

MARINE TECHNOLOGY REPORTER

April 2006
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Q&A with Bill Kikendall
& Harry Maxfield

The Scientific Drilling Vessel Chikyu will Drill to new Depths in a

Mission to Earth's Mantle

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Floating Production Systems

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Chikyu is a \$500 million, state-of-the-art scientific drilling vessel that is designed to drill to 7,000 m below the seabed at approximately 2,500 m water depth. When it begins service as scheduled in 2007, it could be the first vessel to drill to the earth's mantle.

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In the Background: The **Polar Submersibles ROV team** gets wet during a practice session in Fairbanks, Alaska. (Photo courtesy of Patrick Endres). See story on page 42.

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LOOK TO THE FUTURE

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On the eve of the Offshore Technology Conference (OTC 2006) in Houston, strong growth in the offshore oil and gas business continues to deliver solid business opportunities for nearly all sectors of the undersea technology business. Quite simply, the trend toward the discovery and recovery of resources in increasingly deep waters is driving not only business prospects, but technical capability as well. Companies working in deeper waters need not only the capability to go deeper, but are seeking systems and technologies that are proven to be efficient and robust. According to a recent study by International Maritime Associates, the demand for floating production systems is growing rapidly, with 179 floating production systems in operation and another 46 on order. This segment of the offshore business has grown 203% in the last 10 years alone, and prospects are good that the trend will continue. See the story on page 26.



Greg Trauthwein
Greg Trauthwein

Associate Publisher & Editor • trauthwein@marinelink.com

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on the **Cover**

Chikyu is a \$500 million, state-of-the-art scientific drilling vessel designed to drill to 7,000 m below the seabed at approximately 2,500 m water depth. (See story on page 38)

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David Myers is vice president of marketing & product management for CapRock Communications, which provides satellite communication services to remote and harsh locations for many industries, serving both commercial and government. He has 15 years of experience in the satellite and industrial computing markets, and holds an MBA in Technology Marketing and a Master of Science in Telecommunications. (Story on page 34)

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BAE Systems Launches Talisman

The Talisman autonomous unmanned underwater vehicle developed by BAE Systems launched its new autonomous unmanned underwater vehicle (UUV) Talisman at Oceanology International 2006. The Talisman System, developed by BAE Systems, is a latest-generation modular multi-role UUV, capable of a wide range of maritime littoral operations. Fully-funded by BAE Systems' private venture funding, the Talisman program was launched in late 2004, going from paper to initial trials in less than a year. The program is part of BAE Systems' strategy to build up an integrated approach to unmanned vehicles and autonomous systems, leading to the development of Intelligent Autonomy that can be applied across all sectors. The program, developed and managed by BAE Systems at its Underwater Systems business in Waterlooville, U.K.

Talisman comprises the vehicle and a remote control console. The vehicle is based on a carbon fiber composite hull, equipped with internal carbon fiber composite pressure vessels containing the electronics systems and payload. The hull is fitted with commercial-off-the-shelf vectorable thruster pods from Seaeye which allows it to maneuver very accurately, hover and turn 360 degrees within its own length. The hull has been designed and manufactured by stealth aircraft technology experts at the BAE Systems military aircraft sites at Warton and Samlesbury, U.K.

Talisman has been designed with an open architecture system, which allows for easy and rapid re-configuration of the mission system software. It pulls through proven technology from previous projects and couples it with advanced mission planning utilities. All mission parameters are pre-settable



before launch, for full autonomous operation, with the possibility of operator intervention throughout the mission. Communications to and from the vehicle are via RF or Iridium SatCom (while the vehicle is surfaced) and via acoustic communications systems (when vehicle is underwater). Talisman has already undergone a series of trial runs at sea, with a 100 percent success rate. Further trials are planned later this year, aimed at widening the range of payloads and systems that are integrated into the vehicle.

Navy Completes UUV Test

The fast-attack submarine USS Scranton (SSN 756) successfully demonstrated homing and docking of an Unmanned Undersea Vehicle (UUV) system during at-sea testing in January 2006, UVOonline.com reported. The two UUVs used in the testing are a part of the AN/BLQ-11 Long Term Mine Reconnaissance System (LMRS), which was designed to enable submarines to conduct clandestine undersea surveys to locate mines. Repeated homing tests were conducted with slightly different configurations to assess the ability of a UUV to dock with a torpedo-tube-mounted recovery system. The final result was the first successful docking of the LMRS vehicle to a submerged submarine at-sea. The LMRS test demonstrated technologies possible from completely autonomous UUVs. Once launched, there are no wires connecting them to the submarine. The UUVs can monitor and control their position using sophisticated inertial navigation systems and GPS receivers. Forward and side scanning sonars enable obstacle avoidance, and communications are accomplished via acoustic and UHF satellite communications systems. Several critical lessons were learned during these tests, including management of the interaction

that occurs when a UUV comes very close and then docks to a submerged submarine, the integration of UUV systems within the submarine and the performance of UUV acoustic communication and homing systems.



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New Depths for Subsea Construction Monitoring

A FusionPro 1RU MultiViewer from Zandar Technologies was installed onboard the DMT Diamond vessel for Deep Marine Technology, Inc. of Houston. The supply and sale of Zandar equipment was through Industrial Audio/Video, Inc. in Houston and Bock Associates, Inc. in Irving, Texas.

Built in 2005, DMT Diamond is a 240 ft., Class II Dynamically Positioned Multi-Service Vessel (DP MSV) used to carry out subsea construction and field development works, deepwater intervention tasks, remotely operated vehicle (ROV) surveys, and flying lead and umbilical installations for oil and gas companies predominantly in the Gulf of Mexico.

"When putting together the feature elements required to effectively operate a subsea construction vessel in the Gulf of Mexico, it was essential to DMT that our monitoring system be comprised of the latest in state-of-the-art technology" said Jeremy Herndon, Project Manager for the

DMT Diamond at Deep Marine Technology, Inc.

"As a result of endeavoring to offer our clients unparalleled service, we chose the Zandar MultiViewer based upon its ability to take composite video, computer VGA inputs for our survey spread and geoseismic data and combine them all onto a single screen. The benefits of getting a clear, high resolution picture in the combination of computer and composite feeds offers us a





clear advantage over our competitors and also enabled us to save valuable vessel control center office space and money," Herndon adds.

Up to eight high-resolution cameras are operational on the vessel to monitor each subsea project. Live camera images are transmitted directly into the Zandar unit via fiber optic for display on a front projection system at a resolution of 1,024 x 768. The image on the screen is then recorded onto DVD and audio commentary is then overlaid. These DVD images are provided to clients for feedback and record keeping purposes. Each screen is configured depending on the specifics of the job and amount of cameras involved using the front panel of the unit as well as easy-to-use and intuitive software for layout and screen configuration.

"Designed for high resolution displays, the FusionPro 1RU MultiViewer combines the very best in performance and accuracy," said Deirdre Smith, CEO at Zandar Technologies. "It accommodates a vast array of user configurations consisting of a choice of plug in processing cards and associated i/o, enabling users to combine formats - analog video, SDI, HD-SDI,

RGBHV computer sources, DVI sources, and audio - in one system. This makes it perfect for this type of mission-critical application."

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USCG, Science Team to Collect Alaska Volcano Data

Peter Loreaux could taste the salt in the air as the crew readied the cutter to get underway on an early February morning. The familiar calls of the gulls at the dock greeted them. The scientists hovered around the stern as the crates containing the Ocean Bottom Seismometers (OBS) were lowered to the deck from the dock using the ship's crane.

All the cargo loaded and the crew outfitted in mustang suits to combat the cold, the Coast Guard cutter Roanoke Island cast off lines and maneuvered out of the Homer small boat harbor through the difficult "S" turn. The sun was just beginning peak the

snowcapped mountains and cast rays across the water.

The Roanoke Island's white hull sliced through the water as it was piloted around the end of the Homer spit and into Kachemak Bay under blue skies. The transit across Cook Inlet to Augustine Island would take three and a half hours at a distance of 60 nautical miles in good weather.

Under a tight weather window a team of six scientists from the Alaska Volcano Observatory (AVO), United States Geological Survey (USGS) Coastal and Marine Science Center, the Woods Hole Oceanographic Institution in Woods Hole,

A Coast Guard member raises an OBS for deployment using the ship's crane. A science team member was standing by to pull the quick release rope that detaches the instrument from the crane aboard the Coast Guard cutter Roanoke Island. (Photo courtesy of U.S. Coast Guard cutter Roanoke Island.)



Mass., and the Kachemak Bay Research Reserve in Homer, Alaska, planned to use the Roanoke Island as a platform to deploy the five OBS.

The seismometers are resting on the bottom of the ocean for six weeks until the team returns to collect them. During those six weeks they will record seismic activity from the Augustine volcano onto an on board computer. They cannot broadcast the information well through the water column so the information will be stored in the onboard computer and downloaded upon their recovery. When the team returns to recover the OBS, an acoustic signal is sent from the surface ship to the OBS to release its weight. The OBS, which is naturally buoyant, will rise to the surface and be picked up by the crew.

"Basically they're recording those little

Chart of the approximate OBS deployment locations. The green denotes the ship's path of travel. The yellow denotes OBS site. (Chart image courtesy of U.S. Coast Guard cutter Roanoke Island.)



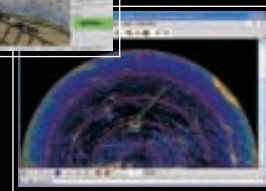
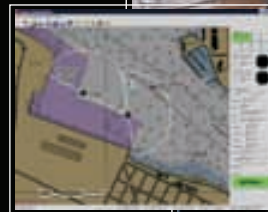
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squiggles you think of when someone mentions seismography," said Dr. Uri ten Brink of the USGS Coastal and Marine Science Center.

According to ten Brink, many of the Aleutian volcanoes are located on small islands that greatly restrict the geometry and aperture of AVO's seismographic networks. Location of seismic stations is often further restricted by strong noise generated by ocean waves, which masks the seismic signal. The noise is often amplified by the unconsolidated pyroclastic deposits (loose fragmented pieces of rock that may be min-

erals, crystals or glass that are ejected from a vent) that frequently make up the flanks of many Aleutian arc volcanoes. The limited extent of many of the AVO's seismographic networks often restricts the accuracy of earthquake hypocenter determination and frequently precludes the detection and tracking of volcano induced seismicity in the mid to lower earth's crust.

"The use of Ocean Bottom Seismometers will allow AVO to improve the data collecting locations of volcano related seismicity, and better the determination of the volcano's internal structure. These improvements will further our understanding of the subsurface components of the magmatic system and the processes that proceed and lead to eruptions," said ten Brink.

As the cutter approached Augustine Island the volcano was in full view and the crew could easily see the steam coming from the top of the mount. Ash deposits colored the peak alluding to recent eruptions. The Coast Guard has put in place a one-mile safety zone off Augustine Island for maritime traffic.

"It was so clear, really beautiful," said Loreaux, operations officer on the cutter Roanoke Island. "You could see the recent activity at the top." Long flows of pyroclastic rock and debris were visible, especially along the north side of the volcano.

As they neared the first OBS location the scientists filed out on deck and readied the OBS for deployment. Using the vessel's crane the OBS was raised over the water. A scientist pulled a line connected to a quick release hook and the yellow instrument vanished beneath the water. The Coast Guard deck supervisor radioed up to the Seaman Josiah Goetz, the Quartermaster of



Science team members, assisted by cutter Roanoke Island's crew, ready an OBS to be hooked to the crane, hoisted over the side and dropped to the ocean floor. (Photo courtesy of U.S. Coast Guard cutter Roanoke Island.)

the Watch, who marked the location of the OBS using the shipboard GPS charting program on the bridge. The depth of the ocean bottom ranges between 85 - 165 ft. around the island.

"It was freezing cold out," said Loreaux. "Dr. ten Brink told me about launching these instruments in the Caribbean. I don't think they were expecting these temperatures and wind."

As they team circled the island and deployed the additional seismometers the weather moved in, it became colder and the waves grew.

"The wind really started to kick up while we were launching the third one," said Loreaux.

It took about four and a half hours to deploy and mark the location of all five instruments. The crew finished up around 5 p.m. and began the trip back to Homer. They were in for quite a ride. The 110-ft. patrol boat bucked in the 12 - 15 ft. waves. The weather prolonged the trip, four and a half hours, getting them back to shore at about 9:30 p.m.

"They got an interesting ride back on a Coast Guard cutter," said Loreaux. "I was on watch on the bridge for the ride back. Trying to hold onto your seat, plot a course and keep the chart on the table through waves like that is difficult."

The expedition was successful. All five instruments were deployed and there were no injuries. In six weeks the scientists will return to recover each \$35,000 OBS from the ocean floor. The scientists hope to use a Coast Guard buoy tender as the recovery platform. The buoy tenders are designed to be able to keep station even in rough seas, better allowing them to recover the OBS from the bottom.

The USGS has an agreement with the national OBS facility at the Woods Hole Oceanographic Institution to build and maintain 16 OBS within the facility. Five of these OBS and a modest amount of funding are available for USGS and non-USGS investigators to be rapidly deployed in response to an earthquake or volcanic activity in coastal areas. The operation off Augustine Island is the first rapid response to natural disasters in U.S. territorial waters.

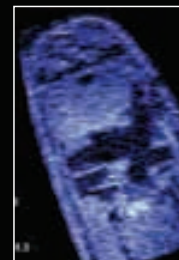
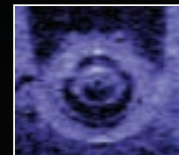
The Alaska Volcano Observatory (AVO), a joint program of the USGS, the AVO Geophysical Institute of the University of Alaska, and the Alaska Division of Geological and Geophysical Surveys are presently involved in monitoring Aleutian arc volcanoes and providing warnings to local communities and affected industries.

By Petty Officer Sara Francis

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Small Yard, Big Boat

The Bayou Country of Louisiana has a reputation as a place where great boats are built in small yards. When Richard Adams Sr. opened his Lockport Fabrication yard on the bank of Bayou Lafourche at Lockport in 1979 he became a part of that tradition. Now, at 72 years of age, he comes in every day to work with his son Richard "Dickie" Adams Jr. Over the years the two men have launched a lot of boats from their yard. Recently, when they launched the supply vessel Bertha D stern first, her 166-ft. length nearly reached to the opposite bank of the bayou.

Designed by naval architect Frank Basil of Houma, La., for Supreme Services also of Houma, the boat has a 36-ft. beam and a 14-ft. molded depth. The hull is fabricated from .75 and .5-in. steel plate. Contained in the hull is tankage for 2,500 barrels of liquid mud, 33,000 gallons of methanol, 60,000 gallons of fuel, 20,000 gallons of potable water and 800 gallons of lube oil. Seven ballast tanks have a capacity for a total of 38,000 gallons.

Propulsion for the Berth D is provided by a pair of Cummins KTA38 M0 main engines each generating 850 hp at 1,800 rpm. The mains turn 70-in. four blade



Dickie Adams showing the **30-inch moon pool**.

Michigan propellers through ZF4660 marine gears with 5.5:1 reduction. A pair of Cummins 6CTA-powered 99 kW gensets provide electrical and pumping power. The drop down azimuthing bow thruster that supports the DP1 equipped boat is powered by hydraulics driven by a 350 hp Cummins QSM11 engine that also powers the fire monitor pump and the hydraulic anchor winch.

About 40 ft. from the stern of the large open cargo deck and just to the port side of the keel line, a plate can be removed to reveal a 30-in. diameter moon pool for use when working with divers and other sub-surface events in rough weather. The Bertha D will be delivered to her owners in March of this year. She is the first to two supply vessels for the same owner with the second to deliver at the end of 2006.



Marine Technology Reporter enjoyed a successful visit to London for the Oceanology International 2006 exhibition. From L to R: Dominick Daddio, Esther Rothenberger, Tony Stein, John C. O'Malley and Rob Howard.

news

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Subsea 7 Orders Pipelay Vessel

Merwede Shipyard received a contract for the design and construction of a new Pipe Laying/Offshore Construction vessel for Subsea 7. Delivery is scheduled for the second quarter of 2008. The pipe laying equipment will be designed and built by Huisman Itrec. Subsea 7 said the overall project cost is estimated to be in the range of \$170-200 million, depending on options exercised. The ship has been designed by Merwede Shipyard in close concert with Subsea 7 and the pipe-lay spread manufacturer. It will be designed and built to be a fully Dynamic Positioned Pipe Laying/Offshore Construction Vessel, suitable for worldwide operation. Its pipe lay equipment will include a vertical lay system with top tension capability in excess of 400 tons, combined with a storage capacity for flexible pipe based on two 1,250-ton carousels below deck and a 3,000-ton carousel or multiple reels on deck. The vessel will have a 400 ton deepwater crane, a built-in deepwater ROV spread and a comprehensive survey system.

sive 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. The ship will have a 6.6kV integrated electric power generation system and propulsion by three electromotor driven fixed pitch propellers in azimuthing nozzles aft. Two retractable Azimuth thrusters will be fitted in the forward part of the vessel; one transverse thruster will be arranged in a tunnel forward.

The ship will be a fully Dynamic Positioned Pipe Laying/Offshore Construction Vessel, suitable for worldwide operation.

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.

Subsea 7 has options to have the vessel delivered with both of these capabilities fully operational.



Main Particulars

Length, o.a.	151 m
Length, bpp	138.3 m
Breadth, molded 28.4 m	
Depth, maindeck molded	12.5 m
Draft, design	7.5 m
Draft, scantling	8 m
Deadweight (w/Payload),scantling draft ..	13,699 MT
Complement	120
Classification	Lloyd's Register of Shipping

Record-Breaking Depth Achieved Knotty Head Discovery

A significant oil discovery was made on the Knotty Head prospect in the Gulf of Mexico (GOM) in December 2005, after drilling and logging operations were concluded by Weatherford International Ltd.

The discovery well is located in approximately 3,500 feet of water, and the total depth is an astounding 34,189 feet (almost 6.5 miles). It is the deepest well drilled to date in the GOM and breaks the previous record of 32,727 feet set earlier in 2005 by Shell. Nexen is operator of the Knotty Head prospect. Partners include Chevron/Unocal, Anadarko Petroleum Corporation, and BHP Billiton. The

well is owned by Chevron/Unocal and partners Nexen, Inc., Anadarko Petroleum Corporation, and BHP Billiton. The well was drilled using the Transocean drillship Discoverer Spirit.

Logging equipment used in this operation set a new benchmark for downhole operating temperatures and pressures. The completion of this job opens up more opportunities for non-traditional drilling, not just in the GOM, but around the globe.

(Source: U.S. Minerals Management Service, Ocean Science, January/February 2006)

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Exploration Goes Deeper Finding More Answers

Exploration in the Gulf of Mexico (GOM) doesn't always involve oil and gas. As more becomes known about the Gulf from the Outer Continental Shelf down to depths of 3,280 feet, scientists are beginning to explore and study even deeper areas. Of special interest in the deepest part of the Gulf are rare hard-bottom areas of the seafloor and the possibility of additional dense chemosynthetic communities or deep coral habitats.

Most of the Gulf deepwater sea bottom studied to date is soft sediment, which is a mixture of mostly silt and clay. But less is known about the rare hard-bottom areas, especially in ultra-deepwater. A few chemosynthetic communities have already been discovered at depths close to 10,000 feet. Even though they look similar in many ways to communities in shallower water, we already know there are very few of the animals that are the same in both habitats. Questions about how the differences in salt structures, water temperature, pressure, and hydrate stability might affect chemosynthetic communities at deeper depths have yet to be answered. Will they be more - or less - abundant? Do they develop in the same way and at the same rate? What about other hard-bottom fauna, such as deepwater corals? To answer these questions, the National

Oceanic Partnership Program (NOPP) is sponsoring a four-year study of the hard-bottom chemosynthetic and other biological communities below 3,280 feet in the Central and Western GOM. This ground-breaking new study will be funded by the Minerals Management Service (MMS) and the National Oceanic and Atmospheric Administration's Office of Ocean Exploration (NOAA OE). The NOPP is a collaboration of 15 Federal agencies, including MMS and NOAA, along with academic and industry partners seeking to bring ocean issues to the forefront and encourage a greater synergy among those concerned with such issues. As this study goes forward, researchers hope to gain a greater insight into the differences between these deeper communities and those in more shallow locations. A significant part of this project will involve the exploration of new and unknown places in the deep Gulf, where no one has ever looked before. It is likely there will be some remarkable discoveries. The exploration and understanding of these new areas will enable MMS to protect and manage the Nation's resources in the deepwater Gulf better.

