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The SUBSEA newsletter

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NOAA Ship Okeanos Explorer "America's Ship for Ocean Exploration" makes a major discovery using the Kongsberg Multibeam System EM 302

The NOAA Ship Okeanos Explorer is the only United States ship assigned to explore systematically our largely unknown ocean for the purpose of discovery and the advancement of knowledge. On its first voyage using the EM 302 it made a major discovery of what are believed to be methane gas plumes.



NOAA Ship Okeanos Explorer. Photo Courtesy NOAA Office Marine and Aviation Operations

EM 302 water column data detected plumes located in location identified above while transiting to the Cordell Bank National Marine Sanctuary working grounds from Astoria, Oregon. The plumes were located in water depths between 1200 and 1900 meters. All plumes were observed to rise to a water depth between 500-550 m making their heights between 700-1400 meters.

Interactive Visualization Systems (IVS3D) developed the Fledermaus mid water software tool as part of a project with the Center for Coastal and Ocean Mapping (CCOM)/ Joint Hydrographic Center (JHC) of the University of New Hampshire. Fledermaus was made available to this project.

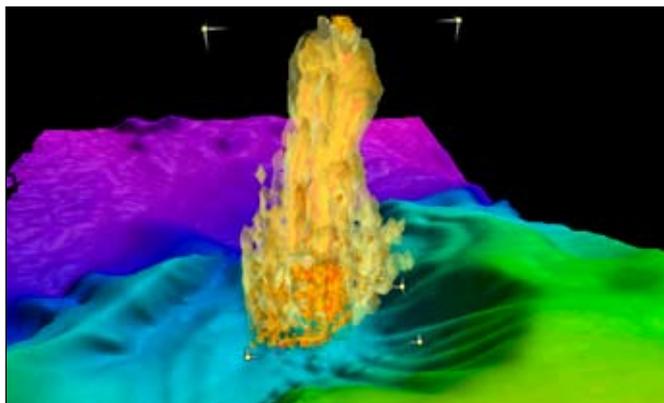
Dr. Jim Gardner and Mashoor Malik (CCOM/JHC) suggest "that the plumes are made up of a stream of methane bubbles coated with a veneer of methane-rich ice. That ice coating, a mate-



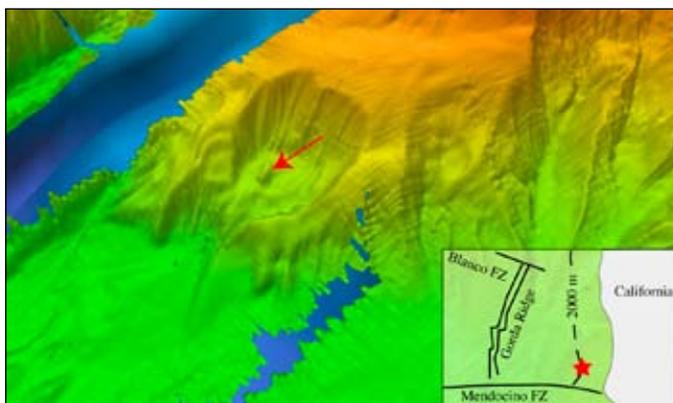
Cordell Bank Location Map of the Plume Site from "Potential Discovery Report", 2009/07/16. Courtesy NOAA Office of Ocean Exploration and Research

rial called methane hydrate, is stable in deep water, where pressure is high and the water is cold. When the ice-cloaked bubbles ascend into warmer waters near the surface, the ice melts and the methane dissolves into the sea." "Although seafloor sediments in shallow areas closer to the coast are known to harbor methane, which often bubbles free of the ocean bottom, no one has reported such plumes in waters this deep, the researchers report. The newly discovered plume appears to originate within a previously unknown, amphitheater-shaped basin on the ocean floor. This 3.6-kilometer-wide scar was probably caused by a massive undersea landslide" Gardner, J. V., Malik, M. A., Walker, S., 2009, "Plume 1400 Meters High Discovered at the Seafloor off the Northern California Margin", EOS Transactions, American Geophysical Union, Vol. 90, No. 32, pp. 275 - 275. Journal Article.

