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Oceans Week 2010

Spotlight on Underwater Vehicles

By Andrew Safer

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

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

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

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

Marport Deep Sea Technologies Autonomous Underwater Systems team.

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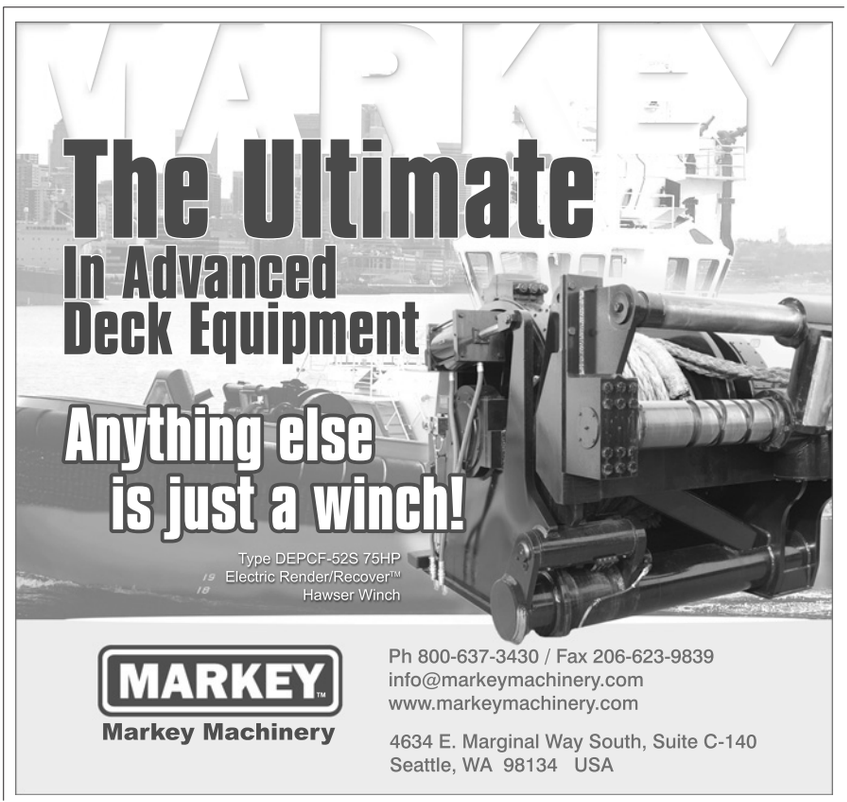
ble testing facilities, infrastructure, and the application area right at its fingertips."

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

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

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

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



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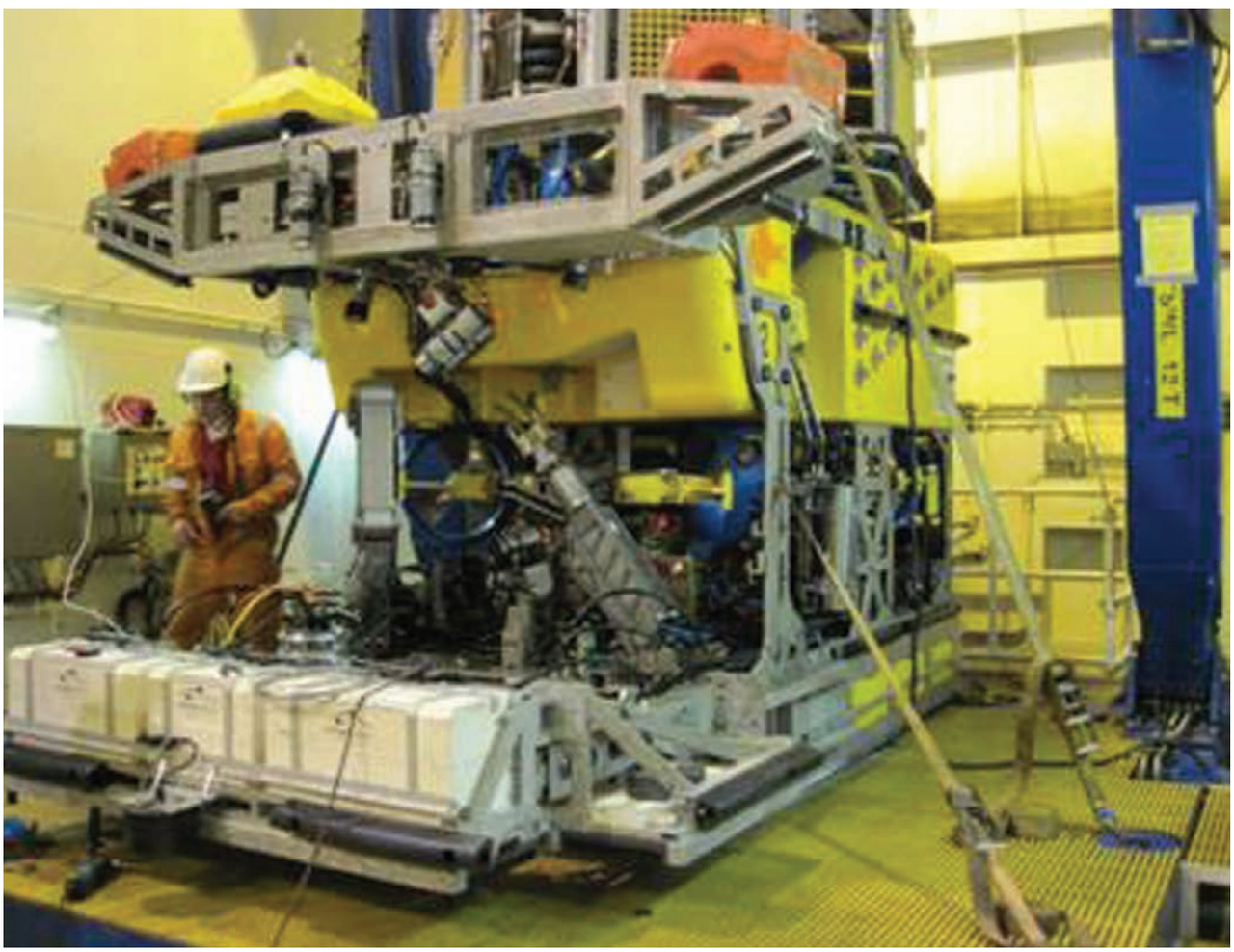
For these purposes GRI is partnering with Dynamic Systems Analysis (DSA) of Halifax to develop the interface that integrates DSA's riser model and analysis software into the FDK, and with Hudson Solutions Group of Houston to enable real-time access and display of historical documents including video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