(Source: U.S. Minerals Management Service, Ocean Science, January/February 2006)

University of Delaware artist David Barczak's **rendition of the submersible Alvin** working on the seafloor at a hydrothermal vent site. The Alvin will be coming to the Gulf of Mexico for over two weeks to explore new sites for MMS and NOAA in May 2006. Photo courtesy University of Delaware College of Marine Studies.



Gulf of Mexico Region Deepwater Discoveries

Nine deepwater oil and gas discoveries were announced in the Gulf of Mexico during 2005. "The deepwater discoveries to date represent a strong continuing success story in the Gulf of Mexico," stated Chris Oynes, Minerals Management Service (MMS) Regional Director for the Gulf of Mexico. "Discoveries like BP's Stones represent a continuing favorable development in the new Paleogene play in the Walker Ridge area." Compared with the seven drilling rigs in the same period one year ago, there are nine rigs drilling in 5,000 feet of water or greater - the ultra deepwater zone. In addition, a new drilling record in the Gulf of Mexico - 34,189 feet - was reached at the Knotty Head prospect. The announced deepwater discoveries in 2005 demonstrate that active exploration in the deepwater Gulf of Mexico will continue to help

The **Holstein oil and gas development** is located approximately 150 miles south of New Orleans. The field is being developed using a **Production Drilling and Quarters (PDQ) truss spar, permanently moored in 4,350 feet of water.**



(Photo courtesy of BP Exploration & Production)

America meet its energy needs. (Source: U.S. MMS, Ocean Science, January/February 2006)

2005 Announced Deepwater Discoveries, Gulf of Mexico

Prospect	Operator	Area/Block Number	Water Depth (ft)
Stones	BP	Walker Ridge 508	9,576
Jubilee Extension	Anadarko	Lloyd Ridge 309	8,774
Mondo NW Extension	Anadarko	Lloyd Ridge 1	8,340
Q	Spinnaker	Mississippi Canyon 961	7,925
Big Foot	Chevron	Walker Ridge 29	5,286
Genghis Khan	Anadarko	Green Canyon 652	4,300
Wrigley	Newfield	Mississippi Canyon 506	3,700
Knotty Head	Chevron/Unocal	Green Canyon 512	3,557
Clipper	Pioneer	Green Canyon 299	3,452
Anduin	Nexen	Mississippi Canyon 755	2,400

GOM Lease Sales Up 38%

Near record oil and gas prices led to robust bidding in an offshore federal lease sale. The Central Gulf of Mexico Lease Sale 198, garnered \$588,309,791 in high bids from 82 companies for oil and natural gas leases in the Federal waters of the Gulf of Mexico. The total of all bids was \$978,310,887, a 38 percent increase over last year's Central Gulf Sale. The sale, held March 15, 2006, in New Orleans, was conducted by the Minerals Management Service. In Sale 198 the agency received 707 bids on 405 tracts. In this sale, 4,040 blocks comprising approximately 21.3 million acres offshore Alabama, Louisiana, and Mississippi were offered. While interest in deep water production continues, the large number of tracts receiving bids in shallow water is of particular note, indicating industry interest in deep gas in shallow waters, as well as deep water oil and gas production. Amerada Hess Corporation submitted the highest bid on Green Canyon Block 287 for \$42,789,994. Newfield Exploration Company and Anadarko Petroleum Corporation submitted the second highest bid on Green Canyon Block 551 for \$33,989,760. Each of the high bids on a block will go through an evaluation process to ensure the public receives fair market value before a lease is awarded.

Top Five Companies by Number of High Bids

Company	Total High Bids	Sum of High Bids
BP Exploration & Production Inc.	73	\$22,276,118
BHP Billiton Petroleum Inc.	26	\$7,661,284
Hunt Oil Company	23	\$10,943,280
Dominion Exploration & Production Inc.	16	\$41,417,099
Hydro Gulf of Mexico, L.L.C.	14	\$20,117,740

Top Five Companies by Amount of High Bids

Company	Total High Bids	Sum of High Bids
Amerada Hess Corporation	13	\$62,593,922
Woodside Energy (USA) Inc.	12	\$47,162,990
Dominion Exploration & Production Inc.	16	\$41,417,099
Newfield Exploration Company	6	\$32,208,909
Samson Offshore Company	10	\$27,109,326

Tyco Telecommunications Perfects the Art of Laying Cable

by Greg Trauthwein

With more than 350,000 km of installed and maintained fiber optic cable under its belt, Tyco Telecommunications turns an eye toward providing wide-bandwidth fiber optic communication pipelines for the burgeoning offshore oil and gas market.

Despite centuries of exploration and work underwater, including the last 50 years in which technological capability has exponentially expanded the ability to work more efficiently in the ocean's depths, it is fair to say that the knowledge regarding 70 percent of our planet is still in its pioneering stage.

Enter Tyco Telecommunications, an undersea cable and sensor equipment provider that has deployed short and long haul global communications networks in the world's oceans for many years.

Not only does Tyco Telecommunications install the fiber optic cables and ancillary systems, it is often responsible to maintain and repair them as needed. To enable the rapid recovery and repair of damaged cable, Tyco maintains a fleet of eight modern, strategically positioned ships and nine product depots around the globe.

"We've installed 350,000 km of fiber optic cable, including 2,200 amplifiers, and we've never had a product related fault that force the recovery of an amplifier," said Frank Cuccio, Vice President Marine Services for Tyco Telecommunications.

Cuccio has the responsibility for the marine engineering, construction and maintenance for everything that

Tyco Telecommunications builds, and thus is involved at the earliest phase of any project, to help determine the customer needs and devise an appropriate solution. Cuccio counts the engineering phase of the project as perhaps the most critical step of all. "The nature of the submarine business is a very demanding, turnkey and unforgiving. The engineering must be correct right from the start." Considering that many trans-oceanic cables lie more than 3.5 miles beneath the surface, the rationale for extensive front-end planning is easily understood.

First and foremost, a logical route for cable and burial depth, given seabed conditions and the nature of the shipping lane, must be set. Cuccio said that, by far, the biggest threat to a cable system are "external threats," in the form of fishermen's nets, dredging operations, pipeline installations and ship's anchors. Depending on the surrounding traffic patterns and consistency of the seabed, the depth that a cable must be buried generally varies from 1.5 to 3 meters, and in special cases as deep as 10 meters.

"After determining the customer's requirement, Tyco Survey Engineers go aboard a survey vessel to map the seabed along the entire cable route. Routing and Cable Engineers select the best route, most suitable cable type, and the slack required to enable the cable to lay flat on the seafloor."

Cuccio notes that each of the world's geographic regions poses its own particular considerations, for example the soft sediments offshore China in the Hong Kong region, which demand a cable to be installed 10 meters below the



seabed. "Even at 10 meters burial the cable is still vulnerable to anchors from very large ships."

In addition to installation, Tyco Telecommunications has a vibrant repair business. "We provide maintenance services to cables all over the world. If a cable is damaged, the cable repair ship is underway within 24 hours."

In depths to 2,000 ft., the company will often deploy a Remotely Operated Vehicle (ROV) to identify the problem, cut the cable and attach a recovery line so that the cable can be brought to the surface for repair. In deeper waters, the ship deploys a grapnel to secure the cable and bring it to the surface for testing. While this technology is decidedly lower tech, it's rather effective given that the ship, using the latest in GPS and DGPS technology, knows where to find the cable.

In fact, Cuccio considers the advent of dynamic positioning to be arguably the technology that has most dramatically enhanced his ship's ability to operate efficiently. "Dynamic Positioning, coupled with the very high accu-

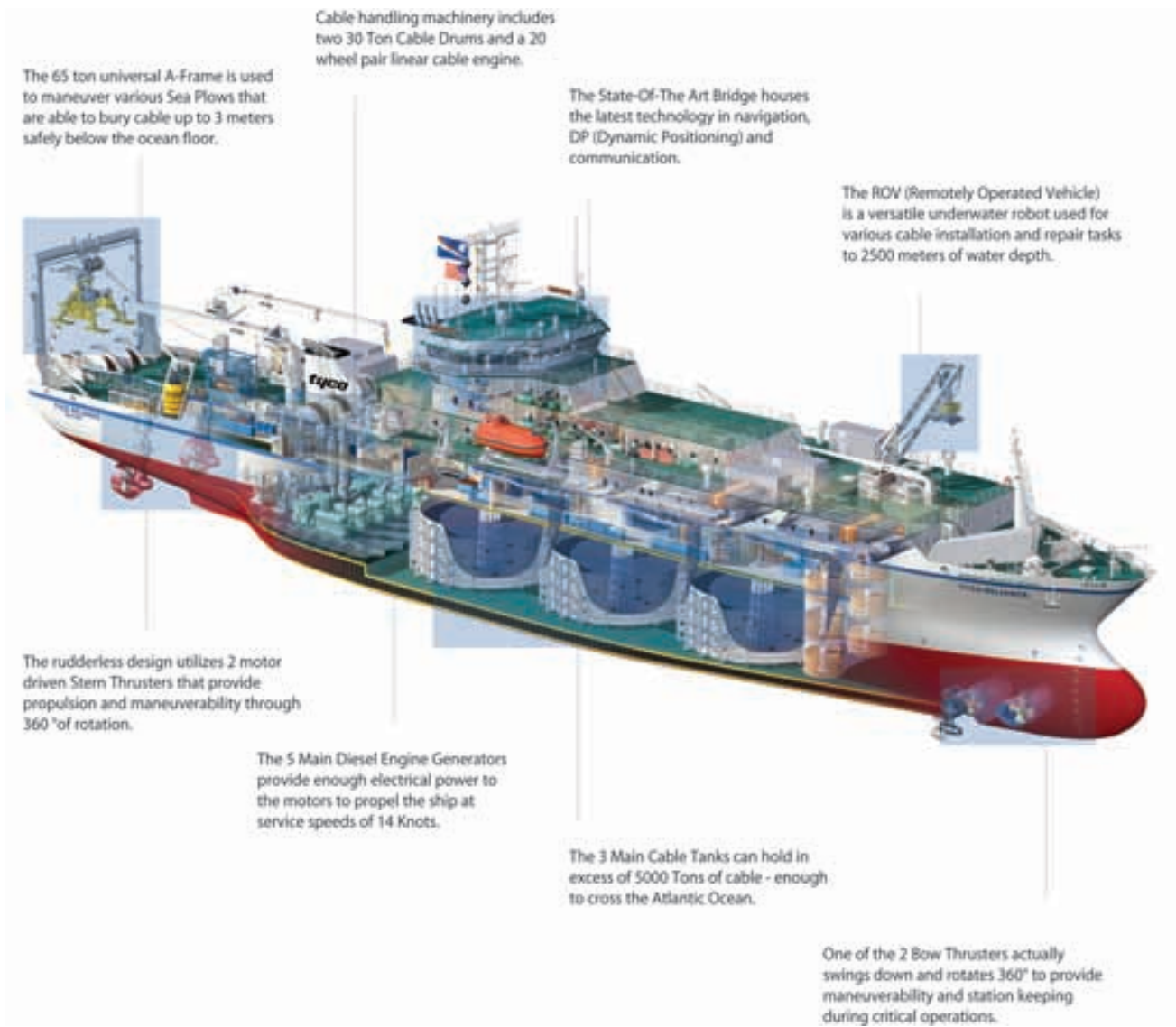
racy of DGPS, enables us to plot a very specific route, to put the ship on station and to keep it on station in almost all weather conditions," Cuccio said. The company can repairs in up to Sea State 7, and can install in up to Sea State 8 or 9. (See table on page 24 for reference). "DP enables us to make quick, efficient repairs, as once we have the cable onboard for splicing, it helps ensure that we're not dragging these cables all over the seabed."

Business in Change

Cuccio began his career in the business of subsea cable laying nearly two decades ago, starting with AT&T Submarine Systems in 1988 when fiber optic cabling was still in its infancy. Thus he has a broad perspective of the changing nature of the business, watching demand soar through the 1990s, powered by the dot.com explosion that saw Tyco Telecommunications employ more than 3,000 around the world. When the dot.com bubble burst, so too did the corresponding bubbles in many related

The Cable Guy: Frank Cuccio, Vice President Marine Services for Tyco Telecommunications.





The 65 ton universal A-Frame is used to maneuver various Sea Flows that are able to bury cable up to 3 meters safely below the ocean floor.

Cable handling machinery includes two 30 Ton Cable Drums and a 20 wheel pair linear cable engine.

The State-Of-The Art Bridge houses the latest technology in navigation, DP (Dynamic Positioning) and communication.

The ROV (Remotely Operated Vehicle) is a versatile underwater robot used for various cable installation and repair tasks to 2500 meters of water depth.

The rudderless design utilizes 2 motor driven Stern Thrusters that provide propulsion and maneuverability through 360° of rotation.

The 5 Main Diesel Engine Generators provide enough electrical power to the motors to propel the ship at service speeds of 14 Knots.

The 3 Main Cable Tanks can hold in excess of 5000 Tons of cable - enough to cross the Atlantic Ocean.

One of the 2 Bow Thrusters actually swings down and rotates 360° to provide maneuverability and station keeping during critical operations.



industries, and there was a subsequent downsizing at Tyco Telecommunications to the 650 it employs today.

While painful, Cuccio notes that the company was able to retain its core of top-tier talent, and he said that today the business is in recovery mode, with the company slowly starting to increase its numbers to meet demand.

An area of growth of particular interest to the company is the burgeoning offshore market, which demands high-bandwidth communication capabilities at locations increasingly further offshore. Cuccio believes that Tyco Telecommunications is well-positioned to capitalize, as he notes it is the only U.S. company with its breadth of product, service and engineering expertise.

The offshore Oil & Gas market, particularly domestically in the Gulf of Mexico region, has recently undergone its own metamorphosis, both planned, with the expansion of operations further from shore in increasingly deep waters, and unplanned via the one-two natural disaster punch of Hurricane's Katrina and Rita late last summer.

"We look at the offshore industry as an emerging mar-

ket, as we have the capability to provide a quality of service and are in a position to connect to the offshore environment with a high availability, high bandwidth communication pipeline," said Cuccio. The company broke into the market nearly six year ago with a submarine system installation for a Brazilian deepwater facility, and today's push further out in the Gulf of Mexico with semi-submersible, floating platforms and stationary drill ships presents a significant opportunity. "Unplanned events (due to hurricanes) cost the Oil & Gas industry millions each year," as major hurricanes can take an offshore facility off-line for days, weeks, and in some cases, months, Cuccio said. With a robust, secure and reliable high-bandwidth fiber optic link from shore, companies can evacuate crews, control operations from the beach, and maintain a wider operating window. Once the storm passes, the fiber optic link will allow a status assessment and a re-start in a more timely fashion. "Currently, it takes about five days to get a rig back up, the industry wants to get it down to three days," Cuccio said.

Table 1
Pierson - Moskowitz Sea Spectrum
 - Values are worst case forecasts for open water in vicinity of referenced point (www.oceandata.com)

Wind Speed (knots)	Sea State	Significant Waves (Ft.)	Significant Range of Periods (Sec.)	Average Period (Sec.)	Average Length of Waves (Ft.)
3	0	<.5	<.5 - 1	0.5	1.5
4	0	<.5	.5 - 1	1	2
5	1	0.5	1 - 2.5	1.5	9.5
7	1	1	1 - 3.5	2	13
8	1	1	4-Jan	2	16
9	2	1.5	1.5 - 4	2.5	20
10	2	2	1.5 - 5	3	26
11	2.5	2.5	1.5 - 5.5	3	33
13	2.5	3	6-Feb	3.5	39.5
14	3	3.5	2 - 6.5	3.5	46
15	3	4	7-Feb	4	52.5
16	3.5	4.5	2.5 - 7	4	59
17	3.5	5	2.5 - 7.5	4.5	65.5
18	4	6	2.5 - 8.5	5	79
19	4	7	9-Mar	5	92
20	4	7.5	3 - 9.5	5.5	99
21	5	8	10-Mar	5.5	105
22	5	9	3.5 - 10.5	6	118
23	5	10	3.5 - 11	6	131.5
25	5	12	12-Apr	7	157.5
27	6	14	13-Apr	7.5	184
29	6	16	4.5 - 13.5	8	210
31	6	18	4.5 - 14.5	8.5	236.5
33	6	20	5 - 15.5	9	262.5
37	7	25	5.5 - 17	10	328.5
40	7	30	19-Jun	11	394
43	7	35	6.5 - 21	12	460
46	7	40	22-Jul	12.5	525.5
49	8	45	7.5 - 23	13	591
52	8	50	7.5 - 24	14	655
54	8	55	8 - 25.5	14.5	722.5
57	8	60	8.5 - 26.5	15	788
61	9	70	9 - 28.5	16.5	920
65	9	80	10 - 30.5	17.5	1099
69	9	90	10.5 - 32.5	18.5	1182
73	9	100	11 - 34.5	19.5	1313.5

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Growing Requirement for Floating Production Systems

by James R. McCaul

Floating production has evolved over the past 30 years in response to the need to produce in water depth beyond the reach of fixed platforms. There are now 179 floating production systems in operation and another 46 on order. They are now routinely producing on fields in the North Sea, Gulf of Mexico and offshore Brazil, West Africa, Southeast Asia, China, other locations. Thirty are producing on fields in water depth exceeding 1 kilometer. The 2 kilometer mark will be passed within the next two years, when the Independence Gas Hub and Blind Faith production semis start producing in the Gulf of Mexico. By any measure, this is a remarkable achievement for a technology that dates only from the mid-1970s.

Growth of floating production

Floating production can be traced to 1974, when Hamilton Brothers converted the semisubmersible drill rig Transworld 58 to a floating production unit for use on the Argyll field in the North Sea. The unit was placed in 79 meters water depth and operated for 16 years. The first ship shape floating production unit is traced to 1977, when Shell converted a 60,000 dwt tanker to an FPSO vessel with 20,000 b/d processing capacity for use on the Castellon field offshore Spain. It operated in 115 meters water depth.

But the commercializing and early expansion of floating production technology can be attributed to Petrobras. The operator saw floating production as an excellent, relatively low cost solution for producing crude in the deep-water fields of Campos Basin. Petrobras began using converted rigs as production semisubmersibles in 1977 - and

within ten years had 11 floating production units operating offshore Brazil.

Interest in floating production spread to other operators in the 1980s. Driving this was the successful demonstration of floating system technology on offshore fields between 1984 and 1986. Most notable were Conoco's Hutton tension leg platform, the Golar Nor Petrojarl 1 early production system and BP's Seillean SWOPS vessel. These systems clearly showed floating production to be a practical and economical solution for certain offshore applications. By the end of the 1980s, there were 31 floating production systems in operation.

The tempo of installations continued to build over the first half of the 1990s. More than a dozen FPSOs were installed in the five year period, the bulk of which were placed offshore China, Southeast Asia, Australia or in the North Sea. They included Woodside's Cossack Pioneer, a large FPSO able to process 140,000 b/d oil that was placed on the Wanaea/Cossack field offshore Australia. Seven production semis were installed, including Norsk Hydro's Troll B production semi in the North Sea, which is capable of producing 270,000 b/d oil and 282 MMcf/d gas. The early 1990s saw the take-off of TLPs, with three units being installed, Snorre and Heidrun in the North Sea and Auger in the Gulf of Mexico. By end 1995 there were 57 floaters in operation.

Things really took off in the second half of the 1990s. In the five year period there were orders for almost three dozen FPSOs, including 14 harsh environment units for use in the North Sea and East of Shetlands. They included the sophisticated and expensive Asgard FPSO, capable



Keppel Shipyard successfully completed the sixth **Floating Production Storage Offloading (FPSO)** conversion project from SBM since 2000.

