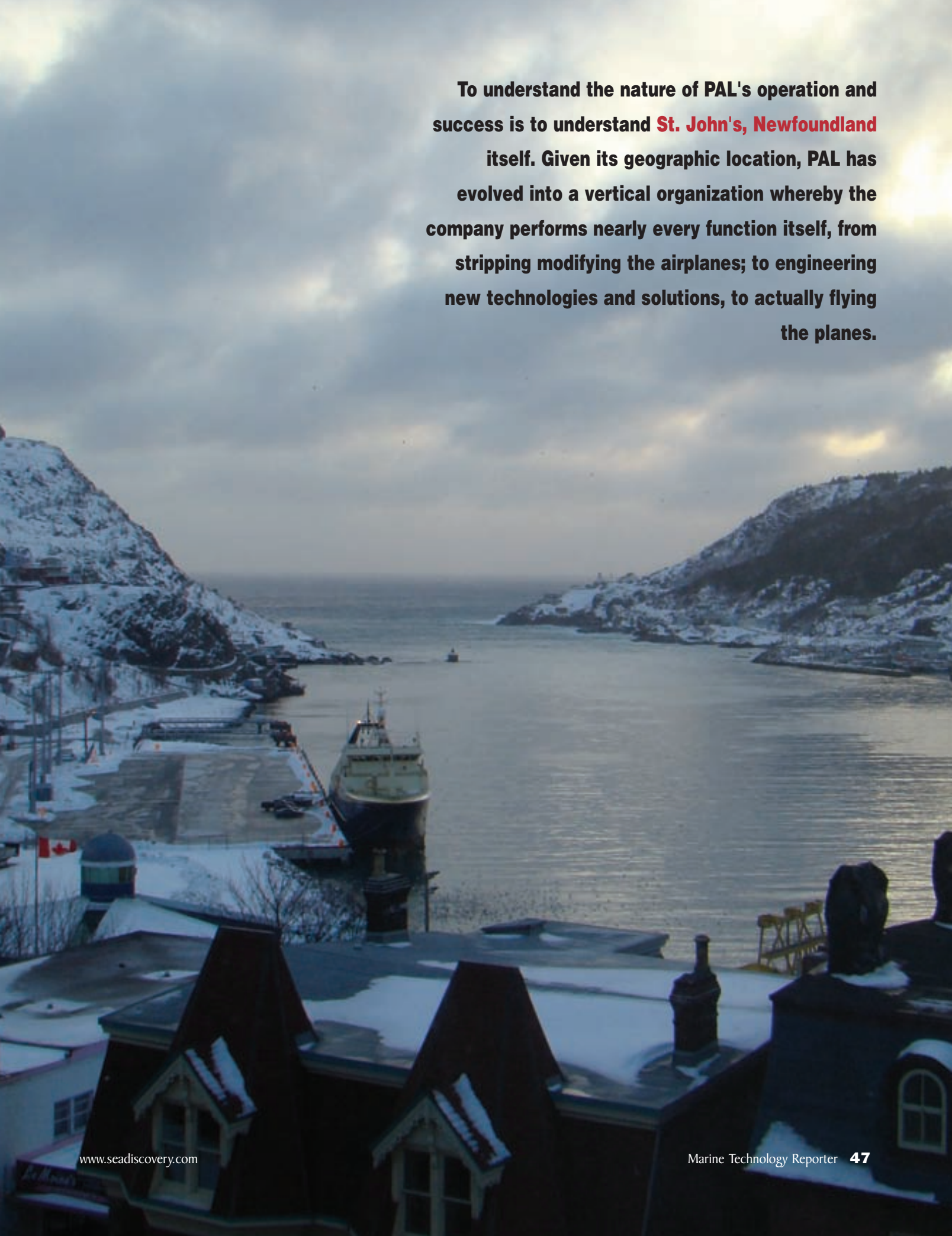
To this end, the company specializes in providing a true turnkey operation, an innovation and in-house capability is a key ingredient to PAL's prosperity. "We have no one else to depend on," Stoodley said.

The Dash 8, with its high wing and low speed stability, is the preferred aircraft for maritime surveillance, according to Stoodley. While much of the company's experience is on these and similar aircraft, he is quick to point out that the company is not platform specific, meaning that if it makes sense, the company will outfit and fly unmanned aerial vehicles (UAVs) to accomplish a given mission.

In fact, the company currently has three UAVs for Research and Development, using them as information platforms to collect oceanographic information in conjunction with Memorial University.

PAL is no studying different payload options that would make the UAVs useful tools for the collection of oceanographic data, as well as for maritime surveillance operations, such as the tracking of tanker traffic.

UAVs, which would still require a PAL pilot, are interesting platforms, as they can fly for nearly 30 hours on a gallon of fuel, have a 100 to 12,000 ft. altitude range and are tough enough to fly through a hurricane.



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Schilling Robotics Names Otto CEO

Schilling Robotics appointed Philip F. Otto as president and CEO. He has also been appointed to serve on the company's board of directors. Otto is a Silicon Valley veteran and former chief executive of several high-growth technology companies.

"Otto comes in as we enjoy an annual growth rate exceeding 40%," said Tyler Schilling, Founder and Chairman. "This growth means we need to put in place an array of talents and an infrastructure that not only retains our customers, but pleases them so much and creates such a level of confidence in our capabilities that our relationship with them continues on the same upward trajectory.

We need to stay ahead of the technology curve. To ensure this, I will be moving into closer collaboration with our customers to anticipate what they will need in the years ahead. We will be exploring several potentially important paths in areas such as subsea vehicle motion control and sensor-based operations. Entrepreneurial companies with our expertise have a special opportunity in the current oil and gas industry since technology development really has not kept pace with what's likely to happen over the next 5 to 10 years, particularly in deep-sea exploration and development."

Otto received his B.S. in engineering from Yale University and his MBA from Harvard University. As both CEO and chief financial officer of a variety of technology-oriented growth companies, he has extensive experience in restructuring and expansion of companies, mergers and acquisitions, as well as deal-making and marketing activity throughout Europe and Asia. He is charged with immediately broadening the senior management team at Schilling.