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NOAA EM 302 Image of Plumes using IVS3D Fledermaus.



NOAA EM 302 Image of Amphitheater-Shaped Plume Basin

NOAA’s Office of Ocean Exploration & Research describes a New Paradigm for Exploration on the Okeanos Explorer:

Next-Generation 3D Mapping System

“The Okeanos Explorer has been outfitted with a new Multibeam swath mapping system. The hull-mounted, first of its kind, Kongsberg EM 302 will provide explorers with high-resolution maps of the seafloor from 40 to 4000 meters. Maps from the system will be used to identify unique seafloor features for further exploration and will be integrated into the high-precision DVL-Nav navigation system to provide a road map for exploring a particular site with the ROV.”

Telepresence and High-Speed Communications

“A unique visible feature is the satellite dome atop the mast, containing a 3.7-m diameter satellite dish or VSAT (Very Small Aperture Terminal) capable of

transmitting data to shore. The VSAT will be able to send up to three real-time high-definition video feeds from the dedicated Remotely Operated Vehicle (ROV), images of mapping data collected by a hull-mounted Multibeam mapping system, and data collected by numerous sensors installed aboard the ship and ROV. Explorers will be able to communicate with the ship, and assess information and conditions to make decisions.”

A New Paradigm for Exploration

“With these tools, NOAA is advancing a new paradigm for exploration, giving shore-based explorers of all kinds and ages access to the excitement of real-time discovery. Using Internet 2 connections and the Exploration Command Centers, explorers can remain on shore and lead or be part of the exploration operations, communicating real-time with the shipboard operators. Through standard Internet connections, anyone

with a computer and web access can watch and listen in on operations aboard ship, bringing real-time exploration into living rooms, offices, schools, and businesses across the globe.” NOAA continues to expand the use of Kongsberg Multibeams in its fleet.

National Oceanic Atmospheric Administration

(NOAA) roots date back to 1807 when the United States of America’s first scientific agency, the Survey of the Coast was established. NOAA operates a wide assortment of hydrographic survey, oceanographic research, and fisheries research vessels. NOAA has ordered four more Kongsberg Hydrographic Multibeam Systems. An EM 122 (1x1 Degree) system for NOAA Ship RONALD H. BROWN, an EM 710 (0.5x1 Degree) system for NOAA Ship RAINIER. Okeanos Explorer is now fully operational. NOAA now has a full suite of Kongsberg multibeams.

Hydroid Inc. and Kongsberg Underwater Technologies Inc. at AUVSI North America

The KONGSBERG team was well represented at the Association for Unmanned Vehicle Systems International (AUVSI) North America Trade Show, August 11 through 13, 2009, displaying models of a REMUS 100 and a Hugin AUV. The AUVS is one of North America’s largest gatherings of unmanned systems technologies, and this year’s conference and exhibition set attendance records, with over 5,000 attendees and 325 exhibits by companies from 15 countries. Being one of only a

handful of AUV manufacturers on display at the show allowed our marketing efforts to stand out. Our “stronger together” message really hit home with senior US defense representatives that visited our booth, and it also caught the attention of some commercial and civil organizations looking to improve their underwater capabilities. Throughout the event the message was clear - the KONGSBERG acquisition of Hydroid, Inc. brings greater capability and strength to our AUV offerings.



From left: Ernie Petrick (Hydroid, Inc), Chris Hancock (KUTI) and Richard Patterson (KUTI), in the booth at AUVSI North America 2009.

Deep water multibeam no. 100

Kongsberg Maritime is proud to announce that our 100th deep water multibeam echosounder system has been contracted and will be delivered in November 2009 to the U.S. Naval Oceanographic Office (NAVOCEANO). This EM 122 (1° x 1°) delivery is part of the Multibeam Sonar System upgrade program on the U.S. Navy T-AGS 60 class survey vessels.