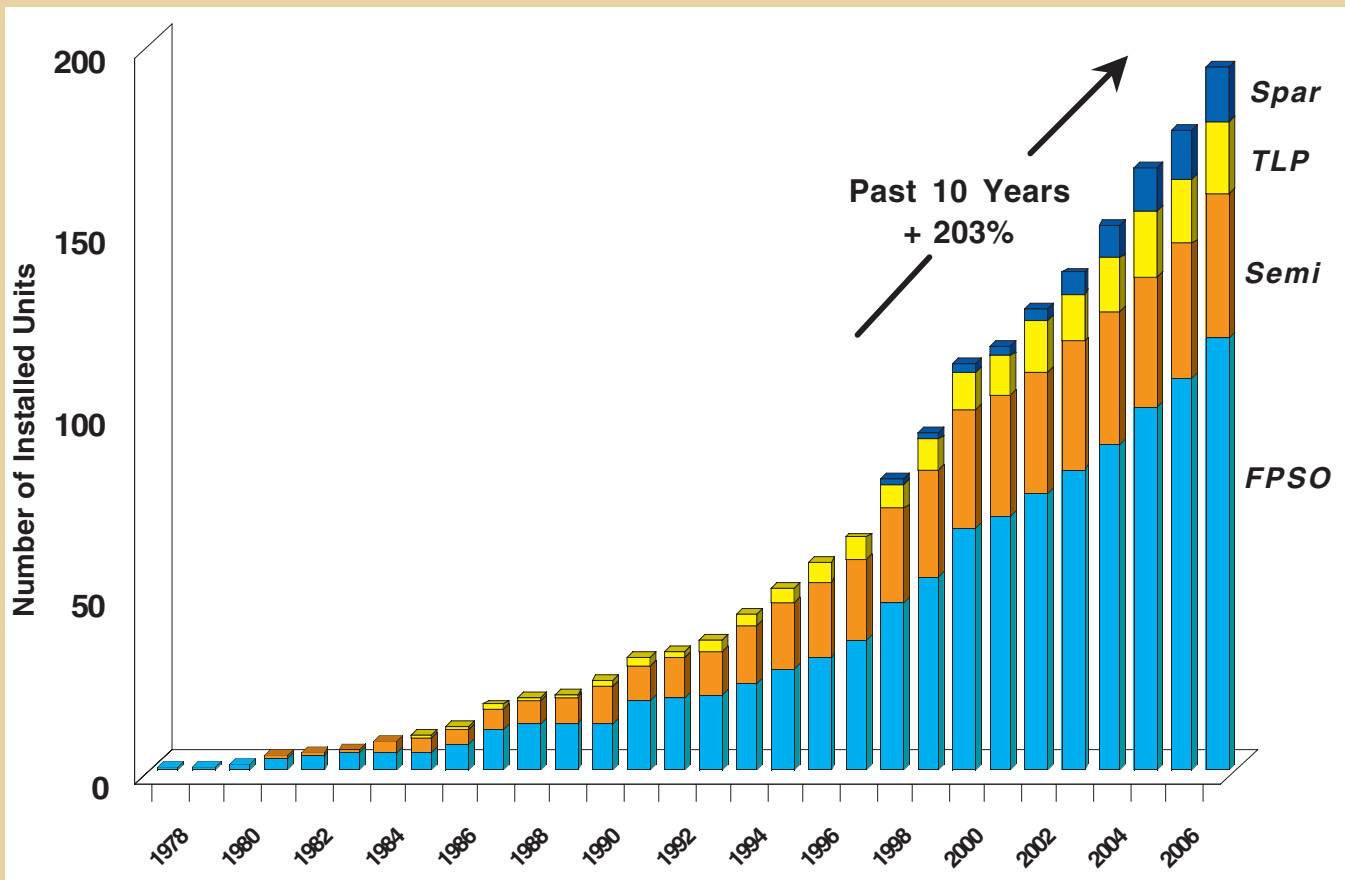
of processing 200,000 b/d oil and 600 MMcf/d gas, and the Schiehallion FPSO, capable of processing 155,000 b/d oil and 140 MMcf/d gas. During this period a dozen production semis were installed, five of which were placed in the North Sea, five offshore Brazil. The North Sea units included the purpose-built Visund, with processing capacity for 113,000 b/d oil and 350 MMcf/d gas, and the Troll C, with capability to process 190,000 b/d oil and 320 MMcf/d gas. TLP installations grew significantly, with six new TLPs being installed in the Gulf of Mexico. They included Shell's large deck TLPs Mars, Ram Powell and Ursa and the mini-TLPs Morpeth and Allegheny. This period also saw the first spar installations, when Kerr McGee installed the Neptune spar in 1997, followed a year later by Chevron's Genesis spar. By the end of the decade, there were 112 floating production systems of all types in operation.

Growth has continued unabated during the first half of this decade. Almost 60 FPSOs have been installed, including 20 units off West Africa. Among these have been some huge purpose-built units for multi-billion dollar deepwater developments. They include ExxonMobil's Kizomba A and B, each having 250,000 b/d oil and 400 MMcf/d gas processing capability, Total's Girassol with

processing capability of 200,000 b/d oil and 105 MMcf/d gas and Shell's recently installed Bonga with 225,000 b/d oil and 150 MMcf/d gas processing capacity. The past five years have seen seven production semis placed in service, including two large gas condensate production semis, Asgard B and Kristin for the North Sea, and the NaKika production semi in the Gulf of Mexico, which at 1920 meters holds the current water depth record for floating production systems. Nine TLPs have been installed since the beginning of the decade, including two wellhead units off West Africa and a unit in Southeast Asia. There has also been significant growth in use of production spars during the first half of the decade. Twelve units have been delivered since 2000, all for placement in the Gulf of Mexico. By end 2006, counting the units to be installed during this year, there will be 194 floating production systems of all types in operation.

Comparing Solutions

FPSOs are the most common type of floating production system. They represent 61 percent of the production units now in operation and 70 percent of the production units on order. They are located in all major offshore areas, except the Gulf of Mexico. FPSOs have the advan-



tage of providing field storage, which enables them to be utilized independent of pipeline infrastructure. They are also less weight sensitive than other types of floating production systems and the extensive deck area of a large tanker provides flexibility in process plant layout. Another advantage is the ability to utilize surplus or aging tanker hulls for conversion to an FPSO vessel, a solution which can be relatively inexpensive compared to building a new hull. The disadvantage is that the subsea tiebacks associated with FPSOs generally bring higher well maintenance costs.

Production semis comprise the second largest segment of floating production systems. They represent 21 percent of all production floaters in operation and 13 percent of the current floater order backlog. This type production system was a popular solution during the early years of floating production. A large number of surplus drill rig hulls were available that could be fitted with process plants and converted relatively cheaply into production units. But when the availability of surplus hulls dried up in the 1990s, the semi as a production facility became less attractive than FPSOs. However, their popularity has rebounded over the past several years as development has moved to ultra-deepwater, dispersed fields. Production

semis have the advantage of being able to operate on complex deepwater fields involving a large number of wells over a disbursed area. Recent orders have included very expensive purpose-built units such as Thunder Horse, P 51, Kristin and Atlantis. But a new range of significantly less expensive light deckload production semis capable of operating in ultra-deepwater are attracting considerable industry interest. There has also been a recent project, Gomez, where the operator converted an old drill semi hull to a small production semi.

TLPs are the third most common type of production system. The 18 TLPs now in operation represent 10 percent of all floating production units and the 3 TLPs on order account for 7 percent of the order backlog. All TLPs have been purpose-built for the field on which they operate. Full size TLPs had been a popular production option in the Gulf of Mexico and North Sea. But Shell's Brutus in the Gulf of Mexico marked the end of the full size TLP period. These types of production floaters are not suited for use on ultra-deepwater fields. Tendon weight grows exponentially with increasingly deeper water and the potential use of full size TLPs is generally considered to be no more than 1800 meters. Mini-TLPs however remain very popular in the Gulf of Mexico. Like full

size TLPs, minis have the ability to support dry trees, which is a particularly desirable feature in the Gulf of Mexico. The disadvantage is they lack storage and though they can operate in deeper water than the full size unit, they still appear to have depth limitations. The deepest to date is the Moses TLP now on Marco Polo, which is in water depth of 1310 meters. Conceptually, there are designs for mini-TLPs to operate in water depth to 2700 meters, but no unit has yet been ordered for such an application. Wellhead TLPs work in conjunction with an FPSO or production barge. They are positioned directly over the well and enable the trees to be at the surface. Production facilities are on an accompanying FPSO, barge or platform. They range significantly in size, complexity and cost.

Spars are relative newcomers to floating production. Production spars have the ability to accommodate dry trees, a feature liked by operators in the Gulf of Mexico where well maintenance is a particularly important issue. Water depth does not seem to be a limitation. Spars have been utilized in water depth to 1710 meters (Devil's Tower) and theoretically can be employed in water depths to 3000 meters and beyond. A spar is currently earmarked for the Great White field, which at 2260 meters would be the deepest application yet for this type production system.

The original classic spar design based on a full length cylinder has been superseded by the truss spar, comprised of an upper hard tank and lower truss structure. Hoover/Diana, the largest classic spar, supports a 26,500 ton payload. Holstein, the largest truss spar, is able to support almost the same payload on a hull that is half the weight of Hoover/Diana. Payload up to 40,000 tons can theoretically be provided on a spar, but only with substantial increase in hull diameter. Spars can provide storage but to date no spar has been used in this capacity. A smaller version known as a cell spar has been used as a

production system on gas fields. The Red Hawk cell spar in the Gulf of Mexico has a bundled hull with an overall diameter of 19.5 meters and is able to support 4,700 tons topsides payload. A spar design was recently selected as a floating wellhead facility for offshore Malaysia. It will work with an accompanying FPSO. This is the first application of a spar as a wellhead facility and the first contract for a spar outside the Gulf of Mexico.

Outlook for Floating Production

Underlying market drivers for floating production are very strong. World energy demand is growing at a rate of 1.6 percent annually, driving the need to find and develop new oil and gas sources. Deepwater fields are one of the few remaining untapped sources for new production. The futures market is forecasting crude prices in the \$60+/bbl area and natural gas in the \$8-9/MMbtu range at the end of the decade, providing incentive for undertaking new capital expenditures. It's not surprising that most oil companies are planning to significantly increase capex budgets for E&P activity over the next several years. Further evidence of the strong underlying market is provided by drill rig demand. Rig utilization is extremely high, pushing 100 percent in some areas, and rig rates are going through the roof as field operators try to secure equipment for exploration and development drilling.

We believe this market has a long way to run before losing steam. In our recent study of the floating production market, we forecast orders for 103 to 130 production floaters over the next five years. This figure includes 75 to 95 additional units that will be purpose-built or converted from existing hulls and 28 to 35 redeployments of existing units. These orders are expected to generate capital expenditures of \$35 to 44 billion over the five year period. In addition, orders for 25 to 35 floating storage units will generate another \$1.5 billion in capital expenditures for conversion or construction.

About International Maritime Associates

International Maritime Associates (IMA) was formed in 1973 to provide strategic planning, business development and project implementation support to clients in the marine and offshore sectors. Our clients include equipment manufacturers, technology firms, financing institutions, transport providers, service companies, facility operators, others. Over the past 33 years, IMA has completed over 300 business consulting assignments for more than 130 clients in 38 countries. In addition to consulting assignments, IMA prepares multi-client studies of specific business sectors that have general industry-wide interest. These studies size and profile the business sector, evaluate underlying market drivers and forecast the available market. They are designed to be utilized as input for business planning. Among our multi-client projects have been more than 25 studies of floating production systems. The floater reports have become a popular industry reference document and most major players in the floater sector are among our clients. Further information about IMA and our multi-client studies is available on our website www.imastudies.com. Just click on IMA Industry Studies to view the contents of reports in the floater series.

Around the World, ROVs in Action

by Maggie L. Merrill

The effects of Hurricanes Katrina, Rita and Wilma are still gripping much of the Southern United States, as the devastation so vast that it will take a decade to rebuild ashore. Offshore, however, the scene is a bit different, as there are fewer politics and fewer people to relocate. The web of underwater pipelines, shut in wells, damaged drilling and production rigs are slowly coming back on line. There are U.S. Energy Department estimates that six percent of the nation's total refinery capacity is still shut off because of all the destruction ashore and at sea.

While the memories of the hurricanes and the devastation has naturally faded a bit, more than half a year later there is still vast amounts of work ongoing in the Gulf of Mexico. Cleaning up after the hurricanes' aftermath is still sucking support ships, ROVs and all manner of underwa-

ter equipment out of circulation for other work in other parts of the globe. Consequently, there is a scramble in the ROV business to service other areas where there is significant offshore work underway, including the North Sea, West Africa, and China. There is also new deepwater oil exploration and infrastructure installation work to be done in the Gulf of Mexico, once again, resources are all geared toward clean up and repair.

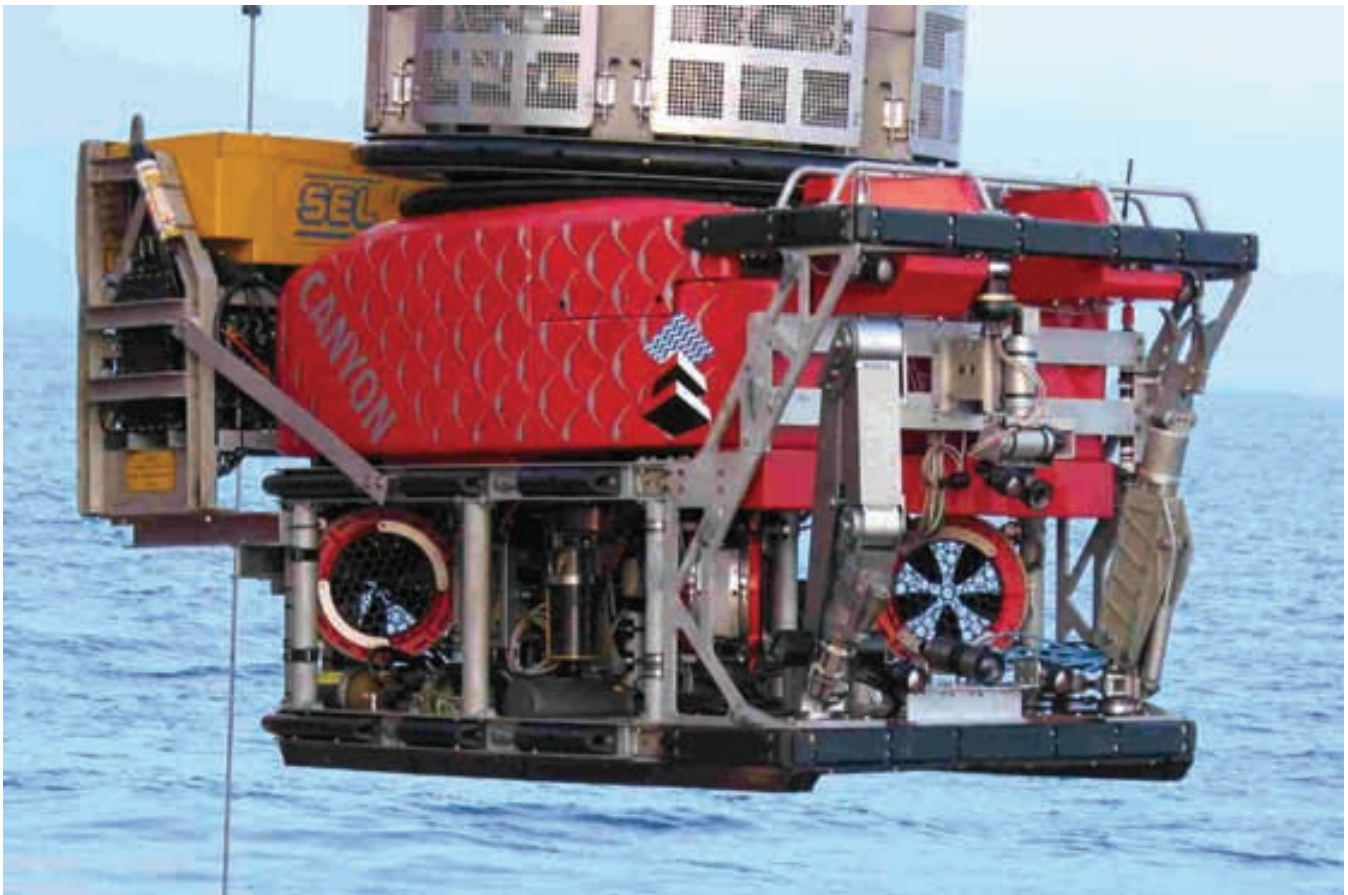
Large ROV with Lots of Coms

While there are many in the business; several stand out as long-term players with major investments in people and technology. Schilling Sub-Atlantic Alliance, director of Remote Systems Applications, Norm Robertson spoke to MTR recently on the matter. Schilling builds the highest specification heavy work load ROVs for use in offshore oil, gas and pipeline and cable laying operations. The Ultra Heavy Duty (UHD) ROV is the company's biggest and brightest machine to date, rated to operate at 4000 m. It incorporates the Schilling Digital Telemetry System (DTS), which easily quadruples the number of sensors that can send a signal up the cable to the control unit. This is important because until the DTS, adding sensors has been a trade off between weight, bandwidth and cable size and ultimately performance.



Remote Systems Application Director, Norm Robertson of Schilling Sub-Atlantic shows off the Digital Telemetry System they now install on all their ROVs.

(Photo Credit: Maggie L. Merrill)



The **QUEST electric work-class ROV** (shown here with a tool deployment unit) can perform a wide range of tasks, from offshore construction support to salvage, mapping, remote tool deployment, and object recovery. (Photo credit: Schilling Sub-Atlantic)

According to Roberston, one of the most important innovations in the ROV operations business has been the DTS. It is amazing how many more sensors can be added and to what was usually fairly limited at depth. Fully loaded vehicles with multiple sensors can operate and feed data easily to the control station. The unlimited bandwidth using fiber optic transmission on gigahertz ethernet back bone system really revolutionizes capabilities at depth in a harsh environment with a heavy work vehicle. The DTS will drive bathymetric sensors, Doppler velocity logs, forward seeking sonar systems such as the Blue View and/or the Didson, which take super high resolution sonar images. It's great to finally have a connection system that virtually any piece of equipment can simply be plugged in and it will be recognized much the way a computer senses when a new device has been connected.

The Schilling DTS signal box measures about 12 x 12 x 6-in. It operates on a fiber optic cable using Ethernet technology to enable multiple instrument plug and play capabilities. It was developed specifically for the needs of

several clients who had signal heavy data to send up the cable. The Schilling DTS connection enables the operator transmit super high definition video to the surface for undersea inspection, broadcast and research purposes.

In May Schilling Robotics expects to deliver its sixth ultra heavy duty ROV UHD to Phoenix International for use in the Gulf of Mexico. This vehicle will offer 200-shp power (generating 1.4 tons of thrust) to a 3,500 m depth. The system will include Schilling's XE extended TMS tether management system with 600 m of tether. "We are pleased to be taking delivery of two of the UHDs. They will go right into service in the Gulf of Mexico supporting subsea oil infrastructure replacement and repair. There is so much work to be done in the Gulf that we are making a huge investment in tools and ships to provide solutions," said Tim Janaitis, Phoenix International. Phoenix has been providing salvage, diving and submarine rescue support to the U.S. Navy for years and they are well known in the Gulf of Mexico for their expertise in technical welding and advanced dive support operations.

Phoenix will place the two Schilling UHDs in service in the Gulf aboard one of their three support vessels by mid-July.

Electric ROVs

"Electric ROVs can be very handy, if you give them a chance," said Chris Tarmey of Seaeeye Marine Limited. There is no doubt that the beefy, very heavy duty ROVs, such as the Hydrovision are the best tools to do certain tasks that require a lot of torque. But, there are plenty of tasks that the lighter, less cumbersome and less expensive ROVs can do. In some cases the electric versions of heavy work vehicles can cost up to half. It makes sense, the electric vehicles are lighter, they require smaller tether management systems and they take up less space on deck, which means they can go on smaller support ships that run on less fuel with fewer personnel.