For more information, visit www.schilling.com

L-3 Klein Appoints Osias

L-3 Klein appointed Rene Osias as Sales Manager for its Side Scan Sonar Systems. Working with other members of the Klein team, Osias will be responsible for implementing Klein's strategy to multiply its sales of domestic and international Side Scan and Multi-Beam Sonar Systems. Osias brings to L-3 Klein a blend of managerial and sales experience acquired over a 20 year career in the U.S. Navy. He is experienced in all facets of Undersea Warfare including operation and maintenance of complex sonar suites. Osias was most recently an Anti-Submarine Warfare (ASW) Specialist on the Littoral Combat Ship ASW Detachment One with the US Navy out of San Diego where he specialized in the Navy's latest generation sonar equipment and unmanned surface vessels. He earned a BS in Liberal Arts from Excelsior College.

Nautilus Appoints New President, CEO

Geoff Loudon, Chairman of Nautilus Minerals announced that Stephen Rogers, Nautilus' Chief Development Officer, has been selected as successor to David Heydon as President and CEO, effective July 10, 2008. Heydon will remain with Nautilus as a non-executive director and will continue to provide the company with his vision, experience and cross-industry contacts.

Don Lindsay, President and CEO of Teck Cominco Limited said, "As a major shareholder and a technical partner of Nautilus, we have seen the company grow and attract international talent to their team. We look forward to continuing our association with David in his role as a non-executive director and to working with Stephen as he and his team continue to bring the Solwara 1 Project closer to production."

Rogers joined Nautilus in January 2007 as Chief Development Officer in charge of the engineering and delivery of the Solwara 1 Project. Since joining Nautilus, Rogers has built a strong engineering team and has put into place the key engineering contracts for the seafloor mining system. He has more than 30 years in corporate and project management and extensive deep water offshore and onshore project development experience. Prior to joining Nautilus, Stephen worked with Clough Limited, one of Australia's largest multidisciplinary engineering firms, where he was CEO for oil and gas. Before his role at Clough Limited, he was regional Managing Director for Technip, formerly Coflexip Stena Offshore, over a six year period where he established a number of successful joint ventures and delivered consistent profitability in a cyclical market.

Rogers is a graduate civil engineer from King's College, London, a Member of the Institute of Marine Engineering, Science and Technology (MIMar EST) and a Fellow of the Australian Institute of Company Directors.

Obituary: Hugh Bradner
Inventor of the Wetsuit

Hugh Bradner, renowned physicist and professor emeritus at Scripps Institution of Oceanography, UC San Diego, died May 5, 2008, in San Diego, Calif. after a prolonged illness. He was 92. Bradner's scientific career incorporated both science and ocean exploration to design many notable ocean technologies, including the first neoprene wetsuit.

Hugh Bradner.
(Photo: Scripps Institution of Oceanography)

He has been affiliated with Scripps since 1961 and was professor emeritus at the Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics (IGPP). During his distinguished career as a nuclear physicist, Bradner worked at the U.S. Naval Ordnance Laboratory in Washington D.C. and the Lawrence Radiation Laboratory at UC Berkeley. He was also one of the founding scientists of the Los Alamos National Laboratory working on the Manhattan Project and a faculty member at Scripps Institution of Oceanography and UC San Diego. It was at Los Alamos that he met Marjorie Hall, his wife of 65 years.

Bradner had a lifelong passion for the ocean. He enjoyed diving and sailing and was one of the first Americans to make a deep-water SCUBA dive.

In 1951, while working at UC Berkeley, he decided to spend some "weekend time" improving diving equipment for navy frogmen, which began his pioneering research on the wetsuit. Bradner focused on the design of a wet suit for military underwater swimmers and developed a foam wet suit using a unicellular material known as neoprene.

"He was an adventurous man who enjoyed traveling," said Walter Munk, professor emeritus and director of IGPP during Bradner's tenure at Scripps. "He built a successful career by combining his geophysical work with his South Pacific adventures."

Bradner collaborated with scientific divers at Scripps Institution of Oceanography who were experimenting with the new SCUBA regulator invented by Jacques Cousteau and Emile Gagnan. Scripps divers first tested his wet suit designs at their SCUBA training classes held in the pool of the La Jolla Beach and Tennis Club.

An early model of Bradner's wetsuit.
(Photo: Scripps Institution of Oceanography)

"Brad's neoprene wetsuit was a tremendous contribution to scientific diving," said James Stewart, professor emeritus at Scripps. "He was a great guy and a lot of fun to work with."

Bradner was well regarded for his collaborative approach to science, evident in his reluctance to claim himself as sole inventor of the wetsuit. He continued to consult for the military throughout his scientific career. His other research endeavors led to novel diving equipment, including underwater contact lenses, a single-hose regulator and a decompression meter. Bradner even developed a loop system for quickly extracting U.S. Navy SEALs from the water via inflatable boats.

In 1961, Bradner joined Scripps as a research geophysicist in the Institute of Geophysics and Planetary Physics. He became a professor in 1964. He served as acting provost of UC San Diego's Revelle College during 1966-1967 and remained at Scripps and UCSD until his retirement in 1980. Bradner published extensively in the fields of physics, seismology, geophysics and diving. He also was co-author of a monograph on the radulae of the cowrie seashell, thus combining his scientific and recreational interests. He was a member of the DUMAND (Deep Muon and Neutrino Detection) Steering Committee.

Bradner was a fellow of the American Physical Society, a member of Phi Beta Kappa and Sigma Xi honors societies, the American Geophysical Union and the Seismological Society of America. He was active in a number of local organizations and served on the San Diego Planetarium Joint Powers Board 1969-1970 and the board of the San Diego Hall of Science. He was a member of the La Jolla Symphony Orchestra and Chorus and a

member of the American Surfing Association. He was active in the Explorers Club of San Diego and the La Jolla Play Readers, as well as various other civic organizations. He served as a member of the UCSD Committee on Athletics, the Intercampus Athletic Advisory Board and the National Association of Intercollegiate Athletics. He served on many national, state and university committees concerned with diving safety. Bradner graduated from the California Institute of Technology (Caltech) with a Ph.D. in physics, where he coached the swimming and water polo teams. Bradner received his undergraduate degree from the Miami University in Ohio and received the Miami University medal in 1960 and an honorary doctorate in 1961.

He is survived by a daughter, Bari Bradner Cornet of Berkeley, Calif., three grandchildren and a great granddaughter. His wife, Marjorie Hall Bradner, passed away on April 10, 2008.

The family requests gifts in his memory to The Hugh and Marjorie Bradner Endowment at Scripps Institution of Oceanography. A memorial service for Hugh and Marjorie Bradner will be held at Scripps Institution of Oceanography at a later date.