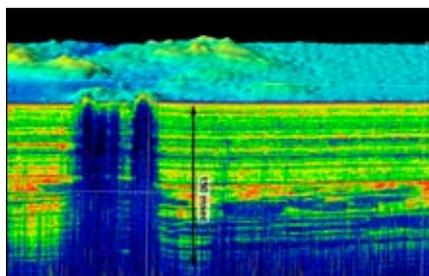


Pictures to be marked with "Approved for Public Release, Distribution Unlimited."

Kongsberg Maritime has been a supplier of echo sounders for more than 60 years. The first Kongsberg (Simrad) Hydrographic singlebeam echosounder was introduced in 1970 and the first multibeam echosounder in 1986. Since then KM has been recognized as a dependable supplier of multibeam systems and a respectable numbers of systems have been delivered through out the years. All systems have quickly earned reputations for reliability and outstanding performance.

In 1990 our first deep water system was delivered, the EM 12. This 12 kHz multi-beam was based on the design experience gained with the successful initial model, the EM 100 (95 kHz). In 1993 a special 12 kHz version was delivered based on a US tender for the T-AGS 60 class vessel program and was named EM 121. The third generation was introduced in 1995 with the EM 300, working at 30 kHz which was followed in 1997 by a new 12 kHz system, named EM 120.

In 2007 and 2008 the EM 300 and EM 120 were superseded with Kongsberg's 4th generation deep water multibeams, the EM 302 and EM 122. With advanced technology the new systems proved to meet and even surpass the specification set by Kongsberg's multibeam development department. Compare to EM 120 the new EM 122 has up to four times the resolution in terms of sounding density and more than twice the number of detections per swath. The new technology also doubles the along-track sounding density through imple-



Mud volcanoes composite with annotation

mentation of multi-ping with two swaths per ping to ensure a constant spacing of the swath alongtrack and 100% bottom coverage even with a 0.5 degree system.

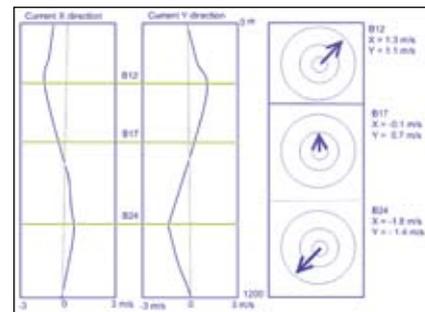
The latest generation also implements long FM chirps to ensure coverage of more than 30 km. From customer acceptance tests it has been proven that the system can achieve swath coverage of more than 40 km under favorable conditions.

About NAVOCEANO:

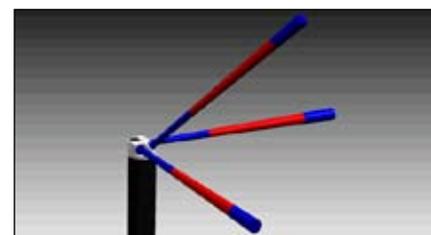
The U.S. Naval Oceanographic Office (NAVOCEANO), located at Stennis Space Center near the Mississippi coast, is responsible for acquiring and analyzing global ocean and littoral data. NAVOCEANO's six unique T-AGS 60 class oceanographic survey ships were specifically designed and constructed to provide multipurpose oceanographic capabilities incoastal and deep-ocean areas. The T-AGS ships have no homeport; they are forward-deployed surveying the ocean 365 days every year. Oceanographers from NAVOCEANO fly to locations around the world to meet the ship and relieve their fellow surveyors, so the operations are not interrupted.

Onboard, surveyors are equipped with the necessary tools that allow them to conduct operations concerning physical, chemical and biological oceanography; multidiscipline environmental investigations; ocean engineering and marine acoustics; marine geology and geophysics; and bathymetric, hydrographic, gravimetric and magnetometric surveying.