ROVTECH is a full service ROVs for offshore oil and gas work all over the globe. Based in Aberdeen and Singapore, ROVTECH owns and operate more than 40 ROVS of varying size and specifications. ROVTECH's vehicles and services are comprehensive, and they provide trained and certified personnel to offshore operations. They operate several different types of ROVs, Seaeeye being their largest inventory item. The type of work that they do includes rig inspection, high pressure jet washing, large valve tightening, cable cutting, pipeline tracking, drill completions, and more. ROVTECH reports they have 22 ROVs stationed in the North Sea; four in

Azerbaijan, one in China, two in Malaysia; two in Angola and one in Tunisia.

The ROVTECH team is expert with any sort of tool, in fact their tool guy, Ian Harvey has created a battery of clever tools that are attached to the bottom, sides and manipulators on all their vehicles.

ROVTECH requested that Seaeeye develop an all-electric vehicle for heavy work underwater. That vehicle is the Panther 2, which has a high thrust to weight ratio. The Panther 2 has been fitted with a special valve twisting mechanism that enables it to sit on top of the spot that has to be closed or opened and use its thrusters to turn the lid. It's sort of like a space ship with a screw driver coming out of the bottom and twirling around to tighten or loosen the screw. With all these improvements the electric ROVS can accomplish much of what their larger, more beefy counterparts can in less time for a lot less money.

The Majors

Global subsea contractor, Subsea 7 is a major force in subsea completions and pipeline installations all over the globe. The company owns and operates several purpose built ships for surveying, pipeline installation, and cable laying (including a recently ordered pipelay vessel, featured on page 16). Subsea 7 also owns and operates 100 ROVs worldwide. With a workforce in excess of 3,000, it is one of the world's leading subsea engineering contractors. The company's global offshore operations are supported out of Asia Pacific, Brazil, Gulf of Mexico,



Ian Harvey, Tooling Manager for ROVTECH stands behind their SeaEye Panther Plus Electric Work Class ROV.
(Photo Credit: Maggie L. Merrill)



The UH ROV being readied for GeoConsult at the Schilling shop in California. (Photo credit: Schilling Robotics)

Norway, U.K. and West Africa.

To provide an example of the magnitude of the underwater construction work that is available; Subsea7 announced that it was awarded a contract with a value of approximately \$25 million from Talisman Expro Limited for a subsea installation contract in the North Sea. The contract is for the fabrication, installation and commissioning of 10-in. production pipeline tie-in spool pieces, eight-in. water injection pipeline tie-in spool pieces and four-in. gas lift pipeline tie-in spool pieces at both the Ula platform and the Blane drill center which are located in the Norwegian Continental Shelf and on the U.K. Continental Shelf respectively. Operations will take place in water depths of between 70 and 75 m using both divers and ROVs.

A year ago, Subsea 7 was awarded a subsea installation contract for approximately \$28 million from Chevron North America Exploration and Production Company, a Division of Chevron U.S.A. for work related to the Blind Faith Project in the eastern Gulf of Mexico. The contract is for the installation of the Blind Faith in-field flow lines including the associated pipeline end terminations and pre-laid steel risers.

In order for Subsea 7's Integrated Remote Technologies division to actually do the work they have been contracted for, they have to build, buy or acquire the tools. Last year, Subsea 7 contracted with Hydrovision to build 5 Hercules heavy construction ROVs capable of operating at 3,000 m. Around the same time, Subsea 7 was awarded four ROV contracts in West Africa. These include drill rig contracts for Peak Petroleum Industries Nigeria Ltd. and Equator Energy offshore Nigeria, for Foxtrot International for work offshore the Ivory Coast, and for Devon Energy Corporation offshore Angola. Additionally, Subsea 7 is to provide Amerada Hess with ROV services offshore Equatorial Guinea over the next two to three years.

It appears that with the likes of Subsea 7, ROVTECH, Schilling to name a tiny fragment of the major players in the offshore oil undersea construction support industry, all is in good and very strong hands (manipulators). There is a noted upswing in the use of ROVs now that most of them and their support vessels and personnel are still working 24/7 in the Gulf of Mexico. There are some that say they have not yet completed the damage done by Hurricane Ivan that ravaged the Gulf in the fall of 2004.

Increasing Productivity Offshore with Broadband

SatCom

by David Myers

Communication technology for the maritime industry has grown exponentially in recent years. Long gone are the days when a crew member aboard an offshore oilrig or an ocean going vessel would have to wait until he got to shore to talk with his family. With satellite broadband communications the industry is entering an era where valuable hours are saved by employing real-time voice and data applications for everything from engine monitoring to, to cargo tracking, to distance learning. These changes not only improve responsiveness and productivity, but also can improve the quality of life for those who spend most of their time in an offshore environment.

The advent of advanced satellite communications capabilities has provided maritime crewmembers with telephone, video and Internet services on their ships and other sea vessels. Today a ship at sea can benefit from the same type of always-on broadband communications as the corporate office back on shore. Cargo manifests and production reports can be faxed, e-mailed or delivered through real-time systems through a modern satellite communications service. However, as new customs and homeland security laws come into effect, and as crew

turnover rates continue to grow, the industry is seeing an increased demand for even higher-bandwidth applications.

Basic voice, fax and even limited Internet communications have been available for some time from Mobile Satellite Service (MSS) providers such as INMARSAT, Globalstar and Iridium. However, the services' per minute charges and slower "burstable" data rates - ranging from 16Kbps to 128Kbps - are becoming less appealing for emerging real-time applications when compared with the higher-end Very Small Aperture Terminal (VSAT)-based services.

VSAT allows a vessel to take advantage of more advanced IP-based communications, Enterprise Resource Planning (ERP) systems, real-time monitoring and video conferencing and surveillance. In addition, using VSAT-based services prepares the vessel for future applications such as video training or telemedicine. VSAT services provide true always-on broadband with near carrier class quality. Select providers even offer Committed Information Rates (CIR) and advanced Quality of Service (QoS) techniques to ensure that real-time applications



(Photo Credit: U.S. Coast Guard)

will perform over the satellite link.

Though VSAT services are more complex and require larger antenna systems, their enterprise grade service and flat-rate pricing offers an unsurpassed benefit for high-bandwidth vessels. These broadband services can offer sustained CIRs - the rate at which the network supports data transfer under normal operations - in excess of 1Mbps, in both upstream and downstream directions making VSAT a necessity for organizations looking to extend their corporate networks and mission-critical applications out to individual vessels.

Larger deep-water vessels have a variety of needs for higher-bandwidth services. Ship captains are trying to find ways to minimize time in port to escalate competition in the shipping industry. Aside from crew and vessel safety, getting back to sea with a revenue generating cargo is often the top priority. In order to meet this business necessity, many maritime enterprises find themselves turning to their IT departments to help them improve their efficiency through better communications.

Emerging legislation requiring vessels to transmit

detailed cargo manifests and other customs declarations - prior to coming within 100 miles of port - is presenting challenges to the entire global maritime industry. Customs officials from Europe to the United States - indeed, all over the world - want to verify the origin of cargo containers to ensure the status of hazardous cargo such as liquefied petroleum gas or explosive fertilizers, prior to entering a busy and populated port. A valid concern considering the September 11 attacks in the United States and the recent subway bombings in London. Sending this "digital paperwork" that is required to comply with these new regulations can take hours to transmit over a radiophone or slow data rate-based services. And that's without taking into consideration a lost connection, which would mean the entire process had to be restarted.

In order to better comply with these new customs and homeland security regulations, vessels can be equipped, not only with a broadband VSAT connection, but an onboard Radio Frequency Identification (RFID) system as well, to track cargo containers, report temperatures and ensure key hatches and doors are secure. This information,

which is collected and stored on an onboard server, can be transmitted in real-time over a satellite link to a control center, or even to a secure Web portal for shipping company or customs personnel to monitor. RFID continues to improve and become more affordable, making this an attractive solution for deep-water vessels.

In addition to RFID, many companies are beginning to employ next-generation tracking and telemetry systems. These systems facilitate quick dock turn-around times and help to maintain optimal vessel performance. For example, if a ship's generator is running hot and experiencing excessive vibration, this information can be forwarded in real-time over the satellite link to a fleet control center so that repair crews and spare parts can be standing by at the vessel's next port of call. These new Machine 2 Machine (M2M) monitoring systems can save days of downtime ordinarily spent awaiting parts or technicians to repair systems. Moreover, they can provide a ship captain with the ability to predict failures and to react to them before they even happen, avoiding costly and dangerous system failures at sea.

While VSAT-based services offer an array of benefits to the enterprise and to the vessel, they also offer a variety of benefits to the crews onboard. Many organizations are finding personnel training and retention to be an ever-increasing challenge. Employers must often invest innumerable dollars and hours in cold-water survival, hazardous materials, and other specialized training so that crews can be certified for offshore work. While traditional classroom training is expensive and keeps crewmen onshore rather than onboard, high-bandwidth VSAT systems allow crew members to benefit from training while at sea through real-time videoconference sessions and interactive distance learning programs. Not only does this technology allow for training, but also it enables a shipping company CEO to talk to every employee in the company simultaneously, whether they are in the corporate office or hundreds of miles out to sea.

Of course, training onboard crews is often not enough to retain key personnel. As crews can spend weeks, and even months, at sea without any shore leave, having a "communications lifeline" back to civilization is an





important contributor to crew morale. Vessels equipped with broadband VSAT systems can offer crew phones, calling-card programs, television, Internet kiosks or WiFi "hotspots," which provide shipboard workers with the ability to use their own laptop or wireless PDA as if they were back on land. The fleets that can offer their crews a better life onboard, with more of the comforts of home, can lower costs by significantly reducing employee turnover.

The advent of satellite-enabled technologies such as

M2M and RFID, IP Telephony, wireless Internet and real-time video technology have made this an exhilarating time in the maritime communications industry. These technologies ensure that maritime operators have more choices in satellite communications than ever before while modern VSAT systems have opened the doors for improved business applications and crew morale services. While older solutions still exist, it is these newer technologies that will combine to usher in a new era in maritime efficiency and communications.

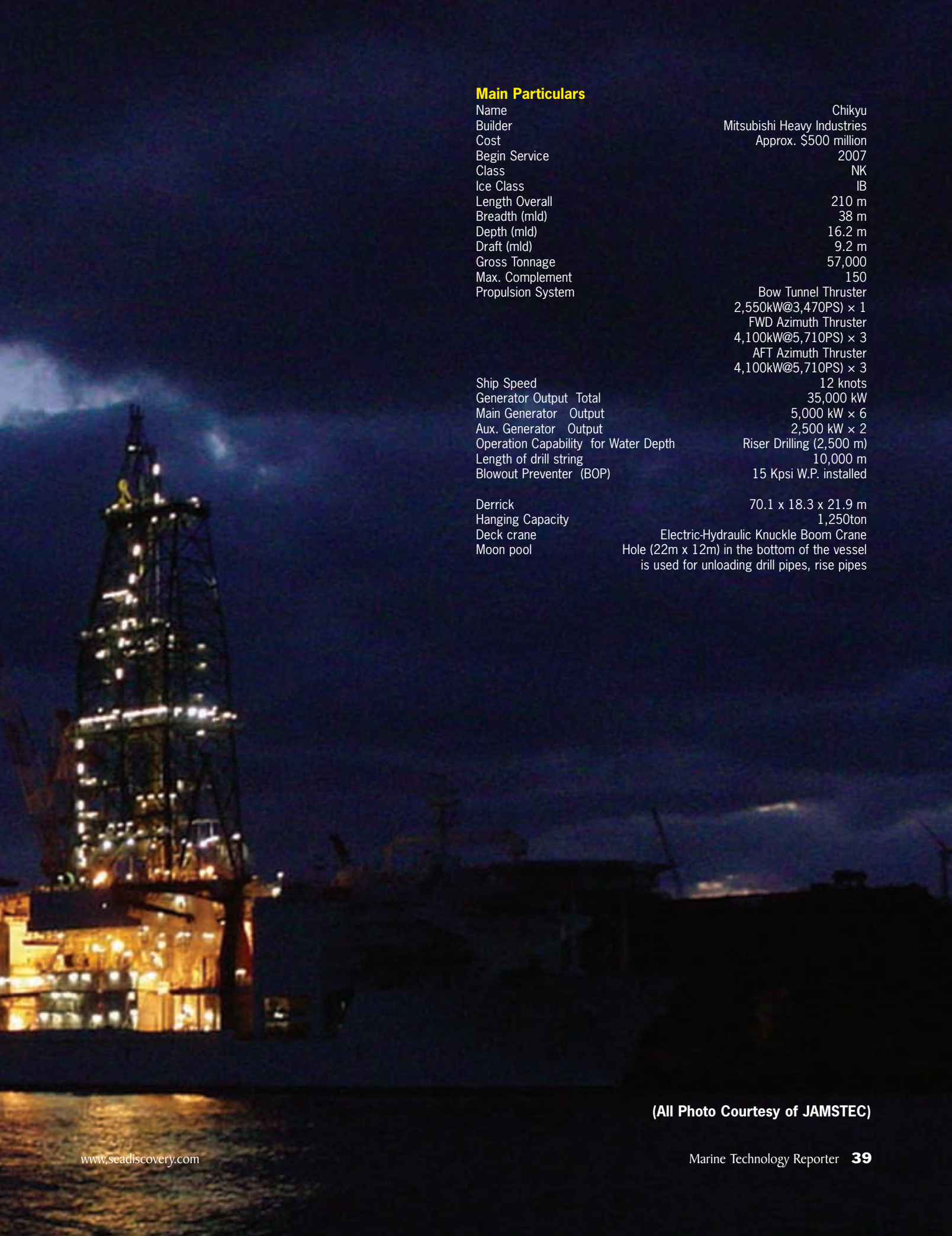


David Myers is vice president of marketing & product management for CapRock Communications. CapRock provides premium satellite communication services to remote and harsh locations for industries like energy, maritime, mining, and construction, as well as the government and military. Myers has 15 years of experience in the satellite and industrial computing markets, and holds an MBA in Technology Marketing and a Master of Science in Telecommunications.

Journey to the Earth's Mantle in 2007 on the

Chikyu

Chikyu - the Japanese word for "Earth" - is a state-of-the-art scientific drilling vessel that is designed to drill to 7,000 m below the seabed at approximately 2,500 m water depth. Built at Mitsubishi Heavy Industries for more than \$500 million, Chikyu's first scheduled assignment will be in the Nankai Trough, a Pacific Ocean zone between two tectonic plates that have produced powerful earthquakes through Japan's history. When it begins service as scheduled in 2007, it could be the first vessel to drill to the earth's mantle, and is intended to play a major role in the Japanese effort to protect the country from the devastation associated with earthquakes.



Main Particulars

Name	Chikyu
Builder	Mitsubishi Heavy Industries
Cost	Approx. \$500 million
Begin Service	2007
Class	NK
Ice Class	IB
Length Overall	210 m
Breadth (mld)	38 m
Depth (mld)	16.2 m
Draft (mld)	9.2 m
Gross Tonnage	57,000
Max. Complement	150
Propulsion System	Bow Tunnel Thruster 2,550kW@3,470PS) × 1 FWD Azimuth Thruster 4,100kW@5,710PS) × 3 AFT Azimuth Thruster 4,100kW@5,710PS) × 3
Ship Speed	12 knots
Generator Output Total	35,000 kW
Main Generator Output	5,000 kW × 6
Aux. Generator Output	2,500 kW × 2
Operation Capability for Water Depth	Riser Drilling (2,500 m)
Length of drill string	10,000 m
Blowout Preventer (BOP)	15 Kpsi W.P. installed
Derrick	70.1 x 18.3 x 21.9 m
Hanging Capacity	1,250ton
Deck crane	Electric-Hydraulic Knuckle Boom Crane
Moon pool	Hole (22m x 12m) in the bottom of the vessel is used for unloading drill pipes, rise pipes

(All Photo Courtesy of JAMSTEC)

While one of the missions of Chikyu — to tap and study the earth's mantle — is revolutionary, it relies on equipment proven in other offshore industries to help it achieve this end. It is equipped with the Riser drilling system that has achieved success in oceanic oil drilling, and is designed to shield the vessel against eruptions of methane gas and pressurized fluids, while allowing for the retrieval of valuable core samples.

In addition, the vessel's Dynamic Positioning System (DPS) is designed to keep the vessel on position, counteracting the drift from wind, waves and sea current. The 210 m, 57,000 ton ship can efficiently remain on station using its GPS and six azimuth thrusters.

There are four integrated research areas on the vessel that house multiple research facilities for physical, scientific, and biological analysis by using the sampled core (cylindrical sediment and/or rock sample) and the drilled hole.

Drilling floor and Machines

Drilling machines are located in a way that allows an efficient and safe drilling operation on the drilling floor. The pipes for drilling, such as casing, riser, and drill pipes, that are stored on the pipe rack at the front end and of the vessel, are lifted by deck cranes and loaded onto the pipe



The derrick has just been installed.
(Photo credit: JAMSTEC)

transfer system.

This pipe transfer system transfers the pipes to the drill floor on rails mounted on the drilling floor. The transferred pipes are assembled, connected, and run down into the sea floor by the drilling machines on the drilling floor. For this operation, there are different machines to manage each task. The main machines are: Hydracker, to move drill pipes on the drill floor; Roughneck, to connect drill pipes; Top Drive, to rotate pipes for drilling; and Drawworks, to lift drill pipes and Top Drive.

There is a drilling derrick standing on the drill floor. This derrick has many drilling mechanisms attached to it. For Example, there is a finger board/belly board that is used for supporting joined pipes on the middle shelf of the derrick.

A Crown Mounted Compensator is fitted to the top of the derrick to compensate for vessel roll on the ocean, effectively designed to prevent the ship's rolling from being transmitted to the drill pipes hanging at the drill insertion point.

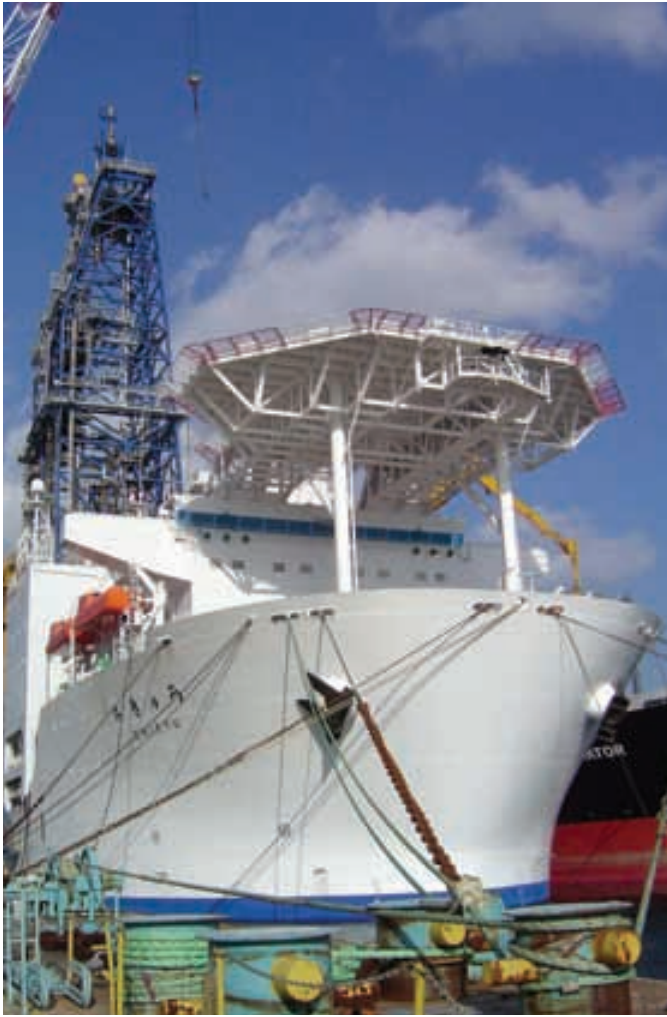
Much drilling equipment is present and its operation is controlled from the driller's house. For this reason the driller's house is positioned so that the operator can look out over drilling operations on the drill floor.

The Laboratory area with a total floor area of 2,300 sq. m. - of Chikyu is located ahead the drill floor, behind the living area. It is composed of four decks, from the top to the bottom.