Howerter Named GM at MacArtney Offshore

Chris Howerter was named as Lars Hansen's successor as General Manager of MacArtney Offshore, Inc. in Houston. Hansen will be returning to Denmark in August. Until then, Chris Howerter will train for the position as the Deputy General Manager. Howerter received his Bachelor of Science degree in Aerospace Engineering at Texas A&M University in College Station, Texas. From there, he began his career as a Mechanical Design Engineer with Oceaneering Space Systems at NASA's Johnson Space Center in Houston, TX. He was involved in the design, manufacturing, and testing of astronaut tools and logistics equipment for International Space Station construction. He also worked for Oceaneering International's Remote Projects Engineering group on various deepwater work class ROV upgrades.

After five years, Howerter took a position as Project Manager with Astro Technology Inc. of Houston, TX. While there, he directed manufacturing, testing, and installation of two cutting-edge fiber optic deepwater riser monitoring systems in the Gulf of Mexico.

Brennan Joins R2Sonic

Charles Brennan has joined R2Sonic as Chief Hydrographic Engineer. He has more than 35 years survey experience and has served as Survey Project Manager and Senior Contract Hydrographer for some of the world's largest offshore survey & engineering firms including Oceaneering International, Brown & Root Survey, SubSea Survey, Fugro Survey and Wimpol Ltd. UK. For the last 10 years, Charles was the Senior Hydrographer for RESON, Inc. where he was responsible for the installation, training and support for all multibeam systems, auxiliary supplied equipment and software suites to customers throughout Asia.

MacArtney Opens Bahrain Branch

The MacArtney Group is expanding its worldwide representation with the opening of its new office in Manama, Bahrain. The office will be in the professional hands of Carsten E. Blankholm, 44, who has been an officer in the Royal Danish army. He has also studied chemistry for three years at the Technical University of Denmark.

Contact Blankholm at Email ceb@macartney.com

Hallin Wins $4.5m Contract

Hallin Marine won a $4.5m contact by specialist floating productions systems company Modec Inc.

Under the terms of the contract award from Modec, Hallin will provide a dynamically positioned Class 2 vessel, saturation diving system and specialist subsea personnel and operators to the Rang Dong Oil Field Block 15-2, approximately 140 km offshore of Vung Tau, Southern Vietnam. Hallin will carry out the installation of the Modec floating

Subsea 7 Opens Spoolbase in Norway

The base was officially opened by Kristian Siem, Chairman of Subsea 7 Inc., Knut Støbakk, the Mayor of Giske Community, Morten Ruud, Executive Vice President of StatoilHydro and Mel Fitzgerald, Chief Executive Officer of Subsea 7 in a ceremony at the base. The $30 million investment is key to further developing Subsea 7's pipelay capability in the North Sea market. Furthermore, it provides a strategic platform for new geographic markets such as the Barents Sea as that region opens up. The spoolbase is located beside the airport on the island of Vigra on the North West coast of Norway, close to the city of Aalesund. The base runs 3.7 km across the island and includes a purpose-built deepwater quay area, covering a total area of 284,505 sq. m.

The first project to be undertaken by the base is the fabrication of a 60 km 12-in. gas pipeline for StatoilHydro. The pipeline will run from Kollsnes processing plant to the Mongstad refinery. One of the first vessels into the base is Subsea 7's new $200m Flex-lay/J-Lay vessel the Seven Seas, picking up a pipeline for the StatoilHydro Yttergryta project.

Photos
Top: Subsea 7 Vigra Opening Ceremony: (L to R) Mel Fitzgerald, CEO, Subsea 7, Mayor of Giske Community, Knut Støbakk, StatoilHydro rep Bård Heimset and Kristian Siem, Chairman of Subsea 7 Inc.

Bottom: Subsea 7 Welding operations at Vigra Spoolbase.

storage and offloading vessel (FSO), installing two six-in. subsea risers. The FSO will have storage capacity in excess of 350,000 bbls and the project is scheduled for installation in 3Q 2008.

PSS Wins $11m Contract

Perry Slingsby Systems (PSS) won a contract to supply two new generation Triton XLX ROV systems and one Triton XLS ROV system to specialist marine contracting services firm Canyon Offshore Inc. The agreement will see PSS deliver two of the 3,000 m systems this summer with the final system delivered before the end of the year. Each TXLX system features the ICE control system (Integrated Controls Engine) and a standard suite of survey and advanced

tooling interfaces. ICE is the latest generation of subsea control system that provides an intuitive front end user interface with unparalleled system level diagnostics.

Harvey-Lynch Named IXSEA Rep

Harvey-Lynch was appointed as representatives for IXSEA's Marine Navigation and Positioning product line for the Gulf of Mexico states. Harvey-Lynch will support IXSEA with sales and technical support efforts from its 16,000 sq. ft. Stafford facility southwest of Houston and will cover the states of Texas, Louisiana, Alabama and Mississippi. Under this agreement, the company will provide commercial, marketing, technical support, and logistical services for OCTANS surface and subsea gyrocompasses and PHINS Inertial Navigation System, both products are based on unique Fiber Optic Gyroscope technology. Harvey-Lynch will also market IXSEA's complete acoustic positioning product line including its USBL systems: GAPS, MIPS and POSIDONIA.

Sonardyne Acquires Wavefront

Sonardyne Group Ltd has acquired Wavefront Systems Ltd., a UK design company specializing in sonar and underwater technology. Wavefront Systems Ltd, based in Sherborne, Dorset, was founded in 2004 by a team of defense sonar engineering professionals and has grown substantially with a focus on design and development services to the military and commercial undersea market worldwide. The Wavefront team's extensive knowledge and experience covers all aspects of sonar system design including performance modeling, acoustics, algorithms, hardware and software.

John Partridge, Chairman, Sonardyne Group Ltd. said, "The success of the recently launched Sonardyne Sentinel diver detection system illustrates the real strength of the co-operation between the two companies. This acquisition enables a longer term approach to system design and development."

Fifteen Years Manufacturing Seismic Power Sources

Applied Acoustics, based in Gt.Yarmouth UK, has been manufacturing sub-bottom profiling systems for more than 15 years. In the past year alone the company has launched three new Seismic Power Sources; the CSP-D and CSP-P with their special dual voltage output and the CSP-S, a compact 'all in one' 6000 Joule power source. Launched at Oceanology International in London in March, the CSP-S provides both requirements geophysicists have when examining the subsea sediment layers; high resolution, shallow penetration or low resolution, high penetration. It operates both with lower powered boomer plates, such as the AA300 boomer as well as the 6000J sparkers. Traditionally high penetration has been achieved with an airgun, but now the CSP-S can obtain both types of results without the need for a separate power supply, specialist operator, air compressor or cable.