New HiPAP® Sea Current Meter function improves control of drilling operations



Graphical APOS view: Current measured by 3D Current Meters at three water depths.



DVL Beams measuring sea current in different directions at an operator set offset (distance) from the riser.

Kongsberg Maritime has put together and delivered a package for reading the sea current speed and direction at given points on a drilling riser. The package consists of a Doppler Velocity Log (DVL) interfaced to a telemetry transponder, which sends the 3D sea current data via acoustics to the onboard HiPAP system.

There are almost no limits to the number of sea current packages that a single rig may utilise. The only consideration is that the telemetry takes time, which will influence the update rates and possibly the DP reference update, but only if the HiPAP is used for this. However sea current does not change in direction or speed over short periods of time, so the HiPAP DVL update rate can be set to read current data every 5 to 30 minutes, therefore mitigating impact on the update rates. Also the DP reference update rate can be maintained at 1 ping per second by installing 'HAIN' reference system.



Transponder interfaced to a current meter

Kongsberg Maritime expects the new package to be very useful in drilling operations especially in deep water or where heavy current may cause problems.

Kongsberg Maritime and WFS to develop world's first AUV through-ice location and communication system

Kongsberg Maritime, the leading marine and offshore technology company behind the sophisticated HUGIN and REMUS (Hydroid) Autonomous Underwater Vehicles (AUV) has joined forces with Scottish communication technology company, WFS, to develop a unique wireless system for locating and communicating with AUVs in ice conditions.



WHF Seatooth underwater broadband radio modem

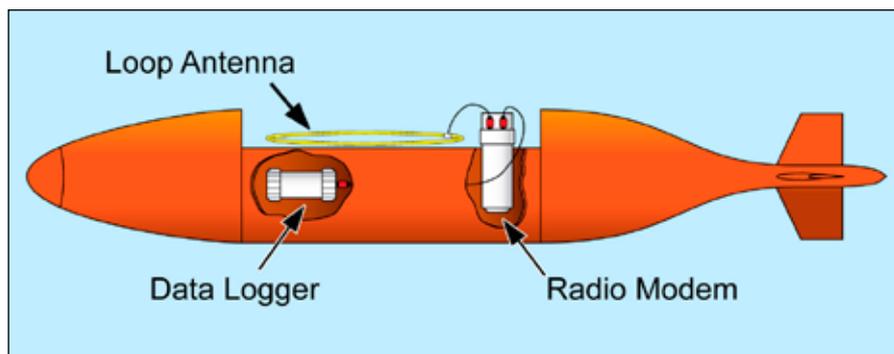
Called TILACSys (Through Ice Location and Communication System), the project has received investment from the UK's Technology Strategy Board and the Research Council of Norway, and will run for 24 months with the objective to deliver a demonstrator system that will be the first of its kind in the world.

"Adapting our AUVs to extensive, large area mapping of under ice areas is a key strategy for us," explains Bjorn Jalving, Vice President of Kongsberg Maritime



Subsea, AUV Department. "We are excited to be working with WFS to equip the HUGIN 1000 AUV with a through ice location and communication system. The reduced risk of loss of the vehicle will increase the use of AUVs and expand our knowledge of the virtually unexplored underwater arctic environment."

The use of Autonomous Underwater Vehicles (AUVs) is growing across the globe, due to their excellent mobility and flexibility, and capability of delivering high quality and high resolution data from the underwater environment. In Polar Regions AUVs offer the added advantage of being able to explore beneath the ice, but today, sub-ice AUV operations are seldom carried out because of the risk of losing the vehicle.



Hugin AUV with integrated RF-modem.

Reducing risk during under ice AUV operations.