Mission Objectives

The main objectives of D/V CHIKYU is to drill through the earth's crust and reach the mantle, where no one has ever explored before, to open the door for direct understanding the relationship between global-scale environmental change and mantle processes. The key is the ship's mammoth drill, which operators say is capable of boring nearly 4.5 miles into the ocean floor, far deeper than the 2,111-m hole achieved by the U.S.'s drilling vessel Joides Resolution.

In addition to gathering information regarding plate tectonics and earthquakes, Chikyu will be well equipped to carry out other missions, including: Research into life in the earth's crust and in the sub-sea floor environment; and Investigation of the record and causes of global environmental change. There are 4 integrated research areas on the vessel that house multiple research facilities for physical, scientific, and biological analysis by using the sampled core (cylindrical sediment and/or rock sample) and the drilled hole.

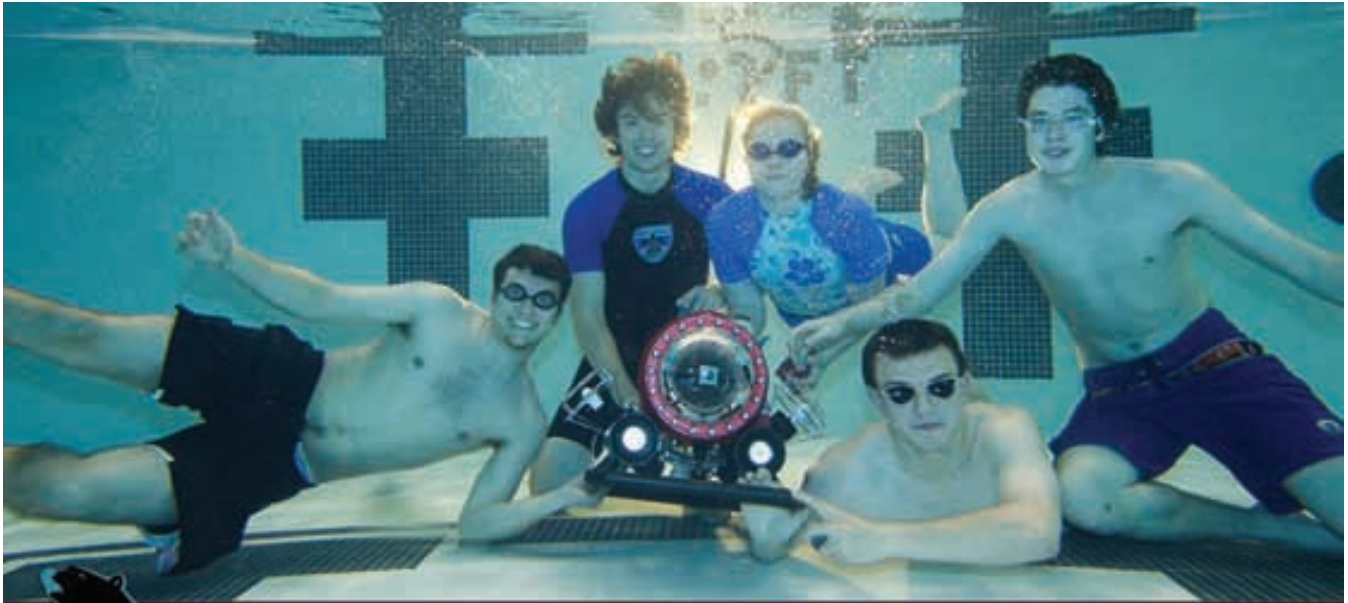


Above: The **D/V Chikyu** in sea trials (from port side near Nagasaki). (Photo credit: JAMSTEC)

Left: The **bow and helicopter deck** of the D/V Chikyu. (Photo credit: JAMSTEC)



Thrusters (propellers) on the hull
CAD computer model.
(Photo credit: JAMSTEC)



The **Polar Submersibles ROV team** gets wet during a practice session in Fairbanks, Alaska.
(Photo courtesy of Patrick Endres)

2006 MATE Student ROV Competition

Setting Sights on Ocean Observing Systems

Teams participating in the fifth annual ROV competition organized by the MATE Center and the Marine Technology Society's (MTS) ROV Committee are experiencing first-hand the scientific and technical challenges that many ocean scientists, technicians, and engineers face every day. That's because the competition is tasking middle and high school, college, and university students from Hawaii to Newfoundland with designing ROVs for the next generation of ocean observing systems.

Teaming up with the National Office for Integrated and Sustained Ocean Observations, Ocean.US, and the Ocean Research Interactive Observatory Networks (ORION) Program, the 2006 competition is highlighting ocean observing systems and the careers, organizations, and technologies associated with ocean observatories.

Nearly 200 student teams are building vehicles for underwater mission tasks that include deploying and networking instruments for power and communications and recovering equipment for maintenance and repair. The teams are also preparing for engineering presentations, where they describe their vehicle and its systems to a panel of industry professionals.

In addition to focusing on the operational aspects of ocean observatories, students are exploring the practical applications and the research questions made possible by

observing systems. The teams' findings will be presented in their technical reports and poster displays.

Background

The MATE Center and the MTS ROV Committee created the ROV competition program to expose students to science, technology, and engineering-related careers; encourage students to develop technical, teamwork, and problem solving skills; help bridge the gap between the education system and the technical workplace; and, most importantly, to provide industry with skilled individuals who can fill workforce needs.

Since 2001, MATE and the ROV Committee have worked with MTS and more than 20 other organizations to coordinate and facilitate international and regional ROV competitions. To date these competitions have involved more than 2,000 students from across North America, challenging them to apply the physics, math, electronics, and engineering skills that they are learning in the classroom to scenarios that are based on situations encountered in the workplace.

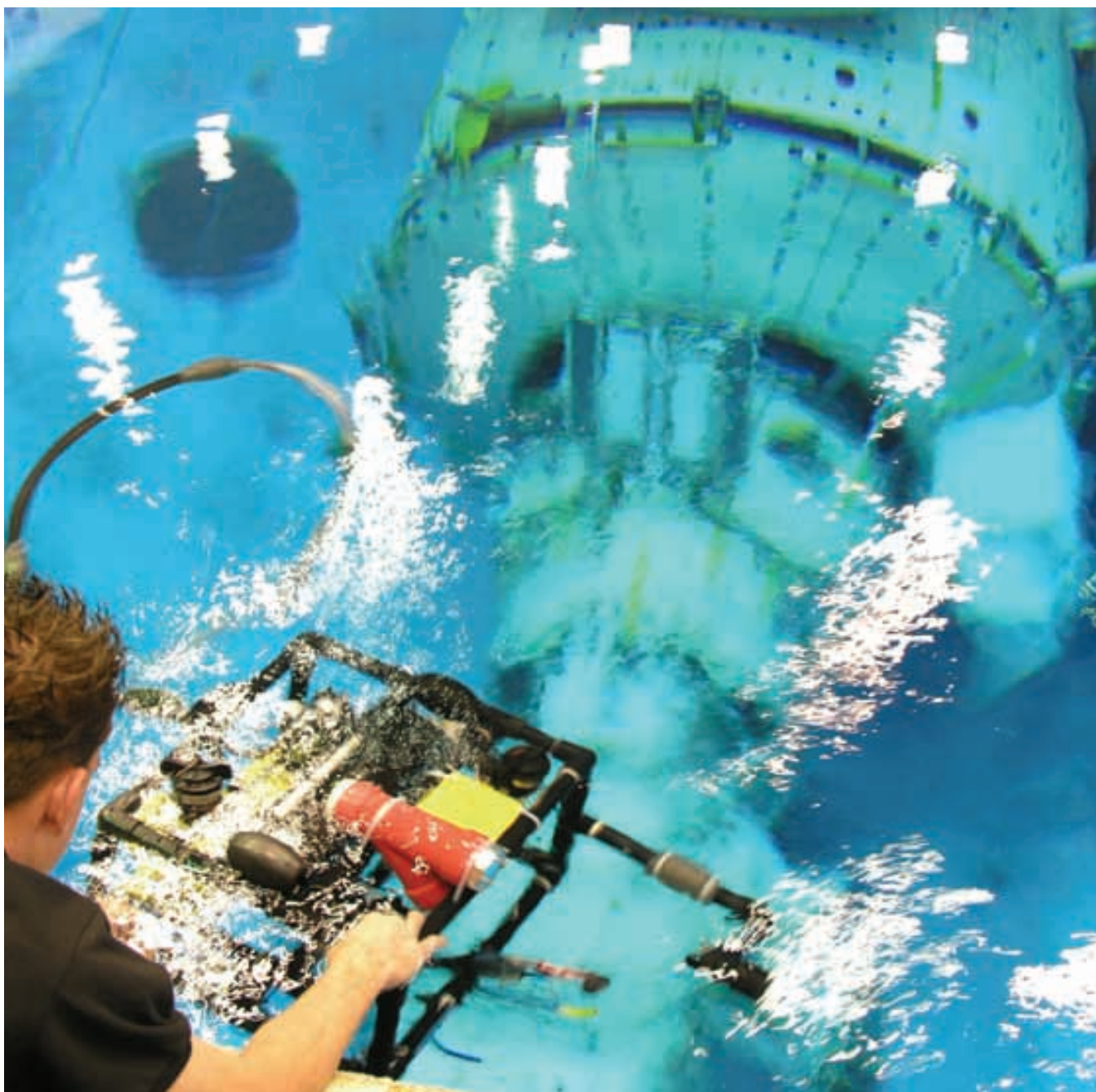
This type of hands-on, real-world learning experience is invaluable, especially in light of the crisis in science, technology, engineering, and mathematics (STEM) education at the middle and high school level. More than that, with

many electronics, machining, and other "shop" programs being phased out at schools and colleges because of funding cuts and a shortage of technical expertise, the competition's financial and technical support is critical to providing students with the opportunity to develop skills that will help them to succeed in the technical workplace and ensure America's competitiveness in a global economy.

Eyes on Oceans at NASA's NBL

The 2006 international competition will be held at the NASA Johnson Space Center's Neutral Buoyancy Lab, helping to highlight NASA's role in ocean observing from space via satellites. The event is scheduled for June 23 - 25, with the underwater missions staged in the facility's 6.2-million gallon astronaut training pool.

South Broward High School (Florida) launches its ROV above a mock-up of the International Space Station during the 2005 international competition at the NASA Johnson Space Center's Neutral Buoyancy Lab (NBL). The NBL is hosting the event again this year. (Photo courtesy of Steve Van Meter, VideoRay)





Miami Dade College (Florida) shows off the "right stuff" at the NASA Johnson Space Center's Neutral Buoyancy Lab (NBL) during the 2005 international ROV competition. The NBL is hosting the competition again this year. (Photo courtesy of Haniel Pulido Jr & Miami Dade College)

In addition to the international competition, thirteen regional contests are taking place across the U.S and Canada - on Oahu, the Big Island (Hawaii), the Pacific Northwest, Northern California, Monterey Bay, Southern California, Texas, Florida, the Southeast, the Mid-Atlantic, New England, the Great Lakes, and Newfoundland. A fourteenth regional is also taking place in Hong Kong. The winners of these events will move on to the international competition.

Wanted: Skilled employees

Increasing awareness of and access to ocean-related career opportunities, including those associated with ocean observing systems, is an overarching goal of the competition. To that end, the MATE Center and its Center for Ocean Sciences Education Excellence (COSEE)-California* partners are also organizing an "Ocean Career Expo" to take place in conjunction with the international competition. The Ocean Career Expo is designed to highlight ocean career opportunities; connect students with employers; and help employers find skilled employees.

Organizations are being invited to showcase their companies and career (job!) opportunities - and students are being encouraged to come with résumés in hand. Exhibitor fees will go directly towards supporting the competing teams, helping to offset travel and housing

costs, meals, and awards - a small investment for what has the potential to be a great return.

What's in a Name?

Exploring career opportunities within the ocean industry is not the only exciting perk for students participating in the 2006 competition. Woods Hole Oceanographic Institution (WHOI) and the National Science Foundation (NSF) are providing ROV competition teams with the exclusive opportunity to choose a name for its new hybrid ROV (HROV). While other HROVs currently exist, this vehicle, which is funded NSF, the Office of Naval Research, and the National Oceanic and Atmospheric Administration, includes many technological advancements that make it unique, such as the use of ceramics as pressure housings.

The team whose name is chosen will travel to WHOI to see the HROV up close and personal. WHOI and NSF are providing travel support, room, and board for the student team members and their instructors to visit the institution for a behind-the-scenes tour of the vehicle lead by the engineers who designed it. The visit will take place in the fall of 2006 in conjunction with the annual Oceans conference and exhibition.

2006 and Beyond

By focusing on ocean observing systems, MATE's goal is to increase awareness and understanding of the scientific, technological, and operational aspects of these systems and the impact they have on society and the economy. More than that, through the Ocean Career Expo and the involvement of programs like Ocean.US and ORION, the goal is to network working professionals and potential employers with students who may one day become the workforce that develops, deploys, operates, and maintains the technologies that are used to better understand, explore, and utilize our oceans.

To find out how you can become involved with MATE's competitions, please contact Jill Zande at (831) 646-3082 or jzande@marinetech.org or visit http://www.marinetech.org/rov_competition/index.php.

*COSEE is an NSF initiative designed to foster the involvement of ocean scientists, technicians, and engineers in ocean science education. COSEE-California partners include the MATE Center, Scripps Institution of Oceanography (SIO), the Birch Aquarium at SIO, California Sea Grant, and the Lawrence Hall of Science at the University of California Berkeley.

Q&A: Bill Kikendall & Harry Maxfield

At the recent Oceanology International 2006 exhibition in London, *Marine Technology Reporter's* Maggie L. Merrill had a chance to chat with William (Bill) Kikendall and Harry Maxfield to discuss Teledyne's recent purchases of RD Instruments and Benthos.

MTR: Bill, can you tell us a little about Teledyne and how you fit into the ocean business?

Kikendall: The Teledyne Group of companies has been in the geophysical industry since 1960, when some of our earliest designs for streamer cables, energy sources, and recording systems were put to use aboard seismic research vessels around the world for use in offshore oil and gas exploration work. Geophysical Instruments, a business unit of Teledyne Instruments, which until recently I headed up, is the leading independent supplier of hydrophones and streamer cables for marine exploration. We have facil-

ities in both the Houston, Texas, and Gloucester, England. I have moved to San Diego to head up the Teledyne RDI group.

MTR: Bill, what is your background and how did you end up running the RD Instruments business unit for Teledyne?

Kikendall: My formal education includes a BSEE from Iowa State University, as well as an MBA from the University of Dallas. Being from Iowa, I was drawn to the ocean from a young age; and through a job fair I found myself in the offshore geophysical industry. I joined Teledyne Geophysical in Houston as a design engineer back in 1983, and have been managing this business unit since 1999. I am really enjoying the focus of the RDI group and the wide-ranging customer base to whom we can offer customized services for a variety of applications.

Bill Kikendall (left) and Harry Maxfield (right) of RD Instruments display the new DVS, Doppler Volume Sampler, their new current profiler. This product was developed to support a multi-year contract from NOAA/PMEL for a next generation moored current profiler. The new low power DVS offers an advanced alternative to single point current meters.

(Photo credit: Maggie L. Merrill)



MTR: What was it about RD Instruments that caught your interest?

Kikendall: Well, Teledyne is a multi billion dollar company. We are deeply seeded in technology for a wide array of applications. Teledyne has a successful business unit in geophysical measurement devices. We have been seeking ways to expand into the marine and offshore industry, and RDI and Benthos fit the bill.

MTR: Can you be a little more specific about why RDI rose to the top?

Kikendall: We were interested in RDI's coverage in the offshore oil and gas; and research markets, and we knew they had a strong reputation within the industry. As a technology company, we were also very attracted to the versatility of their core acoustic Doppler technology, which can be applied to a wide array of applications. We also felt that they had a good group of employees; and now that I'm onboard, I'm especially impressed with their team. This is really a great group of dedicated professionals.

MTR: Harry, you have been with RDI for over 6 years as VP of Sales and Marketing. At what point did it become evident that RDI was becoming attractive to suitors?

Maxfield: RDI has grown very fast over the past five years. To be specific, we have gone from \$15 million to \$38 million in annual sales in just five years. That growth was partly due to our reorganization of the RDI team into separate product lines and business units focused around specific markets. We were able to grow the business, inspire the sales and service team, and have fun all the while. The result was a focused sales and support staff who created the best branding of ADCPs on the market.

Because of this growth, a little over a year ago, a different organization expressed interest in purchasing RDI. At that time we went through all of the due diligence, but after an extended negotiation period the deal failed to transpire. During that one-year process, Teledyne expressed interest and jumped at the chance to "look" at us once the other negotiation had terminated. It did not take Teledyne long to determine that RDI was exactly what they were looking for and the deal was completed very quickly, smooth-

ly, and with as little disruption as possible.

MTR: Now that you have been on board with RDI for this past year, what is it about the place you like the best?

Maxfield: I'm really struck by the people and technology, as well as the opportunities that lie ahead. I also really like what they're doing with utilizing the web to communicate with their staff and customers. Through the use of WebEx, an online conference service, we are able to efficiently address issues, opportunities, and training. How Teledyne RDI approaches customer communications is excellent. For instance, this week we held a defense related training workshop here in London along side this show where we invited key MOD and other approved military personnel to come learn about how our products can make their jobs easier. It's this careful targeting of specific customers groups and the building of relationships that sets RDI apart.

MTR: What are your hopes for the Teledyne, RDI, Benthos Oceans group?

Kikendall: The nice thing about how Teledyne grows is that it looks for small, well-run companies with great reputations and then we let them do what they do best. We try very hard not to upset a good thing. As we build this new marine group, we also strive for these organizations to work together, and draw upon their collective talents and technologies to create new markets and opportunities. We see a lot of synergy here, and we're tapping into that. We're already hard at work combining Teledyne RDI's ADCPs with Teledyne Benthos' Acoustic Modems.

MTR: Bill, would you mind telling me what you are looking for in a company? company?

Kikendall: We are interested in premium companies that are well run, with an excellent work force who are recognized leaders in the ocean technology field. Both RDI and now Benthos fit that bill completely.

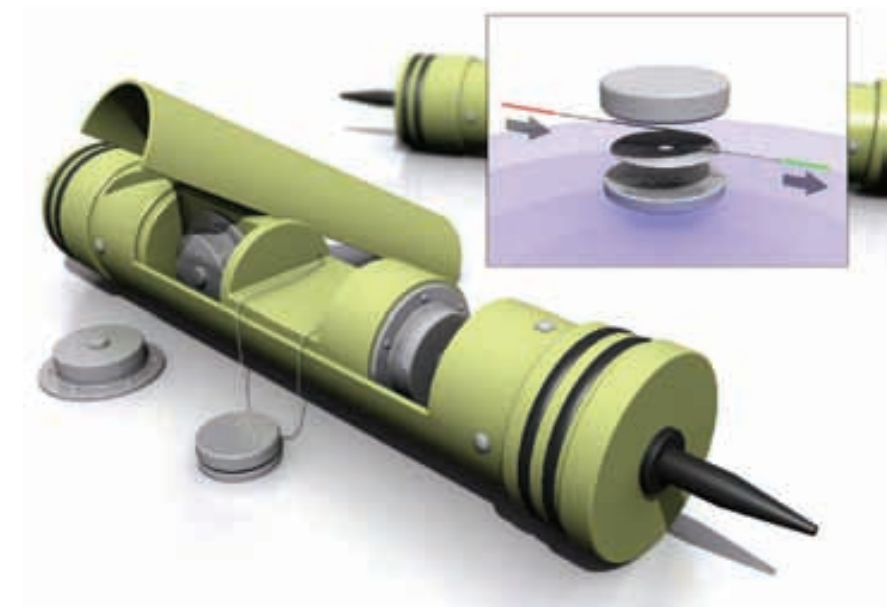
MTR: Are you looking to acquire other companies?

Kikendall: You bet we are. We welcome proposals from other companies such as RDI and Benthos in this industry. Feel free to contact our mergers and acquisitions guru, Walt Rivera.