For more information, Email general@appliedacoustics.com

FarSounder Adds New Test Facility

FarSounder added a new 1,250 sq. ft. test facility, located in Warwick, RI, the same town as FarSounder's main office. "We are extremely excited at what this will mean for our operation, not just in terms of streamlining our manufacturing process, but the opportunities it will offer for our various R&D projects," said Matthew Zimmerman, VP of Engineering. As a company specializing in sonar technology, in a part of the country renowned for its underwater specialties in this field, Zimmerman adds, "In this unique field we recognize the importance of having such a facility and are willing to work with other companies who may need the use of such an environment for their own testing."

For more information, visit www.farsounder.com

Subsea 7 Orders $190m Pipelay Vessel

Subsea 7 signed a contract for the construction of a new-build pipelay and construction vessel. The overall project cost is in the region of $190m and is based on fixed prices from the

Merwede shipyard. The vessel will have an overall length of 133m and a beam of 24m. It will be equipped with a pipelay suite for installing flexible flowlines and umbilicals, including a Vertical Lay System tower and twin underdeck carousels, a 250t crane from Huisman and twin 3000m-rated ROVs. The ship is expected to be delivered in the third quarter of 2010. Mel Fitzgerald, Subsea 7's CEO, said, "We have invested in excess of $1bn in new vessels and equipment between 2006 - 2008. Seven new vessels will join the fleet between 2007 and 2009. This investment in yet another new vessel demonstrates our considerable commitment to becoming the Subsea Partner of Choice for our customers and reinforces our confidence in the market going forward." "It also builds on Subsea 7's already strong working relationship with the Merwede shipyard where we have successfully built the Seven Oceans and Seven Seas on time and on budget, and also with Huisman."

Fugro GEOS Supports SUT Scholarship

Fugro GEOS has continued its commitment to the scholarship program run by the Society for Underwater Technology — Houston Chapter (SUT Houston). The company will provide a $5,000 undergraduate scholarship as part of the overall program that sees SUT Houston offering three $5,000 undergraduate scholarships and a $10,000 graduate scholarship; and corporate sponsors, including Fugro GEOS, between them offering a further $15,000-worth of support.

"This is the 4th year that we have offered a scholarship to be administered on our behalf by SUT Houston," said Rob Smith, VP Sales & Marketing of Fugro GEOS Inc. "During that time we have been proud to sponsor some extremely talented young people, and look forward to meeting the student who will be benefiting from our scholarship during the 2008-9 academic year."

Applicants are encouraged and welcomed from the fields of marine science, technology and engineering or mainline science and engineering courses where students can demonstrate an interest in pursuing a career in the marine field or a marine application for their studies. Undergraduate students must have completed at least one year of full-time study, and must be enrolled full time while receiving the scholarship. Applicants can be students of any nationality in full-time study at any accredited college or university within the United States.

Full details of how to apply for a scholarship and further information about SUT Houston can be found at www.SUTHouston.com. The deadline for application is June 15, 2008. The scholarships will be awarded for academic year 2008-09.

RESON SeaBat 7101

SeaBat 7101 is a small and lightweight sonar, which can be mounted on underwater vehicles (ROV or towed) or rapidly deployed onto survey craft of opportunity. This makes it ideal for a number of applications like subsea intervention & monitoring, guidance & navigation, site & route surveys as well as rig re-entry.

A bathymetric sonar operating at 240kHz, the SeaBat 7101 measures discrete depths over a wide, 150° swath to a maximum range of 500m. A true, time-delay beamformer uses a combination of amplitude and phase detect for maximum performance across the entire swath. Roll stabilization maximizes efficiency during survey operations. Dense sounding coverage is achieved with a combination of 240 equi-distant beams and a range-dependent ping rate of up to 40Hz.

The SeaBat 7101 transducer is available for operating depths of 120, 300, 1500, and 3,000 m. It is available as a complete system or as an upgrade to the existing SeaBat 8101 systems. The SeaBat 7101 will be available from summer 2008.

For more information, visit www.reson.com

Ametek Connectors

Ametek designs, develops and manufactures electrical and fiber optic connectors for extreme environments and critical applications. Ametek offers Sea Connect Products Gigabit Ethernet connector is now available in two configurations: for underwater or outboard of the submarine or undersea systems in oil/gas and exploration applications and for surface or inboard applications of ships, submarines, tanks and aircraft and land systems.

For more information visit www.ametekscp.com

Subconn Micro Connector

Subconn Connectors' Micro connectors were developed to meet the demand for a more compact connector to match the decrease in size of underwater electronic packages. Applications include Cab mounted GPS, electric pumps and motors and boat motors.

For more information visit www.subconn.com

Electrochem

Electrochem offers a portfolio of cells in various sizes, temperature ranges, and rate capabilities. As a tested expert in assembly and integration, including value added solutions such as charging and battery management, the range of resources and experience ensures that the custom design is the exact fit for each customer application.

For more information visit www.electrochem.com

CaviBlaster Model LG-1620

CaviDyne introduces the CaviBlaster LG-1620, an air-cooled, diesel driven unit operating at 2,000 psi with the cleaning capacity of a 10,000 psi pressure washer. The LG-1620 is designed to remove fouling from all types of underwater surfaces without damaging the paint or protective coatings. The low operating pressure protects the diver from being injured and the zero-thrust lance minimizes stress trauma. CaviBlasters create high-energy cavitation bubbles. The vacuum created when the bubbles implode pulls the marine growth from the underwater surfaces being cleaned.

For more information, visit www.cavidyne.com

Hermes Multiplexor

Sonavision announced sales of the new Hermes MM-A Multiplexor to Global Contractor Oceaneering International. Hermes is a hardwired communications multiplexor for data transmission through 8 bi-directional channels over a single twisted pair. Data communication capability over the cable is 230kbaud in either RS232 or RS485 modes as selected or switched by the operator. Although initially designed for the Sonavision suite of sensors, the communication link will reportedly carry communications to and from any other serial devices. Set up of the data link is achieved via USB at the surface. A PC based program allows the user to set up channels for format, baud rate & priority. Additionally, the Hermes can be supplied with hardware to distribute and switch power supplies via one channel to a total of 7 sensors.

For more information, Email alasdair@sonavision.co.uk

Multi-parameter Data Logger

RBR is shipping its latest innovation —the new XRX series of multi-parameter data loggers. Ten sensor channels can now be handled by a single instrument, including CTD, Turbidity, Fluorescence, pH, DO, ORP and other physical & biological parameters. The unit supports RS232 & RS485 data communications and external power, in addition to the standard internal autonomous mode.