The TILACSys through ice communications system will enable a surface vessel, a helicopter or an unmanned aerial vehicle to locate and communicate with the AUV below the ice. The system is seen as a key component for reducing risk during under ice AUV operations, which have the potential to increase human knowledge about topography, oceanography, marine life and marine systems in arctic areas.

Iain Gray from the Technology Strategy Board said: "Taking broadband technology into these remote and otherwise inaccessible locations is a really exciting enterprise. We are pleased to have the opportunity to invest in such an innovative project."

Brendan Hyland, CEO of WFS, added: "This project supports Europe's position in the world as a technological and commercial leader in the field of marine engineering, offshore operations, and telecommunications. Furthermore, it is a great opportunity to put European research at the forefront of Arctic exploration. We are excited about the collaboration with Kongsberg Maritime, and the opportunity to deliver the world's first through-ice location and communication system onboard a world-class AUV platform."

FACTS ABOUT WFS

Wireless Fibre Systems Ltd (WFS) develops underwater electronic communications, sensing and navigation technology. WFS has filed over 50 patent applications in Europe and the US and its products are revolutionising subsea and underground communications for the Defence, Offshore and Environmental industries. WFS is privately owned with head offices in Scotland and offices in Belfast, Northern Ireland, Houston, Texas, and Washington D.C.

Royal Netherland's Navy Increases REMUS Fleet

Hydroid Inc. has received a contract from The Netherlands Ministry of Defence to acquire three additional Hydroid REMUS 100 Unmanned Underwater Vehicles for the Royal Netherlands Navy (RNLN).



The acquisition also includes upgrades to the RNLN's current fleet of two REMUS 100 vehicles with Marine Sonics' latest generation dual frequency 900/1800 kHz side scan sonars and Kearfott Inertial Navigation as well as training, spares and routine factory maintenance. The current REMUS 100 vehicles have been in operation with the RNLN since February 2005 and have provided a reliable and proven capability for underwater search and survey operations.

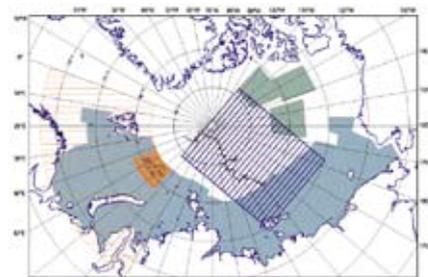
The Dive and EOD unit of the RNLN uses the REMUS 100 AUV as a force multiplier in harbor security and very shallow water mine countermeasure operations. In addition, the vehicles are occasionally used to render assistance to local authorities when looking for drowning victims, criminal evidence, etc.

"We are pleased that the Royal Netherlands Navy has decided to expand and update their fleet of REMUS 100 vehicles. As one of the leading NATO nations in the implementation of Autonomous Underwater Vehicles in Mine Countermeasure operations, they have been able to provide a greatly enhanced organic capability utilizing REMUS AUVs," commented Graham Lester, Director, Hydroid Europe.

Hydroid's REMUS AUVs can be fitted with a variety of sensors, sonars and other payloads and may be used in scientific and environmental sampling, mapping, search and survey, harbor security and mine countermeasure operations. Hydroid's AUVs are currently in use with several NATO and international navies.

Hydroid Inc. holds the exclusive license from the Woods Hole Oceanographic Institution (WHOI) for the manufacture and further development of the REMUS AUV technology. Hydroid, Inc. is part of Kongsberg Maritime and offers both the REMUS and HUGIN families of AUVs that cover commercial, scientific and military applications from very shallow water to full ocean depth.

Russian marked for HiPAP picks up



"HiPAP goes North / East"

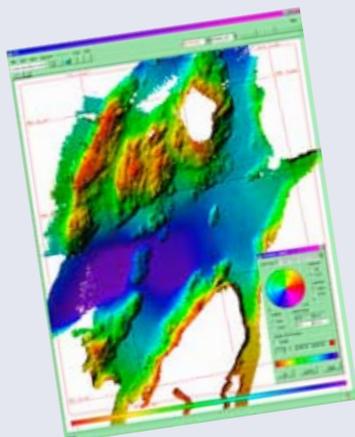
Two HiPAP systems have been purchased by two independent Russian companies. These are the two first sales of HiPAP systems to Russian registered survey and research companies.