Maximizing Oil Field Productivity

Stingray Geophysical, a new spin-out from QinetiQ, was established to develop a commercial fiber optic seismic monitoring system which can be deployed permanently on the seabed to provide high quality data on hydrocarbon reservoirs, designed to help oil companies to increase the amount of oil and gas extracted from reservoirs. Stingray Geophysical secured \$11.5 million capital from a venture capital consortium led by Energy Ventures and including Hydro Technology Ventures and Chevron Technology Ventures. It was founded by a team which blends venture building experience with oil and gas industry know-how and fiber optic expertise. QinetiQ holds a 19.9% share in Stingray Geophysical.

The company has licensed QinetiQ's OptaSeis fibre optic technology which will be commercialized to acquire time lapse (4D) seismic surveys using multicomponent (4C) sensor packages permanently deployed on the seabed to provide oil companies with high quality information about their offshore reser-



voirs. 4D-4C seismic is critical for oil companies to improve reservoir management, accelerate production and increase the total reserves that can be extracted from a reservoir. Typically, oil companies currently recover about 35% of reserves in place. Emerging technologies and techniques such as 4D-4C are expected to help push this to 50%, generating significant additional value and helping to maintain hydrocarbon supply around the

world. However, current 4D-4C systems, while providing highly valuable data, are expensive and can be unreliable, primarily because of the problems associated with installing electrical components in the sea. It is designed to allow the development of a smaller, less expensive and more reliable permanent seabed system that requires no underwater electronics.

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Quest WROV Completes Working Dive at Over 9,000 ft.

Using its Quest WROV, Canyon Offshore has recorded a working dive to 9,024 fsw in Lloyd Ridge block 399 in the Eastern Gulf of Mexico, while operating under contract to an operator. The Quest, an electric work class ROV (WROV) was deployed to perform pre-lay route surveys for 8-inch and 10-inch JVC flow lines, and to conduct array integrity checks. The dive, conducted in depths of 9,000 ft. and deeper, lasted 30 hours, during which time the vehicle performed all tasks efficiently and without interruption. The Quest is a new generation ROV depth rated to 10,000 fsw (2,050 meters) and adaptable for depths to 19,500 ft. (6,000 m).

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Rapp Mareq Wins Contract for its Two Largest Winches Ever

Rapp Mareq LLC marked a historic achievement with the signing of a contract for the two largest winches in company history. Rapp's MHW-200 design for the larger winch handles 11,000 ft. of three-in. wire at nearly 300 tons line pull first layer. The second winch, Rapp's MHW-140 design accommodates 2.375-in. wire at nearly 200 tons line pull first layer. Both DNV-certified winches will be utilized in deep-sea ROV support and other operations, and will be delivered this year.

Rapp also won two other contracts with another international deepwater firm late last year. A first order in

Houston was closely followed by another deepwater/ROV-related order with the Houston firm's Norwegian counterpart office.

Rapp winches for the first project are five-speed and designed to make pinpoint stops, with full loads, at great working depths. Rapp's own multi-motor gearboxes provide powering, so that if one motor fails, remaining ones can still operate the winch, albeit at a lower capacity. Rapp's module-based design allows for substitution of drums, drive units, and braking assemblies, allowing for adaptation to different applications—instead of purchase or rental of a dif-



ferent winch. Rapp's PTS Pentagon system, which is proven on VT Halter's NOAA FRV project, is also to be installed, and Rapp is providing enclosed Hydraulic Power Units (HPUs) for the winches.

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Compact ROV for Drill Support in Heavy Seas



Italy's DNT Offshore took delivery of a specially designed compact work ROV that can perform a wide range of drill support tasks in heavy seas, including AX ring removal. The Ravenna-based company collaborated with Seeye, to expand the capability of the Seeye Cougar into performing a greater range of tasks, and be safe for operating in sea state six.

The solution came from an idea of DNT's to 'piggy-back' interchangeable tooling skids by mounting one on top of the other. In particular they wanted the capability to perform manipulative and bulls eye cleaning

tasks while having their newly designed AX ring-removal tool skid attached. This is the third Cougar delivered to the independent contractor, DNT Offshore whose first contract for the system is off West Africa. DNT also operate two Seeye Falcon systems and have a third on order.

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BP Selects Telenor for Global Communications

Telenor Satellite Services signed a three-year communications agreement with British Petroleum (BP) for global broadband services over satellite. The two-part agreement, including Telenor land-based and Sealink at-sea broadband communications services, is one of the largest of its kind in terms of numbers of sites, vessels and systems included. The contract establishes the terms and conditions for upgrading the communications systems of ships and production facilities, as determined by BP, and has the potential of providing cost-efficient and highly reliable very small

aperture terminal (VSAT) equipment and services to BP's entire fleet, which will surpass 80 deep sea vessels by the end of 2006, and several offshore rigs and land-based production facilities. Approximately 20 vessels are slated to have Telenor's Sealink services by the end of 2006.

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PetroCom Signs Two-Year Contract with Cal Dive

PetroCom signed a two-year agreement to provide VSAT voice and data communication services to Cal Dive International, to manage Cal Dive's rapidly changing communication needs across its fleet of 28 vessels. Ken Wright, COO for PetroCom, said, "instead of introducing an off-the-shelf solution, we carefully specified and selected the best equipment and systems that allow customers unprecedented bandwidth management capabilities and committed information rates.

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Kikendall New GM at Teledyne RD Instruments

Teledyne RD Instruments appointed William Kikendall as General Manager. (See related story on page 45). Kikendall has served as GM of Teledyne Geophysical Instruments (Houston, TX) for the past six years, and will now oversee operations at both Teledyne Technologies' facilities. His credentials include a BSEE from Iowa State University, as well as an MBA from the University of Dallas, and 25 years of industry experience. He began his career at Texas Instruments, before joining Teledyne as a design engineer in 1983. Over the past 22 years, he has progressed through the ranks of Teledyne to reach his current position.

"This is an exciting time for Teledyne Technologies and our new marine organizations," said Kikendall. "We are extremely pleased that companies of the caliber of RD Instruments and Benthos have chosen to join our vision of creating a consortium of world-class marine instru-

mentation companies. Together, we will strive to leverage our talents and resources to provide our customers with an unparalleled level of innovation, service and support to meet their growing and changing needs."

SeaEye Directors Take Control

Directors of Seaeye Marine, led by chief executive Chris Tarmey, have taken full control of the company after buying the remaining 40 percent shareholding held by the private equity and venture capital group 3i Group PLC.

Since acquiring the company in 2000, Tarmey and his management team have expanded the company into world markets and new business sectors, with sales this year alone growing by over 50 percent and profits doubling since the acquisition.

Recently Seaeye broke into the Chinese oil and gas market and expanded further into the U.S. market. The company's remotely operated vehicles (ROVs) are used in oil and

gas fields worldwide, and also by the British Ministry of Defence, the Russian, French, Italian and U.S. Navies for security, diver support and salvage operations. In addition they are sold to marine science institutions, aquaculture operations and the emergency services.

Canyon Offshore Names Edmonstone GM

Canyon Offshore appointed Ian Edmonstone to the position of General Manager, Operations. Operating out of Canyon's Houston headquarters, Edmonstone will be responsible for overseeing the company's operations activity throughout the Americas. Edmonstone brings with him extensive international offshore and subsea experience. Originally from Scotland, he transferred to the United States in 1997, and was most recently Integrated Remote Technologies (IRT) General Manager with Subsea 7.

He joined Canyon Offshore in December 2005.

Schilling Robotics Adds Another UHD to GOM

Schilling Robotics will deliver a second UHD ultra-heavy-duty ROV to Phoenix International. The UHD 06, will feature the same 200-shp power (generating 1.4 metric tones of thrust) and 3,500-m depth rating as the UHD sold to Phoenix in late 2005. The system will include Schilling's XE extended TMS system with 600 m of tether. The UHD 06 ROV, which will be delivered to the Phoenix Subsea Projects Group in Houston, Texas in July 2006, will join the Phoenix UHD 05 system for operations in the Gulf of Mexico. The two systems will be fully supported by Schilling Robotics' regional office in Houston.



AXYS' New Japan Agent

ATI confirmed the appointment of Nippon Kaiyo Co. Ltd. as its Agent in Japan. Headquartered in Tokyo, Nippon Kaiyo is a supplier of oceanographic and hydrographic equipment and services. According to Nippon Kaiyo, ATI was selected as a supplier based on its experience in providing reliable and robust oceanographic and meteorological data buoys. "ATI sees tremendous opportunities in Japan, particularly in the directional wave buoy market," said Harry Weiler, ATI President & CEO. "We are proud to be represented by Nippon Kaiyo, who have been involved in the Japanese oceanographic industry for almost fifty years."

C&C's AUV Transits to Brazil

C&C Technologies' C-Surveyor I AUV, aboard the R/V Rig Supporter, began a 13-day transit from the coast of Angola to Rio de Janeiro, Brazil on March 11, 2006. Over the last six months, the C-Surveyor I completed 10,700 km of survey lines for clients in Africa. Upon completing its transit to Brazil, it was to commence work on several deepwater projects.

Kongsberg Underwater Tech Wins Navy Contract

Kongsberg Maritime's USA subsidiary, Kongsberg Underwater Technology Inc., received the first delivery order of \$2.13 million for integrated Multibeam Sonar Systems for the Navy. These systems include deep water multibeam echo sounders,

multi-frequency single beam echo sounders, deep water sub-bottom profilers and acoustic doppler current profilers. The systems are for permanent installation aboard the six T-AGS 60 class survey vessels operated by the US Naval Oceanographic Office (NAVOCEANO). The contract is for performance over a five-year period and if all options are exercised will continue until February 2011 with an estimated total value of \$29.5 million. The contract includes design, manufacture, test, integration, installation and overall support of the new systems. The integrated equipment package selected by the Navy includes four sonar systems: the EM 120 (1° x 1°) - Deep-water Multibeam echo Sounder for mapping to full ocean depth, the EA 600 (200, 38, 12 kHz) - Multi-frequency Single Beam echo sounder for surveying at all depths, the SBP 120 (3° x 3°) - Deep-water Sub-Bottom Profiler for high-resolution sub-bottom data to full ocean depth, and the ADCP (supplied from Teledyne RD Instruments) - Multi-frequency Doppler Current Profiler for shallow and deep current profiling.

Noordhoek ROV Fleet to Expand

Noordhoek took delivery of a light workclass ROV (WROV) to complement the existing fleet of Inspection Class ROV's. The new Seaeye Panther Plus is designed for subsea support services, including survey, inspection and construction support services. The features of the vehicle include: Two hydraulic manipulators

(6 function and 4 function), 10 thruster configuration for optimum maneuverability, extended payload capacity (105 kg), TMS system with 200 meter excursion option, operational down to 1,000 m MSW, Launch & Recovery system (LARS), multiple channel communication to surface, full range of camera's & lighting, and standard sensors pack.

Tetra Tech Acquires Epic Divers & Marine

Epic Divers & Marine has been acquired by Tetra Technologies, Inc. for \$50 million in cash. Epic will remain headquartered in Harvey, La., and its management team, staff, divers and marine personnel will remain with the newly acquired dive company. Julie Rodriguez will serve as President of the newly acquired company. Epic will continue to do business as Epic Divers & Marine. Epic Divers was founded in Harvey, LA in 1972, by L. J. "Pie" Rivet. His daughter, Julie Rodriguez, began working for the company in 1976, and purchased it from her father in 1991. Six years later she launched its marine division, Epic Marine, LLC, which later became established as Epic Divers & Marine. Tetra is a \$531 million oil and gas services company whose products and services enhance oil and gas production upon well completion and facilitate well abandonment and platform decommissioning.

Tyco Completes Cable Job

Tyco Telecommunications completed both the St. Lucia and Barbados

landings of the Antilles Crossing Cable System. Antilles Crossing is a 940 km undersea fiber optic cable system linking St. Lucia, Barbados, and St. Croix. Antilles Crossing will provide communications to the rest of the world. Both the Barbados and St. Lucia landings are being conducted by the Cable Ship Teneo. After the shore-end landing in Barbados is complete, the Teneo will head north to complete the shore-end segment in St. Croix followed by the final splice. Installation of the transmission equipment at the Viggie Beach, St. Lucia cable station, as well as at the Needhams Point, Barbados and Hamms Bay, St. Croix cable stations, is complete. Tyco Telecommunications expects to have the system up and running - connecting Barbados, St. Lucia, and St. Croix to the rest of the world, by June.

Scripps Research Oceanographer Receives Munk Award

Peter Worcester, a research oceanographer at Scripps Institution of Oceanography at the University of California, San Diego, has been selected as winner of the Walter Munk Award for Distinguished Research in Oceanography Related to Sound and the Sea.

The award is granted jointly by The Oceanography Society, the Office of Naval Research (ONR) and the Office of the Oceanographer of the Navy. Worcester is being recognized for his "early and continuing contributions to the development of acoustical oceanography and to-

graphic inverse methods for acoustic measurement of ocean processes, for tireless service aimed at developing a responsible permitting structure for the use of sound in the sea for scientific purposes and for leadership in the U.S. ocean acoustics community."

Teledyne RDI Wins NDBC Contract

Teledyne RD Instruments has been awarded a contract from the National Data Buoy Center (NDBC) to supply 27 Workhorse Acoustic Doppler Current Profilers (ADCPs) to support numerous NDBC platforms. The 27 Workhorse ADCPs will be delivered in four product configurations ranging from 75 to 1200 kHz, which will allow for profiling in water depths ranging from 5 to 400 m. The ADCPs will be deployed for one-year durations, mounted on buoys, C-MAN stations and seafloor platforms. The units will provide a current profile ensemble on an hourly basis, delivering near real-time accurate current data for a variety of NDBC programs.

Teledyne RD Instrument's Workhorse ADCPs measure current flow and direction at up to 128 vertical data points (bins) in the water column, providing a clear illustration of the current dynamics over an extended range. The Workhorse ADCPs incorporate patented Broadband technology that allows the instrument to efficiently collect an increased number of data ensembles over an extended period of time. The Workhorse ADCPs also incorporate a

unique four-beam configuration that provides data QA/QC, thus ensuring the integrity of collected data.

ACMA Concludes NOAA Job

Alan C. McClure Associates (ACMA) has concluded its assignment of assisting in the design and development of a new Small Waterplane Area Twin Hull (SWATH) coastal mapping vessel (CMV) for the National Oceanic and Atmospheric Administration (NOAA).

"The vessel's primary mission will be to conduct full seafloor mapping of U.S. coastal areas," said Doug Ottens, principal marine engineer with ACMA. "The vessel's unique design and capabilities will enable it to monitor discreet changes in coastal area floors which, in turn, will allow for enhanced monitoring by the government and supplement to national security efforts."

ACMA's scope of work included intact and damage stability to CFR subchapter 'U' requirements. Marine engineering activities included powering and maneuvering predictions, as well as propeller design, shaft alignment calculations and general piping systems and electrical load analysis. Structural FEA models were developed to determine the vessel's global strength, verify minimum scantlings and calculate lightship weight. ACMA also planned, supervised and provided customer oversight during model tank testing to verify the vessels final performance characteristics.

New Software for Large-Volume Scanning

FARO Technologies, Inc., released FARO Scene 3.0 software for its Laser Scanner LS product. The FARO Laser Scanner LS is designed to empower users to digitize massive spaces into 3-D, action-ready data. Ideal for large-volume modeling, factory planning/redesign, quality control and forensics, it scans 120,000 points per second with 3mm accuracy. The result is an image so detailed that it looks like a black-and-white photo, but in three dimensions that, thanks to FARO Scene 3.0, one can use to instantly measure the distance between points, move in 3-D space and create CAD models for practically any application.

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Schilling Robotics Adds Horsepower to UHD ROV



Schilling Robotics is upgrading its ultraheavy-duty, hydraulic UHD 05 ROV, ordered by Phoenix International, from 150 to 200 shp. Upgrading from 150 to 200 shp increases the UHD's thrust capability by almost 25 percent, adding to the Phoenix fleet's ability to perform

demanding, deepwater construction tasks while handling the strong Gulf of Mexico Loop Current. Frank Sayle, general manager of the Phoenix International Subsea Projects Group, says that the upgraded ROV will be a valuable asset. "Because there is a 'new frontier' of demanding, deepwater projects in the Gulf of Mexico, our fleet needs the most capable ROVs that we can buy. This power upgrade for the UHD, along with the vehicle's 3,500-m depth rating, will further equip us to handle these demanding projects."

The UHD 05 ROV, which is rated to 3,500 meters, will be delivered to Phoenix's Subsea Projects Group in Houston, Texas in June 2006, and will be the first UHD system to operate in the Gulf of Mexico.

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AML Product Editor from CARIS

CARIS released the Additional Military Layer (AML) Product Editor, an addition to the CARIS Hydrographic Production Database (HPD) product suite. AML Product Editor expands upon the existing HPD product suite, which already includes the HPD Source Editor, S-57 ENC Product Editor and Paper Chart Editor. AML Product Editor is designed to manage and produce S-57 AML's compliant with the six vector NATO AML v2.0 specifications: Contour Line Bathymetry (CLB), Environment, Seabed and Beach (ESB), Maritime Foundation and Facilities (MFF), Routes, Areas and

Limits (RAL), Large Bottom Objects (LBO) and Small Bottom Objects (SBO). Functionality includes the ability to import from many common GIS data formats; to view raster images; and to connect to external databases for importing valuable data, such as mine contact or wreck information.

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TITAN Electronics Upgrade



This upgrade relocates slave arm electronics from an external enclosure to inside the manipulator arm. The resulting reduction of electrical connections is designed to increase the system's ability to withstand shock and to decrease system weight. Indicator lights on the slave electronics board and on the manipulator connecting cable are designed for faster manipulator arm diagnostics.

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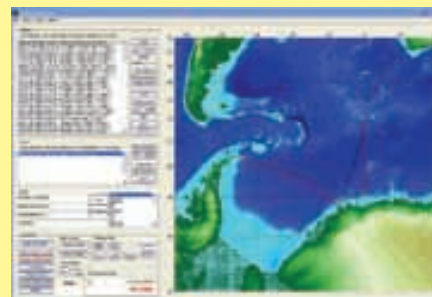
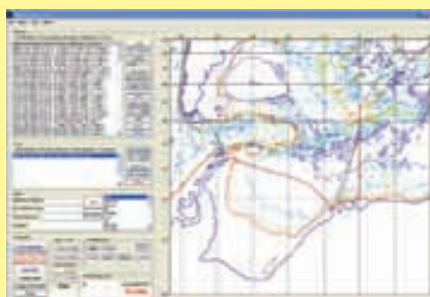
Global Marine Launches GeoCable V 5.2

Global Marine Systems Limited launched version 5.2 of its GeoCable marine engineering software package.

Werum Software & Systems

Werum Software & Systems, Germany, introduced Perplex, a computer-aided system for dynamic planning and execution of scientific maritime expeditions. Perplex, which stands for 'Program for Expedition Route, Planning and Execution' is designed to substantially simplify the complex and time consuming process of planning with research vessels. It aims to make cruise planning easier, faster, and more comfortable. Perplex contains routines to set up the cruise track with waypoints and stations which can be rearranged in any desired order. Stations can be inserted or modified and ship speed between waypoints may be prescribed. The software will automatically update the cruise schedule. In addition, Perplex provides menus to edit the cruise schedule and merge the calculated schedule with the real date and time. At any stage the cruise plan is presented as a list and plotted on a map.

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GeoCable assists companies with the management of cable route planning, installation and maintenance operations. Comprising more than 1.9 million kmm of cable route data and 3,000 hydrographic charts, version 5.2 is designed to enable customers to benefit from bespoke functionality to reflect the needs of their business, such as viewing information based upon a specific geographical focus, seismic activity or dedicated information and statistical analysis on a particular type of subsea cable.

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MacArtney Announces DIDSON Milestone

MacArtney A/S said that they have both a Standard and a Diver Held DIDSON available for test, demonstrations and rental. So far MacArtney A/S are demonstrating the systems to military clients, com-

mercial inspection companies, police authorities and fisheries research institutes, to name a few.