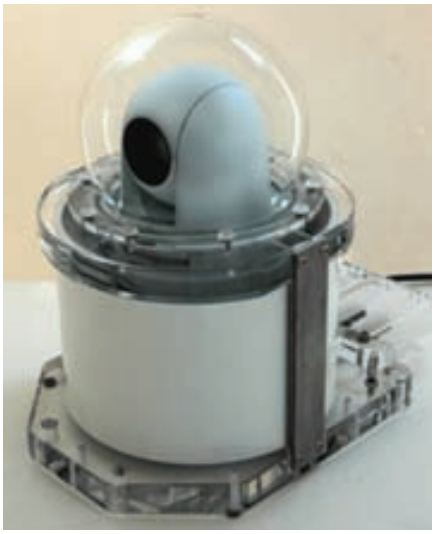
The XRX is an extension of the existing RBR the sensor and logger range and the depth rating is down to 740m, depending on the sensors fitted. This RBR data logger is field upgradeable and is designed to deliver a flexible, future-proof instrument with functionality that can be extended as budget becomes available or requirements evolve.

RBR designs and manufactures sensing data loggers that are submersible down to 10,500m as well as other instruments for lab' or field work, including tide and wave recorders for ports, harbors and other installations.

For more information, visit
info@rbr-global.com

OceanCam

Ocean Presence Technologies (OPT) announced a new model of its OceanCam underwater IP video product with many advanced features. The OPT-06 OceanCam is now available and provides improved features for extended operation in harsh environments such as the open ocean. Its Double-Bore sealing system employs two concentric O-rings for two lines of protection. Three pairs of O-rings are used to seal the dome and housing body to provide added protected against boring marine organisms. With a rated depth of 250 feet (75 m), the OPT-06 can operate in most environments accessible to divers.



For more information Email
robert@oceanpresence.com

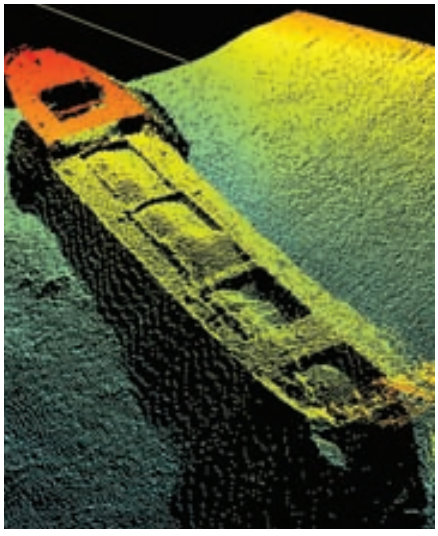
New Broadband Multi Beam Echo-Sounder

R2Sonic debuts its next generation SONIC 2024 Broadband Multibeam Echo-sounder system. The Sonic 2024 is designed to provide users survey flexibility with selectable wideband frequencies from 200 kHz to 400 kHz from a Vessel, ROV or AUV. The system architecture with embedded processor and controller eliminates bulky processors and interface bottles on the vessel. The focused 0.5° x 1° beam widths, coupled with ultra high 60 kHz signal bandwidth provide unprecedented resolution over bottom features and imagery. The Sonic 2024 provides 130° horizontal swath coverage and may be provided in dual head configuration which operates at full system ping rates, enabling faster survey speeds, reducing survey time and costs.

For more information, Email
csabo@r2sonic.com

EM 710 Multibeam Echo Sounder

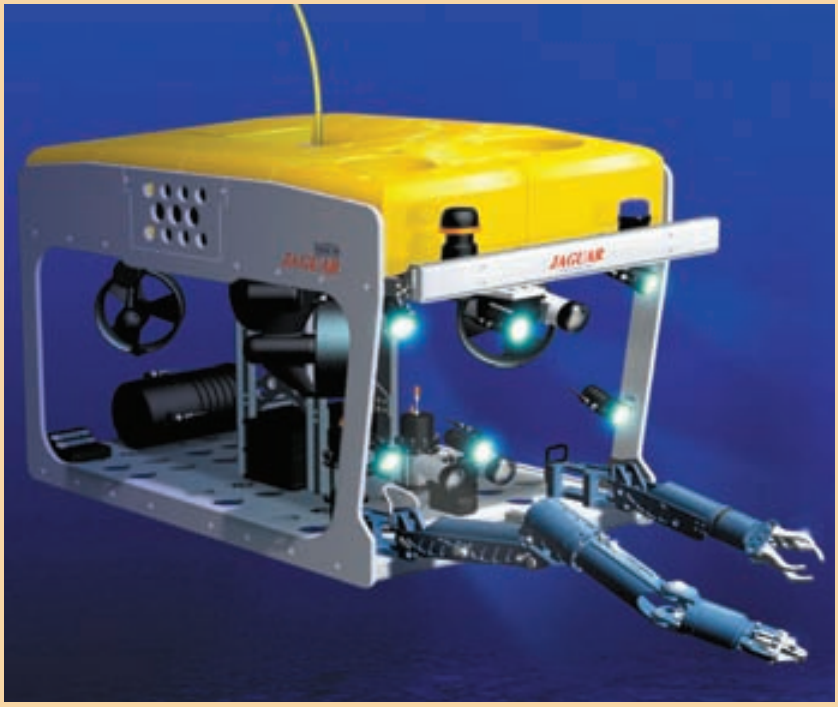
The wideband EM 710 multibeam echo sounder has gained users in



many different categories. The model with the highest specification of 0.5° x 1° beam widths has become the most popular, making up about 50% of the units sold. The narrow transmit beam of 0.5° is a feature that results in very high resolution of the survey results, and is required for detection of objects according to IHO S-44 special order. Many users are waiting for the dual swath functionality, in order to have the full system performance of their EM 710.

For more information, Email km.sales@kongsberg.com

Jaguar ROV



Saab Seaeye launched a new concept in electric work ROVs. Called Seaeye Jaguar, it is now the largest in its range. Key features touted by the manufacturer include significant weight savings as compared to the hydraulic ROV equivalent, with a smaller footprint, and needing fewer operators.

Saab Seaeye touts a simplified control system that will enable operators faster training of new pilots. Its built-in intelligence, with fewer and more intuitive controls, has lightened the burden on the pilot by making it easier to manage the ROV.

The manufacturer also contends that pilots will find fault diagnostics easier. A system of self-diagnostics and simple presentation, displays the fault and the necessary remedial action to the pilot.