It is expected that these references will give further synergies for sales volume when the new users now will see all the advantages and good performance of the High Precision Acoustic Positioning system; HiPAP.

Bearing in mind the huge developments at the Shtokman field in the Barents now is in progress, Russian companies now are able to take into use top equipment into their own operations.

The two systems, a HiPAP 350P and a full HiPAP 500 will be used for survey and ROV / Tow fish tracking both in the Barents, Kara, Laptev and in the Caspian Sea.

News from our Training department:



OPEN SIS/EM Operator course. We are pleased to announce another open 5 day SIS Operator course here in Horten, Norway, November 9-13, 2009. The course will consist of four days theory and one day hands on training at sea.

The course will be held in our Training Center in Strandpromenaden 52, course days will be 0900 to 1545. The cost for a 5 day course is NOK 23 000,- per person.

Please book your seats via email km.training.horten@kongsberg.com

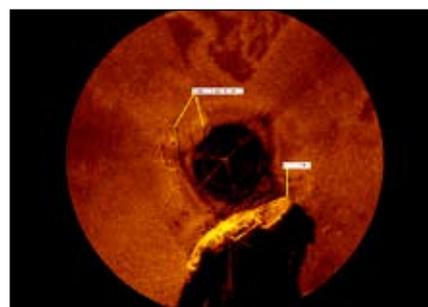
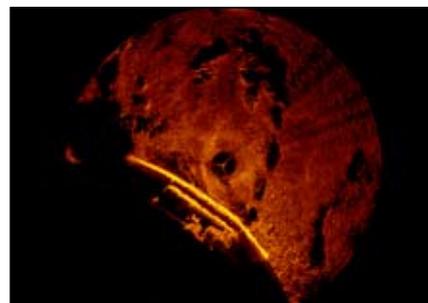


HiPAP 500

HiPAP 350P

Kongsberg helps to establish a Hydrographic Program at the Great Lakes Water Studies Institute

Using KONGSBERG's single beam echosounder EA 400, Northwestern Michigan College's Great Lakes Water Studies Institute (GLWSI) is spearheading the first effort to map the bottom of Grand Traverse Bay in 80 years.



Michael Wills, Volunteer Rotary International, Chuck Hohing, KUTI, Karl Wm. Kieninger, KUTI, Hans VanSumeren, Director, Great Lakes Water Studies Institute. Photo by courtesy of Northwestern Michigan College.

Sonar images of the Lauren Castle using a Kongsberg MS1000 sonar. Photo by courtesy of Brian Abbott, Nautilus Marine Group.

The endeavor has already pinpointed the location of one shipwreck, that of the LAUREN CASTLE. She sank Nov. 5, 1980 off Lee Point near Suttons Bay in water more than 400 feet deep. The Kongsberg EA 400 sonar records show a wreck consistent with photographs of the tug boat.

The survey equipment was loaned to Northwestern Michigan College by Kongsberg Underwater Technology,

Inc. The Great Lakes Hydrographic Survey Project will provide key scientific information and facilitate technical competencies and educational opportunities for NMC students. The project will constitute a major portion of the curriculum of NMC's new Freshwater Studies degree, the first such Associate Degree program in the nation. Students will develop case studies and field projects based on the survey data.

In addition, cadets in NMC's Great Lakes Maritime Academy will have the unique opportunity for hands-on training with the hydrographic survey technology.