DIDSON sets a new standard for imaging sonars and high-definition sonars. It gives near video quality images for inspection and identification of objects underwater. It is a surrogate for optical systems in turbid water. The Standard DIDSON operates at two frequencies (1.8 MHz and 1.1 MHz) and provides images of objects from one meter to over 30 meters in range. DIDSON LR operates at 0.70 MHz and 1.2 MHz and can image objects out to 80 meters. DIDSON is small and requires only 30 watts. MacArtney's current models operate at depths to 300 m.

The Diver Held DIDSON is a self-contained unit with batteries and mask-mounted display. It allows divers to operate in zero-visibility conditions. The Diver Held DIDSON was developed to inspect hulls

and berths in turbid water where divers otherwise would resort to slow, tactile examinations.

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Real-time Mosaic Interface for Sonar

Chesapeake Technology, Inc. (CTI) announced its first sale of its new SonarWiz.MAP interface for the Marine Sonic Technology Limited (MSTL) SeaScan PC sonar. SonarWiz.MAP is a real-time time data acquisition, real-time mosaic and post-processing system now in use by commercial, government and academic institutions. This newest interface allows MSTL sonar owners to record XTF format data files of any length while producing sidescan mosaics in both real-time and post-processing.

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Sonar Systems & Seafloor Mapping

Survey Exchange a Positive Experience

The British Royal Navy has the capability to speed up production of oceanographic charts, following an exchange program visit by an officer from the U.S. Navy's Fleet Survey Team (FST) at Stennis Space Center in Mississippi. In January and February, FST's Lt. Cmdr. Deborah Mabey traveled the Mediterranean Sea aboard HMS Roebuck, a Royal Navy survey ship. Mabey sailed aboard Roebuck from Malta to Monaco and Gibraltar, providing focused training and assisting Royal Navy surveyors in the execution of hydrographic surveys. She aided in hydrographic data collection both ashore and aboard the ship's survey motorboat, and worked with her British counterparts in multibeam data collection and processing, tidal data collection, and the setup and testing of a new field processing system. In

addition, Mabey wrote several standard operating procedures the British can use to save time and increase efficiency in their data collection and processing.

Until now, British survey ships have gathered data at sea and only produced field bathymetric sheets while still in theater. Conversely, FST and survey ships in the Naval Oceanographic Office (NAVOCEANO) fleet are able to produce field charts while still on the scene of the survey. Fleet Survey Team is a subordinate command to NAVOCEANO, which falls under Commander, Naval Meteorology and Oceanography Command. Both are also located at Stennis. Along with FST, they support the warfighter with relevant oceanographic data applied in areas including expeditionary forces, mine warfare and anti-submarine warfare.

Atlas Hydrographic Echosounders



Atlas Hydrographic extended its Atlas Deso range of survey echosounders with the introduction of a new advanced three-channel system featuring a networked Windows interface with associated software, Atlas Deso 35. Available as a compact rack-mounted assembly for ease of installation or one that can be operated direct from a PC, the system provides full-size split-screen LCD dis-

plays of port and starboard measurements with internal data storage. Alternatively the Atlas Deso 35 can produce hard copy data via a high-resolution thermal paper recorder; both facilities are supplied as flexible modular enclosures complete with swivel-mounting hardware. Additionally, Atlas Deso 35 very low frequency operation down to 3 kHz with a 3 kW power output enables enhanced sub-bottom penetration over depths down to 6,000m.

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C-MAX Deck Units

C-MAX introduces two new deck units for its CM2 Sidescan Sonar System. The Sonar Transceiver (STR), with a laptop linked to its USB interface, provides a compact and economical acquisition capability. As an alternative, the C-Case all-

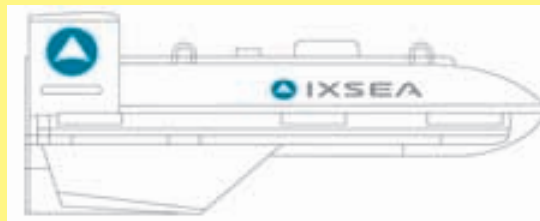


in-one weatherproof deck unit has been updated with a higher resolution display and the ability to run MaxView or third-party acquisition and mosaicing software. The C-Case has a revised splash proof keypad complemented by a Glidepoint pad. MaxView has been completely revised with a new user interface and new plotter and survey planning facilities. Both the STR and the C-Case versions of the CM2 come with a choice of robust dual-frequency

Sonar Systems & Seafloor Mapping

IXSEA Launches COTS SAS

IXSEA launched SHADOWS, its new Synthetic Aperture Sonar (SAS), at Oi06 in London. The company reports that SHADOWS is the first commercially available off-the-shelf (COTS) Synthetic Aperture Sonar (SAS), is a quick and efficient high-performance sonar system with synthetic aperture processing, which is designed to offer unparalleled image quality in real-time with no gap at nadir boosting productivity. According to IXSEA, SHADOWS doubles the resolution while reducing survey costs by one-third. It is positioned as the solution for all sidescan survey applications: cable route, offshore mining, pre-dredging survey, small objects search on the seabed and shipwreck search and salvage. Moreover SHADOWS is compatible with GAPS and POSIDONIA, IXSEA's USBL positioning systems.

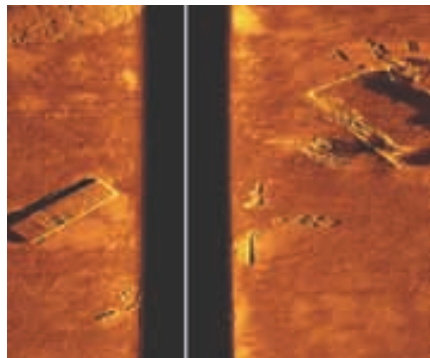


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digital towfish, either 325/100kHz or 780/325kHz.

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EdgeTech Side Scan System Options



EdgeTech will introduce a new dual simultaneous 300/600 kHz option for its existing 4200-FS Dual Mode Side Scan System. The current 4200-FS System operates dual simultaneous 120/410 kHz frequencies. The new high frequency option aims to provide the user with superior imagery at ranges of at least 230 m/side on the low frequency and 100 m/side on the

high frequency. In High Definition Mode (HDM) the system operates conventional dual simultaneous 300/600 kHz frequencies. In High Speed Mode (HSM) the system operates in MultiPulse mode on either selected frequency at speeds of up to 10 knots while meeting IHO and NOAA specifications for surveys.

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General Acoustics Products

General Acoustics GmbH specializes in acoustic measuring devices and develops, produces and sells its own devices from its headquarters in Kiel, Germany, and through their network of representatives around the world. The products include Water Level and Wave measuring Systems as well as special echo sounders for the



hydrographical and geological operations.

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GeoAcoustics Sonar

GeoAcoustics' new 24-bit digital side scan sonar is designed to provide full 24-bit data, digitized directly at the transducers, thus providing surveyors with high quality resolution. With sonar frequencies based upon the combination of 100kHz and 400kHz, this sonar is designed to provide a high level of image clarity. The system can also be mobilized as a modular sonar on ROVs and AUVs.

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Innomar Technologie Profiler

Innomar Technologie GmbH presents its new system variant SES-2000 deep, a portable parametric sub-bottom profiler for deep-sea operations is rated for water depths of 5 to 6,000 m. It has a very narrow sound beam of $\pm 1.5^\circ$ for low frequencies between

Sonar Systems & Seafloor Mapping

2 and 7kHz with a transducer of 0.8m -0.75m. A very high layer resolution in the decimeter range is possible due to the transmission of short pulses without the known ringing effect of linear sub-bottom profilers.



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Innovative Technology Projects

The Acoustic Systems Trainer for SONAR has been designed and manufactured for underwater studies.

The system is comprised of a control Console, containing the CW and Pulse gating electronics, and the hardware/software-processing (Sonar Signal Analyzer - SSA) interface with the computer. The transparent Acoustic Tank is constructed from acrylic material, measuring 1.2 m in length, 600 mm deep, and 600 mm wide, with a capacity for 400 liters of water.

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New Resource for Marine GIS and Seabed Mapping

The new Davey Jones' Locker Treasure Chest of Links, accessible at either www.marinecoastalgis.net or www.seaflormapping.net provides scores of marine/coastal GIS and seafloor mapping links to assist researchers, educators, and students in finding helpful information and data. The site is maintained by the Davey Jones Locker research laboratory, Department of Geosciences, Oregon State University.

Kongsberg Maritime

Kongsberg Maritime will launch the EM 302, a new version of the EM 300 multibeam echo sounder, a product for marine geology mapping of the seabed for depths to 5000 - 6000 m. The new product will include all earlier features, and will use chirp technology to obtain extended range capability. It will also offer high-density signal processing and increased number of soundings for improved resolution. Also from Kongsberg Maritime is the SBP 300 multibeam sediment profiler, designed for integration with EM 302.

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E-sea Sound MP 35

MARIMATECH has manufactured Hydrographic Survey Equipment for more than a decade. Its E-sea Sound MP 35, used for shallow water surveys as well as full ocean dept, is able to perform sup-bottom penetration, multiple layer tracking and advanced heave, roll and pitch correction. Mud layer detection is yet another feature. The E-sea Sound MP 35 has now been equipped with a flash drive memory.

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Sonavision Launches RoxAnn GD

Sonavision launched the RoxAnn GD-A Seabed Classification system,



the successor to the RoxAnn System. RoxAnn was developed more than 20 years ago as an aid to the commercial fisherman, as it automatically linked the seabed type information available from an echosounder with the position of the vessel. The RoxAnn GD-A is a radical re-design and contains a number of improvements. The most noticeable difference is the size of the system. At 200 x 110 x 60 mm and 600g, it is considerably smaller and lighter than the older version. RoxAnn GD-A is also small on power consumption and can be powered using the USB connection from the computer. A 5VDC laptop style supply is also included.

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Sonar from GeoAcoustics

GeoAcoustics' new 24 bit digital side scan sonar provides full 24 bit data, digitized directly at the transducers, thus providing surveyors with high quality resolution. With sonar frequencies based upon the combination of 100kHz and 400kHz, this sonar is designed to provide a high level of image clarity. The system can also be mobilized as a modular sonar on ROVs and AUVs.

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Sonar Systems & Seafloor Mapping

U.S. Geological Survey Publishes Report

usSEABED: Atlantic Coast Offshore Surficial Sediment Data Release, 2005, Version 1.0, U.S. Geological Survey Data Series 118

This data release publication provides an improved and robust integrated database (usSEABED) of seabed characteristics for the Atlantic continental margin of the United States that fulfills a need for information about seabed characteristics for use by geologists, ecologists, biologists, resource managers, and national defense investigators. usSEABED provides a digital, integrated database of existing physical data and information from the seafloor, including textural, statistical, geochemical, geophysical, and compositional information. It uses the dbSEABED data mining and processing software to extend the coverage of information in areas where data coverage is descriptive as well as quantitative. The data coverage includes the U.S. Atlantic coast from northern Maine to Key West, Florida and extends seaward across the continental shelf and slope. More than 150 different data sources containing over 200,000 data points are currently contained in usSEABED for the Atlantic.

DS-118 is available on the web at: <http://pubs.usgs.gov/ds/2005/118/>

Commercial 3D Sonar Put to the Test

Coda Octopus and the University of South Florida's Center for Ocean Technology (COT) recently held a joint demonstration in Tampa Bay of the COT developed Mobile Inspection Package (MIP), which features the Coda Echoscope, touted as the world's first commercially available real-time 3D sonar.

With military and homeland security observers on hand, the Coda Echoscope — on board a small research vessel — successfully located a variety of mine-like objects placed on harbor walls. Images and data were transmitted via the Internet to a remote command and control center where they could be shared and rapidly analyzed by personnel.

"We are extremely proud that we have been able to reach the commercial stage with this revolutionary technology, making it available as a tool in the worldwide effort to fight potential

terrorist attacks on our vulnerable ports and harbors," said Jason Reid, CEO of Coda Octopus.

Larry Langebrake, COT director, said, "The Coda Octopus Echoscope is indeed a powerful instrument. Its unique ability to provide crisp, clear 3D images that are easily interpreted by the untrained eye make it ideal for underwater security."

Coda Octopus has delivered four of the first 10 Echoscope units that are on order around the world, and it is building up its manufacturing capability to deliver many more in the months ahead. Tests by the U.S. Navy are scheduled and the firm expects steady growth in new orders as testing and utilization of the equipment continues.

Working with Coda Octopus, the Center for Ocean Technology has successfully integrated a number of complementary sensors, including

the Echoscope 3D real time sonar and a survey-quality navigation system, refining the approach to underwater inspection in the port and harbor environment.

The result is a readily understandable 3D data product where the exact location of every target is precisely known and available in real time, which allows for intuitive operator analysis. The data from the MIP is visible from the support vessel and is also simultaneously sent back in real time to a command and control center. This allows the MIP system to integrate well with other existing security systems.

Founded in 1994 as Coda Technologies, Coda Octopus is a leading developer of underwater technologies for imaging, mapping, defense and survey applications.

By AUVSI Staff

Environmental Monitoring & Remote Sensing

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Email: bmccclure@biosonicsinc.com
URL: <http://www.biosonicsinc.com>
Product: BioSonics, Inc. is a consulting, engineering and manufacturing firm that specializes in applying hydroacoustics to monitor and assess marine and aquatic biological resources and habitat characteristics. Advanced digital SONAR (hydroacoustics) is capable of unobtrusive, rapid, detailed, quantifiable measurement of animal and plant abundance as well as classification of bottom substrate. Autonomous systems can operate for months at a time and generate periodic reports for transmission back to the user. Underwater assessment solutions since 1978.

Geonav Marine Systems

Russell Morton
President
11211 Katy Freeway, Suite 430
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Phone: 713 722 9697
Email: morton@geonav.com
URL: www.geonav.com
Product: marine electronics interface systems, VDR and sVDR. Custom gyro solutions. Navigation and positioning software for off-shore industry.

Marin Mätteknik AB

Anders Höfnell
Marketing Manager
Nya Varvet, Building 84
V.Frölanda, SE42671 Sweden
Phone: +4631695280
Fax: +4631695290
Email: anders.h@mmtab.se
URL: www.mmtab.se
Product: MMT maps shallow, littoral and off-shore areas for bathymetrical, geophysical and geotechnical surveys. Our information products enable nautical charts producing, subsea route and foundations engineering and marine environmental assessments and exploration.

Mariscope Chilena

Cristina Rodriguez
PhD Science
C/Egaña 425
Puerto Montt, Chile
Phone: + 56 65 434324
Fax: + 56 65 282896
Email: info@mariscope.cl
URL: www.mariscope.cl

Product: Oceanography ROV manufacturing and services commercial diving training and research services hyperbaric services

NYC Dept. of Environmental Protection

Robert Ranheim
Section Chief
Marine Sciences Section New Admin
Room 213 7 Wards Island
Wards Island, NY 10035-6096
Phone: 212-860-9378
Fax: 212-860-9570
Email: branheim@dep.nyc.gov
Product: The Harbor Survey Program is NYC's ambient water quality monitoring program that has been in existence since 1909. The Program monitors 50 stations within NY Harbor on a weekly basis during the Summer and a monthly basis in the Winter.

OceanNet Consultoría y Sistemas Ambientales

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Elche, 03296 Spain
Phone: +34 635 249 903
Fax: +34 962 853 881
Email: direccion@ocean-net.info
URL: www.ocean-net.info
Product: Oceanographic studies (current, waves), bathymetries, development of environmental monitoring systems, sale of oceanographic instruments

OceanWaveS GmbH

Munstermannskamp 1
Lüneburg, 21335 Germany
Phone: +49 - 4131 - 78 98 318
Fax: +49 - 4131 - 78 98 319
Email: info@oceanwaves.de
Product: Wave Monitoring System WaMoS II: Wave measurement with any type of X-band radar in real time. The system detects the spectral sea state parameters like significant wave height, wave period, direction, and length as well as currents. It works automatically and unattended from moving vessels, off-shore platforms or at coastal sites.

The Oceanic Institute

Ph.D Anne Gasc
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Phone: 808-259-3154
Fax: 808-259-5971
Email: agasc@oceanicinstitute.org
URL: www.oceanicinstitute.org
Product: aquaculture research - analytical laboratory (water quality) Education (Hawaii Pacific University)

Ocean Ecology

Dr. Barb Faggetter
1662 Parmenter St.
Prince Rupert, V8J 4R3 Canada
Phone: 250-622-2501
Email: blueseas@oceanecology.ca
URL: www.oceanecology.ca
Product: Based out of Prince Rupert, Ocean

Ecology works on the west coast of British Columbia, specializing in oceanographic research, marine environmental assessment, sea floor bathymetric charting, and marine surveys. We combine in-depth knowledge of the west coast marine environment, scientific expertise in areas of biology and oceanography, and cutting-edge ocean charting and monitoring equipment to provide our clients with detailed information on marine environmental issues. With a broad range of skills and experience in the field, we can provide in-house solutions to difficult data collection and processing problems. Whether you are looking for custom-built monitoring equipment or survey designs to address specific environmental issues, we have the capabilities to assist you.

Otronix Co.,Ltd

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South Korea
Phone: +82-2-703-0440 (ext :102)
Fax: +82-2-703-0433
Email: hjeah@otronix.com
URL: www.otronix.com
Product: 1. Ocean Environmental Monitoring Buoy 2. Data Logger for various environmental Sensors. 3. Unattended River Discharge Monitoring System

Pacific Gyre, Inc.

Tracey Reece
Operations Coordinator
110 Copperwood Way, Suite G
Oceanside, CA 92054
Phone: 760-433-6300
Fax: 413-375-0914
Email: treece@pacificgyre.com
URL: www.pacificgyre.com
Product: Pacific Gyre designs and manufactures oceanographic research equipment for remote, environmental data collection. The company specializes in drifting buoys that are designed to follow water currents in a Lagrangian sense. Customers include research institutions, governmental agencies and municipalities who wish to collect physical data about the open ocean, coastal waters, and estuaries. Pacific Gyre manufactures a suite of standard products, including platforms and also works with customers to innovate new designs.

Reltek LLC

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2345 Circadian Way
Santa Rosa, CA
Phone: 707-284-8808
Fax: 707-284-8813
Email: reltek@reltekllc.com
URL: www.reltekllc.com
Product: Mfr. of proprietary specialty adhesives & sealants for hard-to-bond substrates and harsh environments, overmolding and sensor potting, cable waterblocking, cable termination, including custom splice kits for electrical cables. Manufacturing process consulting. Research & development of materials for spe-

cial applications. Markets served include industrial, commercial, off-shore, marine, military, automotive and others: bonding plastics to dissimilar materials as well as themselves; electrical, electronic, fiber optic, and transducers; primers for molding PU and PE with adhesion to various substrates; anti-fouling and anti-microbial environmentally friendly products. Bonds survive long immersion, downhole oil, etc. Your first, or final, stop for solutions.

Teledyne RD Instruments

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9855 Businesspark Avenue
San Diego, CA 92131
Phone: 858-693-1178
Fax: 858-695-1459
Email: glopez@teledyne.com
URL: www.rdinstruments.com
Product: Teledyne RD Instruments is a leading manufacturer of Acoustic Doppler Current Profilers (ADCPs) and Doppler Velocity Logs (DVLs) for scientific, commercial and military applications. Teledyne RD Instrument's Workhorse ADCPs measure current flow and direction at up to 128 vertical data points (bins) in the water column, providing a clear illustration of the current dynamics over an extended range. The Workhorse ADCPs incorporate patented Broadband technology that allows the instrument to efficiently collect an increased number of data ensembles over an extended period of time. This provides the user with highly accurate data, with a minimal power draw. The Workhorse ADCPs also incorporate a unique 4-beam configuration that provides data QA/QC, thus ensuring the integrity of collected data. Teledyne RD Instruments ADCPs can also be upgraded to include multi-directional wave measurement capability. Our Waves product measures a complete frequency-direction wave spectrum and can operate in shallow and deep waters. The unit measures not only velocity profiles, but water level and wave frequency-direction spectra at once, providing you with a highly accurate and comprehensive understanding of your environment. Teledyne RD's Waves unit can also be

interfaced to a combined NEMO/acoustic modem, which compresses the data and provides wireless transmission of data to the surface.