There is also a new dual redundant high-frequency/high voltage power distribution system, allowing the ROV to continue to operate on reduced power if one of the dual power systems fails. It also reduces the diameter and weight of the umbilical, and significantly cuts the size and weight of the onboard transformer.

The accessories offered as standard on the ROV include a pair of Schilling Orion manipulators: the seven function position feedback manipulator, and the four function rate manipulator.

The Seaeye Jaguar is unveiled as the company continues to make inroads into a market area dominated by hydraulic work vehicles, but where operators are increasingly turning to electric work ROVs, attracted by lower cost of ownership and ease of handling compared with the hydraulic equivalent.

This new breed of operator is bringing innovation to cost effective operational management by utilising the electric ROV for the vast majority of tasks performed by hydraulic systems. They also focus on tasks for which the electric vehicle is best suited: such as drill support, survey operations, cable laying support, touch-down monitoring, IRM, and a high proportion of intervention and construction tasks.

For more information, Email jdouglas@seaeye.com

aquaSketch

The aquaSketch Minno is a new underwater notation device currently in use by NASA in the Neutral Buoyancy Lab at Johnson Space Center, Woods Hole Oceanographic Institute and in testing by the Surface Warfare Division of the US Navy. While aquaSketch represents a breakthrough, the device itself is low-tech, robust and inexpensive. This patented invention was created by a New York artist, musician and inventor, Mark Hagan, who wanted to sketch marine life while scuba diving. Hagan teamed up with members of

the Museum of Natural History and the Mars Rover design team to create aquaSketch.

The aquaSketch Minno is small enough to be worn on the wrist, yet it can hold up to ten feet of waterproof material that is printable, scan-able and reusable.

For more information, visit
www.aquasketch.com

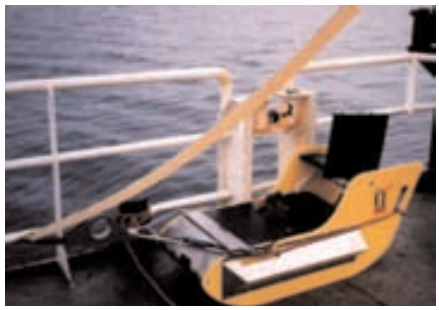
SubTrac Tracking Device

Deltawave offers the SubTrac which is a GPS tracking device that offers the capability to track your asset position on a global basis. It is designed to transmit coordinates once the vehicle surfaces, utilizing Iridium's satellite network. The unit is based around the Iridium 9601 SBD transceiver, and offers low latency reporting capabilities. It is engineered for deep-sea (4000m - 6000m optional) and extreme environment applications.

For more information visit
www.deltawavecomm.com

Nv-Shuttle

The Nv-Shuttle is a versatile vehicle designed to be operated from a wide range of research vessels and ships of opportunity. It is suitable for use in both coastal seas and open ocean. The Nv-Shuttle can operate autonomously when towed using a



non-conducting cable. Its undulation instructions are preloaded into the built-in controller, which is powered by the vehicle's impellor driven alternator, which allow deployment from ordinary winches and capstans. Real-time flight control and data acquisition can be obtained via conducting cable.

For more information visit
www.chelsea.co.uk

Virtual Marine Technology: Training Simulators

Virtual Marine Technology, based in Canada, provides realistic, effective and safe training technologies. VMT's simulators are designed to provide a customized means for personnel to train in various environments. Founded in 2004, VMT grew from the research and development programs of Atlantic Canada's leading maritime institutions at Memorial University, the Maine Institute and the National Research Council.

For more information visit
www.vmtechnology.ca

Applied Acoustics
Marine House, Marine Park,
Gapton Hall Road
Great Yarmouth, NR31 0NB
United Kingdom
Gavin Willoughby, Sales Manager
Phone: +44 (0)1493 440355
Fax: +44 (0)1493 440720
Email: gavinwilloughby@appliedacoustics.com
URL: www.appliedacoustics.com
Product: Manufacturer of EASY-TRAK, a through-water acoustic positioning and tracking system that provides XYZ co-ordinates of range and bearing information to a variety of subsea moving targets such as divers, ROV's, AUV's and tow-fish.

AR Engineering
84 Center St.
Shelton, CT 06484
Ray Johnson
Phone: 203 924-5649
Email: arengineering@snet.net
URL: www.marinecomp.com
Product: manufacturer of hardened marine computers and systems, glass bridges, and virtual instrument display and observation.

ASA
70 Dean Knauss Drive
Narragansett, RI 02882
Lee Dooley, Director of Marketing
Phone: (401)789-6224
Fax: (401) 789-1932
Email: ldooley@appsci.com
URL: www.appsci.com
Product: Applied Science Associates (ASA) is currently a consulting and engineering company specializing in marine and freshwater environmental modeling. ASA will be broadening that core message to represent our full spectrum of world-class products and services. ASA is a global science and technology solutions company. Through consulting, modeling and simulation, and application development, ASA helps a diverse client base to investigate their issues of concern and obtain functional answers.

Autonomous Surface Vehicles
2 City Business centre, Baasin Road
Chichester, Hampshire PO19 8DU, UK
Hugh Young, Chairman
Phone: +44 (0)1590 683805
Fax: +44 (0) 1590 682896
Email: info@asv.co.uk
Product: Development and Manufacture of unmanned surface vehicles for MCM, surveillance and underwater warfare.

EdgeTech
P.O. Box 850 4 Little Brook Road
West Wareham, MA 02576
Simon Reeves, Director of Intl. Bus. Development
Phone: 508-291-0057 x704
Fax: 508-291-2491
Email: reeves@edgetech.com
URL: www.edgetech.com
Product: EdgeTech designs and develops a full line of underwater survey equipment including side scan sonar and sub-bottom profiling systems, combined side scan/sub-bottom, Synthetic Aperture Sonar (SAS), deep towed, integrated and modular imaging systems. These systems are available in towed configurations as well as for AUV, ROV, USV and ROTV platforms.

Electrochem Commercial Power
9645 Wehrle Drive
Clarence, USA 14031
Jim Stawitzky, Sales Manager
Phone: 716-759-5822
Fax: 716-759-2562
Email: sales@electrochempower.com
URL: www.electrochempower.com
Product: Manufacturer of high performance batteries for oceanographic and underwater defense applications including UUVs, buoys, sensors and more.