The data will be shared with governmental agencies like the National Oceanic and Atmospheric Administration. Potentially it could serve as a template project for a hydrographic survey of all five Great Lakes "The idea is that the information will be shared, what we want this to be is the launching pad for knowledge and appreciation for what this means for our waters" said Hans VanSumeren, Director of GLWSI. VanSumeren said the equipment will collect imagery from the bottom of the bay to centimeter resolution. The data will be collected in a 1,000-foot swath from the moving NORTHWESTERN. "Basically it's a motion picture of the bottom. That's the kind of resolution we'll get," VanSumeren said. He added that the technology will provide much more accurate depth measurements



Lauren Castle Historic Photo and EA 400 Sidescan Record Photo by courtesy of Chris Doyal Photography.



The endeavor has already pinpointed the location of the Lauren Castle, which sank Nov. 5, 1980 off Lee Point near Suttons Bay in waters more than 400 feet deep. Photo by courtesy of Northwestern Michigan College.

than currently exists. “The technology has advanced so much that we probably don’t know the true depths of our lake in certain positions,” he said.

Assisted by Michigan Sea Grant, NMC is conducting advanced hydrographic surveys of both east and west arms of Grand Traverse Bay and northern Lake Michigan this summer and again in 2010. The first phase of underwater research is being conducted with single beam and side-scan sonar equipment aboard the NMC Research Vessel NORTHWESTERN.



The first phase of underwater research is being conducted with single beam and side-scan sonar equipment aboard the NMC Research Vessel Northwestern. Photo by courtesy of Northwestern Michigan College.

Since existing data dates to the 1920s, the survey project will provide important updated and expanded information with multiple applications, including environmental impact assessments, commercial navigation charts and supporting fisheries.

“The Great Lakes continue to be challenged by both natural and human-induced stressors, including the changing

climate, continued introductions of non-native invasive species and lake level fluctuations,” said VanSumeren.

“These stressors have dramatically altered the Great Lakes ecosystem, our near shore waters and nearly all of our navigable waters and harbors, but existing data is outdated and does not accurately reflect how the ecosystem has changed.”

MMT AB purchases new EM 3002D Multibeam systems



Vessel IceBeam

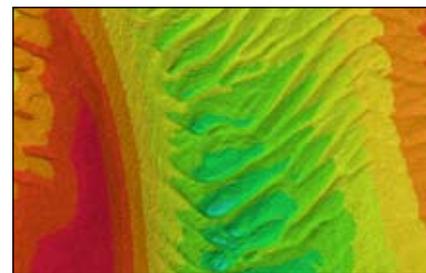
In the past year, MMT AB has purchased three new EM 3002 dual head Multibeam systems

The first Kongsberg Multibeam was installed on one of MMT AB’s vessels back in the mid-nineties and MMT AB has since then operated different Kongsberg Multibeam systems at various locations worldwide. The latest purchase brings a total of eight modern Kongsberg Multibeam systems installed on MMT AB’s fleet of survey vessels and ROVs.

One of the new systems has been permanently hull-mounted on MMT AB’s latest vessel acquisition, IceBeam, which was launched under a Swedish flag earlier this summer. IceBeam is a specially developed ROV and survey vessel for high-resolution charting in shallow-to-medium waters.

A new EM 3002D deepwater system has also been purchased for installation on one of MMT AB’s ROVs. The combination will allow detailed ROV mapping and inspections down to 1500 metres water depth with both EM 3002D survey and pipe inspection modes. MMT AB is at present considerably expanding its ROV capacity with new equipment and personnel.

MMT AB works worldwide on seabed mapping projects, with a strong focus on the European market. Seabed survey operations are conducted for the offshore industry as well as for govern-

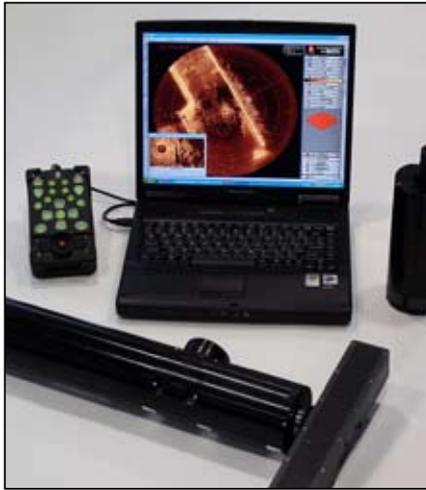


Sand ripples

ments and institutions. Typical tasks are hydrographic charting projects and route surveys for cables and pipelines. Geophysical site surveys are performed for various offshore infrastructures and for wreck and munitions charting. The company also specialises in environmental mapping projects which are performed in coastal areas as well as offshore in deep waters.