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

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

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



(Credit: PanGeo Subsea Inc.)

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

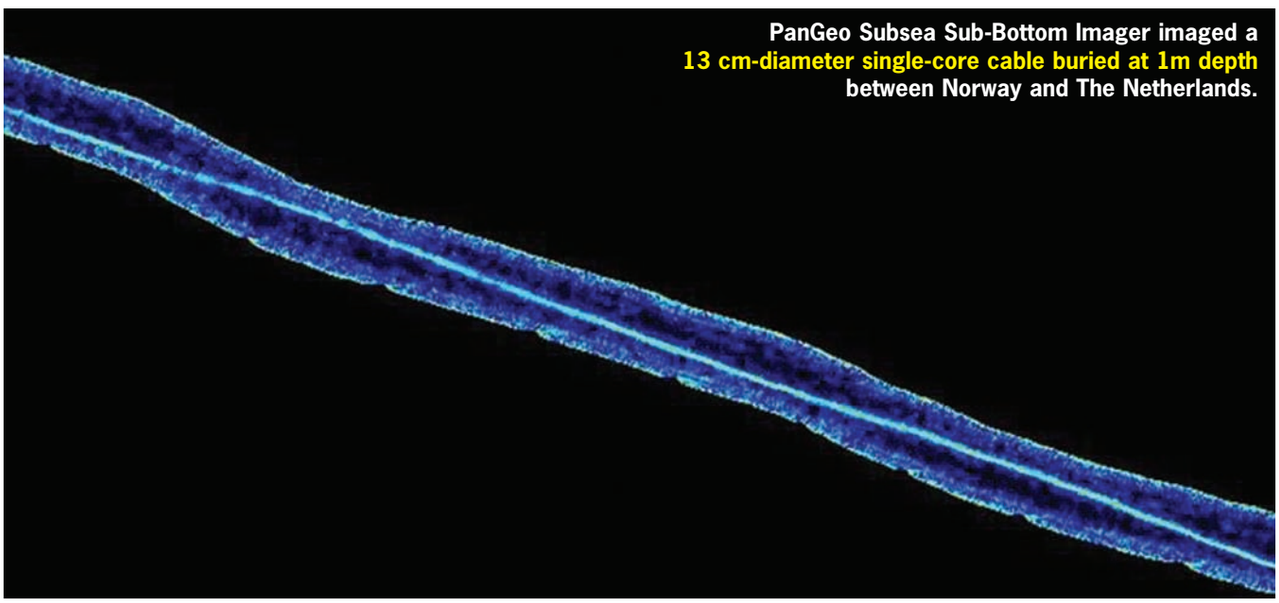
PanGeo Subsea Inc.'s (http://www.pangeosubsea.com/) Sub-Bottom Imagerä is an acoustic survey tool that creates a five-meter-deep by five-meter-wide 3D volumetric image of the sub-seabed which images buried pipelines and cables, stratigraphy, geohazards, unexploded ordnances, and other manmade objects.

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

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

(Credit: Andrew Safer)

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



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

(Credit: PanGeo Subsea Inc.)

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

Andrew Safer is a St. John's, Newfoundland based reporter on subsea technology.
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Rear Admiral Christopher J. Parry CBE is a former British naval officer who is Chair of the UK Government's Marine Management Organisation and a leading world authority on maritime issues and security. He is also a senior adviser to Coda Octopus.
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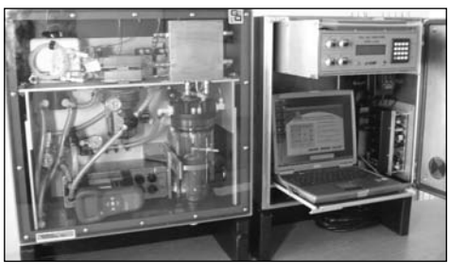

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General Oceanics, Inc.
1295 NW 163rd street
Miami, Florida 33169 USA
Tel: 305-621-2882 • Fax: 305-621-1710
Sales@GeneralOceanics.com www.GeneralOceanics.com

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