Exomos
Pobox 261489 Dubai, UAE
Dubai, 17000 United Arab Emirates
Herve Jaubert, CEO
Phone: 971 488 35222
Fax: 971 488 35228
Email: hjaubert@emirates.net.ae
URL: www.exomos.com
Product: Swimmer Delivery Vehicles Submersible Patrol Boats

Impulse Enterprise
8254 Ronson Road
San Diego, CA 92111
Andy Gardner, Sales Manager
Phone: 858-565-7050
Fax: 858-565-1649
Email: andyg@impulse-ent.com
URL: www.impulse-ent.com
Product: Design + manufacture harsh environment electrical and optical interconnection systems

International SubSea Inc.
18119 Telgy Rd.
Cypress, TX 77429
Jason Dunnam, President
Phone: (281)-351-2227
Fax: (281)-351-2294
Email: Jason@intlSubSea
URL: Http//:www.IntlSubSea.com
Product: ISS Provides SubSea Services and Specialty Fabrication. Including ROV, Survey, Inspection, Home Land Security, Inland Water inspection, AUV And Rov Dredging Operations

Marine Sonic Technology, Ltd
5508 George Washington Memorial Hwy. PO Box 730, White Marsh, VA, 23183-0730
Rob Williamson, Mrktg. and Intl. Sales Manager
Phone: 804-693-9602; 800-447-4804
Fax: 804-693-6785
Email: rwmson@marinesonic.com
URL: www.marinesonic.com
Product: Marine Sonic Technology, Ltd. manufactures the Sea Scan PC a high-resolution, low cost, side scan sonar system. The system produces high-resolution, photo quality underwater images. MSTL manufactures a full line of systems to meet various mission profiles and operating conditions. Systems are available in Desktop, Splash-proof, Submersible, AUV and ROV configurations. Sea Scan? PC systems can be found in use world-wide in the fields of Law Enforcement, Search and Rescue, Surveying, Research, Salvage, Underwater Construction and Military Special Operations. MSTL also manufactures SHARPS (Sonic High Accuracy Ranging and Positioning System) a high accuracy positioning system.

MSI
543 Great Road, Littleton, MA 01460
Rick Foster, Business Development Mgr.
Phone: 978-486-0404
Fax: 978-486-0706
Email: info@matsysinc.com
URL: www.matsysinc.com
Product: Materials Systems Inc. (MSI) designs and manufactures custom sonar transducers and arrays for a wide range of applications. MSI's piezocomposite technology offers extremely broad bandwidth, high receive sensitivity, high source levels, conformability for curved arrays, and shading for reduced side lobes. The technology has enabled several of the most advanced sonar systems available today.

Neptunic Sharksuits
2308 Kettner Blvd. 'D'
San Diego, CA 92101
Jeremiah Sullivan, President
Phone: 619 236 0711
Fax: 619 236 8119
Email: info@neptunic.com
URL: www.neptunic.com
Product: For nearly thirty years Neptunic has developed and manufactured historically significant specialized safety products. Our well known Sharksuits are being utilized worldwide by divers whose work must continue regardless of threat from marine predators.

Ocean Design, Inc.,
1026 North Williamson Blvd.
Daytona Beach , FL 32114
Phone: +1 386 236 0780
Fax: +1 386-236-0906
Website: www.odi.com
Ocean Design, Inc., (ODI) is a technology focused provider of innovative engineered solutions for challenging environments. Founded in 1988, ODI, a Teledyne Majority Owned Company and a certified ISO 9001-2000, is located in Daytona Beach, Florida, USA. ODI excels in designing and manufacturing subsea electrical and fiber optic interconnect solutions. ODI is a vertically integrated, custom-engineered components and assemblies supplier for worldwide offshore oil and gas, defense, oceanographic, and research applications.

Remote Ocean Systems
5618 Copley Dr.
San Diego, USA 92111
Phone: 858-565-8500
Email: sales@rosys.com
URL:
www.RemoteOceanSystems.com
Product: Remote Ocean Systems (ROS) is an industry leader in the design and manufacturing of reliable, high-tech equipment and systems for the most severe oceanographic, industrial, commercial, and military environments. OOur standard product line includes underwater HD video cameras, underwater lights, rugged pan and tilts, controllers and video inspection systems which are manufactured primarily for the oceanographic, nuclear, and defense industries.

Sidus Solutions
P.O. Box 60767
San Diego, CA 92166
Michael Weston, Business Development
Phone: 619 275-5533
Fax: 619 275-5544
Email: sales@sidus-solutions.com
URL: www.sidus-solutions.com
Product: Sidus is headquartered in San Diego, CA, is an integrated systems provider of robust security and video surveillance systems, services and equipment for numerous worldwide businesses in the heavy commercial, industrial and oil and gas markets.

VideoRay
580 Wall Street
Phoenixville, PA 19460
Chris Gibson, Director, Sales & Marketing
Phone: 610-458-3000
Fax: 610-458-3010
Email: info@videoray.com
URL: www.videoray.com
Product: With more than 750 ROVs in service around the world, VideoRay has clearly become the global leader in underwater Micro-ROV technology. Starting at just $5,995 and weighing just 8 pounds, VideoRay is as an extremely versatile, portable, affordable, and reliable solution for underwater robotic operations including surveys, offshore inspections, search & recovery, homeland & port security, science & research, fish farming, and other unique applications in underwater environments. "Plug and play" technology. VideoRay is also currently available on the General Services Administration (GSA) schedule.

OceanTech Expo (OTE) 2008

October 1-3, 2008

The annual OceanTech Expo is a unique, industry-led exposition that will feature new equipment, training and live demonstration of the most current technology available to the growing ocean technology and marine science industry in North America. OceanTech will bring exhibitors and attendees together in an interactive, "hands-on" environment to share and learn about the most current technology available. OceanTech Expo provides participating ocean technology and marine science companies an international event to connect with and educate key decision makers, increase brand awareness and build meaningful relationships with professionals from this growing industry. This format will also allow attendees from state and federal government agencies, academic institutions, oil & gas companies and offshore service contractors a venue to identify, learn about and acquire the latest technology and equipment available to them — all in one location! **www.oceantechexpo.com**

To exhibit, contact Rob Howard at: Tel: 561-732-4368; Email: howard@marinelink.com

SEAMASTER AWARD! At OTE '08 *Marine Technology Reporter* will present its "Seamaster" Award, presented to the company which has exhibited innovation and commercial success. To qualify for the "Seamaster" Award, you must fill out and return a MTR100 Application, found in this edition on page 45, or online at **http://www.SeaDiscovery.com/MTR100**