MMT AB operates five fully equipped survey vessels and has full capacity for geophysical and ROV surveys down to 2000 metres. For further details visit www.mmtab.se

Kongsberg Maritime Cameras and High Resolution Sonar for two new submarine rescue vehicles



Full imaging packages to support safety and efficiency of sub rescue operations

Two new Submarine Rescue Vehicles (SRV) built by James Fisher Defence for the Republic of Korea Navy (ROKN) and the Republic of Singapore Navy (RSN) have entered operation in 2009 with extensive camera and sonar packages supplied by Kongsberg Maritime Ltd.

The SRVs, designated DSAR (Deep Search and Rescue), have been developed from the ground-up, using experience gained by James Fisher Defence

during decades of support for the UK Submarine Rescue Service's LR5 SRV. Both feature a number of enhancements over existing SRV technology including the ability to operate at a depth of 500m, where visibility is poor so high quality imaging equipment is vital for a safe rescue operation.

"The importance of high quality, reliable imaging systems cannot be overstated during a submarine rescue," comments Ben Sharples, Underwater Projects Director, James Fisher Defence. "The rescue teams rely on the cameras and sonars to ensure safe operations under very stressful conditions, so they should provide a high standard of imagery in addition to being up to the job of operating in extreme conditions. Kongsberg Maritime was able to provide a cost-effective package that met these requirements."

DSAR-5, which was officially named ROKS DSRV II in September 2008 features OE15-103 Low Light CCD and OE14-367 Colour Zoom cameras in addition to the OE10-101 Pan & Tilt unit. It also features a powerful Kongs-

berg Mesotech Sonar System with the MS1000 Sonar Processor c/w remote keypad, High Resolution (330 kHz) Sonar Head, 1007 Series Altimeter.

DSAR-6 will, uniquely, be operated over a 20 year period on behalf of the RSN by James Fisher Defence and its partner ST Marine through a joint venture called First Response Marine Pte Ltd (FRM). It features similar Sonar System configuration to DSAR-5 but utilises OE15-102 Low Light CCD and OE14-366 Colour Zoom cameras.

"We have extensive experience in providing instrument packages for submarine rescue vehicles, having played a significant role in the provision of imaging products to the NATO Submarine Rescue System (NSRS) for the French, Norwegian and UK Navies," says Colin Jaffray, UK Sales Manager (Imaging Products), Kongsberg Maritime Ltd. "We're confident that our cameras, sonar and other equipment supplied for the DSAR vehicles will prove themselves during training and routine operations, and indeed, during live submarine rescues should such an unfortunate event occur."

HiPAP System sale No. 1000



HiPAP System sale No. 1000 was earlier this month contracted to Marin Mätteknik AB.

Marin Mätteknik AB is a survey company specializing in high resolution

marine survey providing industry and authorities with detailed information of the seafloor.

Marin Mätteknik has had many years of business relations with Kongsberg Maritime, especially within the area of Multibeam Echosounders.

Kongsberg Maritime is very pleased that Marin Mätteknik becomes the owner of HiPAP system No. 1000. The HiPAP System will be installed on-board the Triad, which is a survey vessel loaded with sophisticated equipment used for gathering seafloor data used in



the important work of seabed constructions, installations and environmental investigations.

The Triad is sister vessel of Kongsberg Maritime's own Research vessel M/K Simrad Echo based in Horten.