For more information, contact Greg Trauthwein at: Tel: 212-477-6700; Email: trauthwein@marinelink.com

UDT Europe 2008
June 10-12, 2008
Glasgow, U.K.
UDT is the only dedicated platform covering all aspects of undersea defense technology.
www.udt-europe.com

Subsea Asia 2008
June 11-13, 2008
Kuala Lumpur, Malaysia
www.allworldexhibitions.com

International Ocean Stewardship Forum 2008
June 17-18, 2008
National Oceanography Center, Southampton, UK
Facilitating the effective integration of marine science, policy and law within ocean governance.
www.oceanstewardship.com/

ICES 2008 Annual Science Conference
September 22-26, 2008
Halifax, Canada
www.ices.dk/iceswork/asc/2008/index.asp

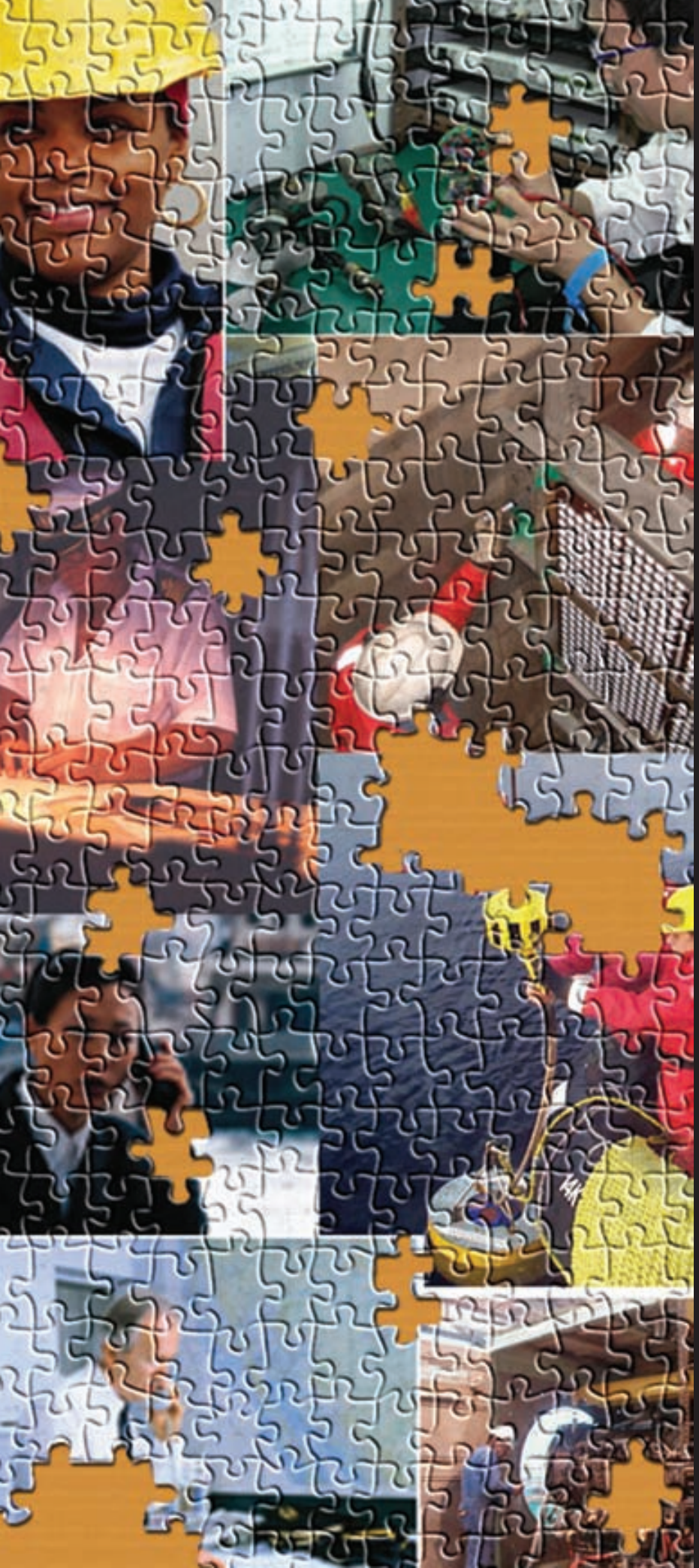
Sea Tech Week 2008
October 13-17, 2008
Brest, France
www.seatechweek-brest.org

SNAME Annual Meeting and Expo
October 15-17, 2008
Houston, Texas
www.snameexpo.com

UDT Pacific 2008
November 4-6, 2008
Sydney, Australia
www.udt-pacific.com

Ocean Business 2009
March 31 - April 2, 2009
National Oceanography Center, Southampton, UK
www.oceanbusiness.com

Interspill 2009 Conference & Exh.
May 12-14, 2009
Marseille, France
www.interspill.com



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Engineer II

Woods Hole Oceanographic Institution

The Deep Submergence Laboratory is seeking an Engineer II – Electrical Engineer to become an integral part of the team responsible for the operation, design and maintenance of undersea robotic systems, including the Jason ROV. Sea duties include operational and technical support of systems at sea world-wide. Yearly travel ranges 3-5 months, depending on scheduling, with individual trip lengths of 3-6 weeks.

ROV Pilots (ROV Tiburon)

Monterey Bay Aquarium Research Institute

Founded in 1987 by the late David Packard, the Monterey Bay Aquarium Research Institute (MBARI) is a private oceanographic research institute, uniquely dedicated to the development of state-of-the-art equipment, instrumentation, systems and methods for scientific research in the deep waters of the ocean. Located in Moss Landing, California, MBARI's research center includes science and engineering laboratories, as well as an operations facility to support our research vessels and oceanographic equipment, including robotic remotely operated and autonomous underwater vehicles.
MBARI has openings for Remotely Operated Vehicle (ROV) pilots with an electronics and mechanical background. We are seeking intermediate to senior-level pilots.

Mooring Technician

University of Alaska Fairbanks, IARC

Design and deploy, recover deep sea arctic oceanographic moorings. Expeditions out of Norway on Russian icebreakers.

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C2	VideoRay LLC	www.videoray.com	(610) 458-3000

Pictured is a a pot, believed to be Roman, that was used aboard a vessel shipwrecked off Sicily. Delicately removing artefacts from the seabed is one task of many for the brand new Saab Seaeye Panther XT.

This space is reserved each month for the month's most interesting, off-beat image. Submit your images (300 dpi/.jpg) and a short (approximate 100-word) description to Greg Trauthwein at trauthwein@marinelink.com.

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