UCLA Institute of the Environment

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Phone: 3102675352
Fax: 3108259663
Email: seaworld@ioe.ucla.edu
URL: www.ioe.ucla.edu/seaworld
Product: R/V Seaworld UCLA Oceanographic research and education vessel. Used for studying California Coast, especially Santa Monica Bay.

University of Neuchatel

Dr. Pierre Schnegg
Geomagnetism Group Rue Emile Argand 11
Neuchatel, 2007 Switzerland
Phone: +41 32 718 2676
Fax: +41 32 718 2601
Email: pierre.schnegg@unine.ch
URL: http://www-geol.unine.ch/GEOMAGNET-ISME/tract.html
Product: The GGUN-FL flow-through field fluorometer is the ideal instrument for detection of submarine fresh water springs of coastal karst origin. The instrument detects and separates as many as three different mixed dye tracers such as uranine (fluorescein), rhodamine B, G or WT, Tinopal, or chlorophyll. With convenient tracer selection, the instrument can separate other dyes such as eosine, pyranin, etc. Since fresh water lowers the conductivity, the sonde is equipped with a conductivity meter.

Uplynx Technologies

J. Patrick Murphy
President
11515 Brown Trail
Tomball, TX 77377
Phone: 281 370 1569
Email: pat.murphy@uplynx.com

URL: www.uplynx.com
Product: Custom software development especially in field data collection for mobile devices (Palm, Pocket PC, Tablet) Bar Code, wireless, network application.

Woods Hole Group

Bill Grafton
Sales Manager/Environmental Scientist
81 Technology Park Drive
Falmouth, USA 02633
Phone: 5084956253
Fax: 5085401001
Email: wdgrafton@whgrp.com
URL: www.whgrp.com
Product: Founded in 1986, Woods Hole Group offers coastal and ocean engineering, measurement & environmental assessment services; Real-time measurement system design, integration & operation; Software application for monitoring multiple sensors; System installation & field services; Computer modeling & Data telemetry worldwide.

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- **June 2006: Communications, Telemetry & Data Processing**
- **July 2006: Undersea Defense Products**
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For information on posting a job on these pages and on the "JOBS" site at www.seadiscovery.com, contact Dale Barnett at tel: 212-477-6700; fax: 212-254-6271; or e-mail: barnett@marinelink.com

SUBSEA/HYDROGRAPHIC SURVEY

Job Location: Norway, Experienced Subsea Surveyors, Senior Surveyors, QA/QC reporting and Technicians are required by a leading international Geotechnical Survey Company for various assignments on 28 day rotations throughout 2006. HUET and Norwegian Survival / medical will be required and allowance will be made for Norwegian Tax. This is an excellent opportunity to work for a good company on 1st class survey vessels.
 Start Date: April / May 2006
 Duration: 28 Day Rotational Assignments
 Rate: Good day rate
 Bridget Drakes
 TEK Personnel Consultants Ltd
 4th Floor, Broadstone House, Broadstone Road, Stockport Manchester, SK5 7DL United Kingdom
 Phone: +44 (0) 161 975 0321
 Email: bridgetdrakes@tekperssonnel.co.uk
 WEB: <http://www.tekperssonnel.co.uk/>

DATA PROCESSOR (HYDROGRAPHIC SURVEY)

Job Location: Norway, Experienced Data Processor for Hydrographical Survey required by a leading international Geotechnical Survey Company for various assignments on 28 day rotations throughout 2006. HUET and Norwegian Survival / medical will be required and allowance will be made for Norwegian Tax. This is an excellent opportunity to work for a good company on 1st class survey vessels.
 Start Date: April / May 2006
 Duration: 28 Day Rotational Assignments
 Location: Norwegian Base
 Rate: Good day rate
 Bridget Drakes
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 WEB: <http://www.tekperssonnel.co.uk/>

IMMEDIATE - NAVAL ARCHITECT

Job Location: Singapore, Singapore Naval Architect (3-5 Candidates)
 Base at Site to assist Owners in the plan approval, inspection and witnessing/supervision work for the construction of new vessels.
 Assist in various issues related to design, plan approval and other hull structure issues. Carry out schedule, inspections and tests as required.
 Ensure design, steel cutting, fitment, fabrication & treatment.
 Review relevant drawings & documents. (Auto Cad & other programs)
 Deliver reports and daily logs.
 The position is immediate and we request candidates who are currently available. To apply send your resume to vikram@newway.com.sg
 Location: Singapore / South Korea (yearly contract)
 Salary: US\$ 3,500.00 / month
 Naval Architect Job Type: Staff / Contract
 Vikram Subramanyan
 Newway Consulting
 Fareast Plaza, Singapore
 Singapore, 223114
 Email: vikram@newway.com.sg
 WEB: <http://www.newway.com.sg/>

REGIONAL SALES MANAGER

Job Location: USA, FL Fort Lauderdale Marine Propulsion Manufacturer seeking Sales person for the State of Florida. Engineering degree desired along with experience selling a similar product. Excellent opportunity with 6 figure potential for the right candidate. Contact klitchfield@litchfieldandassociates.com and view our website at: www.marinesearchassociates.com
 Karen Litchfield
 Marine Search Associates
 Fort Lauderdale, FL 33063
 Phone: 954-969-9609
 Email: klitchfield@litchfieldandassociates.com
 WEB: <http://www.marinesearchassociates.com>

MARINE/OCEANOGRAPHIC INSTRUMENT TECHNICIAN

Job Location: USA, CA Bodega Bay VL# 5043 External Marine/Oceanographic Instrument Technician Final Filing Date 04-21-06
 This position is located in: Bodega Marine Lab, Bodega Bay, CA and is represented by a union. Working hours: MF, 8-5.
 This External position is for UCD/UCDHS employees and the general public. Applications from the general public and UCD/UCDHS employees will be considered simultaneously.
 Bodega Marine Laboratory (BML) is an Organized Research Unit (ORU) of the UC Davis campus, located in Sonoma County about 100 miles from Davis. BML and its surrounding 362-acre Reserve provide research and instructional facilities for resident, campus-based and visiting faculty, researchers and students. For application materials, call (707)875-2211 Mon - Fri 8 - 5; apply to BML, P.O. Box 247, Bodega Bay, CA 94923, OR apply to UC Davis per Application Process below.
 Responsibilities: This position will serve as the Marine Instrument Technician at the Development Technician III (\$2,797-3,359./mo.), Development Technician IV (\$3,359 - 4,046./mo.), or Development Technician V (\$3,861- 4,659./mo.) level based on qualifications. At the DEV. TECH. III level, under supervision, this position coordinates and participates in a variety of technical tasks associated with the design, construction, deployment, operation, and maintenance of marine scientific instrumentation and sensors in support of coastal research and facilities at BML. Serves as an on-shore and sea-going technician for testing, operation, maintenance, and repair of meteorological, oceanographic, and vessel instrumentation, including Acoustic Doppler Current Profilers, CTDs, current meters, an underway data acquisition vessel system, and mooring hardware. At the DEV. TECH. IV level, this position performs all of the above plus data management tasks related to recovery, processing, distribution, and archiving of data obtained from land-based, moored and vessel instrumentation. At the DEV. TECH. V level, this position performs all of the above while working independently, under direction. All levels will provide technical assistance and training to scientists and staff in the selection, operation, and maintenance of appropriate research instrumentation.
 Requirements: Experience in electronics and electronic systems and installing, operating, and maintaining analog and digital electronics data acquisition equipment, signal conditioners, environmental sensors, ocean instrumen-



Engineering Assistant II - Electronics Multiple Positions Announcement #05-12-04

The Alvin Group is looking for an Engineering Assistant II. The qualified applicant, with some supervision, applies acquired knowledge of established procedures to the assembly, testing and use of equipment in support of engineering projects related to oceanographic research.

GENERAL REQUIREMENTS: Meticulous work habits and broad electrical/electronic skills are required. Must be capable of troubleshooting to the component level utilizing the proper test equipment and minimal documentation. Excellent soldering skills are required.

SPECIFIC DUTIES PERFORMED:

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- Assist in the preparation of scientific equipment used with the vehicles.
- Troubleshoot and repair both digital and analog circuit.
- Work may require maintenance of lead acid batteries including assembly of cells into battery cases, charging, equalizing, watering and condition analysis.
- Maintain and test DC power distribution components such as electrical relays, fuses, circuit breakers, DC brushless motors and controllers, underwater lighting components, cables and connectors.
- Participate in all phases of the launch and recovery operations of the vehicles, including swimming tasks.
- Possibly enter into the DSV Pilot training program with the goal of obtaining Alvin pilot status within 18 months.
- Must be able to pass the equivalent of an aircraft Private Pilot 3rd Class medical examination to be eligible for manned submersible pilot training.

A physically demanding job requiring ability and willingness to go to sea for extended periods of time, typically eight months total over a one year period.

Education and Experience:

A BS in Electronic or Electrical Engineering with 2 years of related experience preferred. At-sea experience desired. Computer skills in Microsoft Windows 2000 are desirable.

How to Apply:

For a full job description, including education requirements, and to be considered, applicants should begin the review process by registering on-line at our Career Center, <http://jobs.whoi.edu> and apply.

Women and minority candidates are strongly encouraged to apply.

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M/F/D/V/EOE

ment, instrument platforms, cabling. Knowledge of telemetry. Knowledge of oceanographic sensors such as CTDs, ADCP, thermosalinographs. Knowledge of calibration techniques and testing equipment. Skill in, and commitment to, keeping abreast of changes in ocean sensor, remote sensing, data acquisition and mooring technologies. Experience working with research and physical plant equipment and tools such as mechanical and wiring tools, electrical meters, sensors, probes, and pumps in the field, on boats, and in the laboratory. Skill to perform light construction. Skills to develop and maintain effective working relationships. Skills to assume a lead role with diverse groups of individuals at different levels of organizations. Skills to work collaboratively on dynamic project based work. Excellent verbal and written communication skills for interactions with colleagues, scientists, staff, engineers, and consultants; for documenting policies and procedures; and for producing and delivering instructional materials. Record-keeping skills to create and maintain procedures and histories of group and organization-

al tasks. Experience functioning under deadlines to meet expectations as a resource person for the department; willingness and ability to work with multiple departmental managers and researchers. Skill working on a computer using office software including designing spreadsheets, figures. Experience using instrument specific software (i.e. Seabird, RD Instruments) preferred. Experience working from vessels. Knowledge of boating and diver safety procedures. Ability to become Scuba certified by a nationally recognized agency (i.e. PADI, NAUI, etc) preferred. Knowledge of electrical and computer safety procedures. Skills and willingness to interact with larger scientific and technical community to seek advice, approaches, or welcome collaborations. **ADDITIONAL QUALIFICATIONS FOR DEV TECH IV LEVEL:** Skills to design and write database applications, reports, and documentation. Knowledge of data acquisition systems from moorings, vessels or shore-based sensors, evaluating data quality, postprocessing, manual and automatic data archiving, computer and data security, and disaster recovery methods. Skill with designing, fabricating,

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deploying and maintaining offshore oceanographic instrumentation moorings, including anchor systems, float/buoy fabrication. Skills in computer networking and operating systems and a variety of applications software. **ADDITIONAL QUALIFICATIONS FOR DEV TECH V LEVEL:** Skill with data acquisition systems from moorings, vessels or shore-based sensors, evaluating data quality, postprocessing, manual and automatic data archiving, computer and data security, and disaster recovery methods. Skill generating reports from data collection, including graphical representation. **Special Conditions of Employment:** Non smoking work environment. Work occasional evenings/nights. Work occasional varied lunch hours. Work occasional weekends and holidays. Work occasional emergency Call Back. Work from coastal vessels for day (possibly extended day) trips. **Physical Requirements:** Position requires lifting up to 100 lbs. Work in confined areas while installing or repairing equipment or hardware. Work outdoors and during cruises, sometimes during inclement weather. Assist others, sometimes under harsh environmental conditions, during field, shipboard, and diving operations to service meteorological instrumentation.

Julie Quigley
Bodega Marine Laboratory
Phone: 707.875.2211
Email: julquigley@ucdavis.edu

OIL RIG ENGINEER

Job Location: Singapore, Jurong
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EMBEDDED SOFTWARE ENGINEER

Job Location: United Kingdom, Edinburgh
SeeByte Ltd is a world leader in software and embedded systems for underwater vehicles. Our flagship product, SeeTrack, is the mis-

sion-planning, monitoring, sensor-fusion and visualisation platform of choice for Autonomous Underwater Vehicles. In support of our well funded development programmes for underwater robotic vehicles, we are looking to recruit an Embedded Software Engineer to work in this exciting area. To succeed in this job, you will have the following essential qualifications:

- Expertise in C++ and Linux
 - At least 1 year's experience and a good Bachelors Degree in Software Engineering, Electronic Systems or Computer Science
 - You must be a team player yet also able to work autonomously. You must have a flexible working approach and be able to remain calm under pressure
 - Good written and spoken English.
- ALL CANDIDATES MUST BE ELIGIBLE TO WORK IN THE UK**
Our ideal candidate will also have the following skills:
- Knowledge of real-time programming and embedded computing hardware
 - Experience with Ethernet and WiFi
 - Some practical skills and the ability to work in the field
 - Experience of developing in an embedded environment
 - 3 years' experience.
 - A Masters Degree in Software Engineering, Electronic Systems or Computer Science, or equivalent experience.

The candidate should have the ability to produce quality, well-commented and documented source code to meet specifications and requirements set out by the product manager; good organisation skills; and be able to work with colleagues and other staff. The candidate must be able to adapt and be self-motivated. Travel may be a requirement of the position.

The starting salary for this post will be between ?18k and ?25k depending on experience and training.

Suitably qualified candidates should submit a covering letter, their C.V. and the name of three referees (include their e-mails and phone numbers) by the 7th of April 2006.

Juliet Grant
SeeByte Ltd
Canaan Court
6a Canaan Lane
Edinburgh, EH10 4SY UK
Email: juliet.grant@seebyte.com

NAVIGATOR

Job Location: USA, TX Offshore Position
VERITAS MARINE ACQUISITION
Veritas DGC Inc., a \$600 plus million public geophysical information and services provider, is one of the world's leading providers of advanced geophysical technologies. Veritas Marine Acquisition currently has several rewarding opportunities for the position of NAVIGATOR in our various global offshore locations.

The NAVIGATOR is responsible for:

- * The recording quality of navigation data onboard the vessel.
- * The accurate setup and operation of ALL navigation acquisition systems and sub-systems onboard the assigned vessel.
- * Ensuring that all components of navigation acquisition operations run efficiently and effectively to minimize down time.
- * Performing installation and maintenance of the above systems and their associated cables and antennas located on the masts, catwalks and on in-water floats.
- * Performing proper layout of seismic recording equipment and ensure proper connections have been made to recording equipment.

REQUIREMENTS:

Working knowledge of UNIX preferred but not required. GPS - Navigation experience a plus. Associates Degree (or equivalent) or above in Hydrographic Surveying, Marine Science, Marine Technology or Electronic Engineering a plus. Must possess willingness and ability to travel and work offshore for extended periods of time (current rotation is six weeks offshore / six weeks leave). Team player with strong interpersonal communication and organizational skills. Proficient computer skills. We also require that you have a valid passport before starting employment. You must submit to and pass a drug screening and UKOOA medical. You must obtain a Basic Offshore Safety Induction and Emergency Training Certificate before starting employment (this is scheduled and paid for by the company).

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Veritas Geophysical Corporation

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Houston, TX 77072

Phone: 832-351-8047

Fax: 832-351-8721

Email: trena_gipson@veritasdgc.com

WEB: <http://www.veritasdgc.com>

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Vikram

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Singapore, 223213

Singapore

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HYDROGRAPHIC SURVEYOR / AUTOCAD / HYPACK EXPERIENCED

Job Location: USA, NJ Sewell

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and field crew to perform hydrographic surveys. We are a small firm in business for 26

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basis looking for full time employee.

Michele Jeanne Dickey

Hydrographic Surveys

237 Delsea Drive

Sewell, NJ 08080 USA

Phone: 856-589-8546

Fax: 856-589-4897

Email: hydrographic@comcast.net

FIELD ENGINEER

Job Location: USA, WA Lynnwood

Kongsberg Underwater Technology, Inc., a US

subsidiary of Kongsberg Maritime, currently has an opening in Lynnwood, WA for a Field Engineer. Primary responsibilities will include the installation, service, customer support and customer training for Kongsberg's wide range of maritime products including hydrographic survey systems, autonomous underwater vehicles, underwater navigation systems, and underwater surveillance systems. Successful applicants must have a strong technical background in the maritime/ocean engineering field, be capable of working independently in the field, and interfacing directly with the customer. Associates degree in a related field or equivalent work experience required, BS degree is desired. Position requires extensive domestic and international travel and work aboard offshore vessels. Must be a US citizen and capable of obtaining a US Government security clearance. Kongsberg Underwater Technology, Inc. is an Equal Opportunity Employer.

Darlene Burt

Kongsberg Underwater Technology, Inc.

19210 33rd Avenue West

Suite A

Lynnwood, WA 98036

Phone: 425-712-1107

Fax: 425-712-1197

Email: darlene.burt@kongsberg.com

ENGINEER/DIVER

Job Location: USA, NY West Nyack

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John F. Hackett

McLaren Engineering Group

100 Snake Hill Road

West Nyack, NY 10994

Phone: 845-353-6400

Fax: 845-353-6509

Email: jhackett@mgmclaren.com

WEB: <http://www.mgmclaren.com>

ASSISTANT DRILLER FOR MEXICO

Job Location: Mexico,

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SENIOR HYDROGRAPHIC SURVEYOR

Job Location: United Kingdom, Southam

NetSurvey Limited are a specialist multibeam

services company. As we continue to expand

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and geographical extent. You could be surveying

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surveys off the Orkneys on the next project.

We perform multibeam surveys from ROVs,

harbour launches, vessels of opportunity all the way up to construction vessels. Typically we will install, acquire and process the multibeam data and produce the project deliverables. If you are interested in varied work with a small but expanding company and you are an experienced hydrographic surveyor then please contact us.

Duncan Mallace

NetSurvey Limited

Office 4

Manor Farm, Northend Road,

Fenny Compton

Southam, Warwickshire CV47 2YY

United Kingdom

Phone: +44 1295 770011

Email: jobs@netsurvey.co.uk

WEB: <http://www.netsurvey.co.uk>

DEVELOPMENT ENGINEER

Job Location: United Kingdom, Edinburgh

Applications are invited from qualified candidates

for the position of Software Engineer. SeeByte's

core technologies involve intelligent systems for

autonomous or remote platforms and processes. The

successful candidate will work, under the guidance of

the Product Manager, on the development of

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SeeTrack is a mission planning, monitoring,

sensor fusion and visualisation platform for

Unmanned Underwater Vehicles.

Juliet Grant

SeeByte Ltd

Canaan Court

6a Canaan Lane

Edinburgh, EH10 4SY UK

Email: juliet.grant@seebyte.com

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FIELD SALES ENGINEER

Job Location: USA, NH Portsmouth

With over ten years in the highly dynamic IT

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The ideal candidate will have a strong geosciences

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Salary and overall compensation are commensurate

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Portsmouth, NH, and may require

travel up to 50% of the year (domestic and

international).

Please send your application to IVS 3D by 28 February 2006 by e-mail to hr@ivs3d.com or fax to (603) 766 0485.

Carole Mahoney

IVS 3D Inc.

1500A Lafayette Rd

Portsmouth, NH 03801

Fax: (603) 766 0485

Email: hr@ivs3d.com

WEB: <http://www.ivs3d.com>

FPSO GENERAL JUNIOR PROJECT ENGINEER

Job Location: Italy, Italy & India

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Salary: GBP 300 / day

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FPSO experience preferable but not a must.

Salary: GBP 300 / day

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FPSO / Process plant experience.

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Susan Ghamari

Skilled Technical Services

Phone: +44 845 245 3120

Email: susan.ghamari@satslimited.com

OFFSHORE DRILLERS

Job Location: Nigeria, Nigeria and Angola

Offshore

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Skilled Technical Services

Phone: +44 845 245 3120

Email: susan.ghamari@satslimited.com

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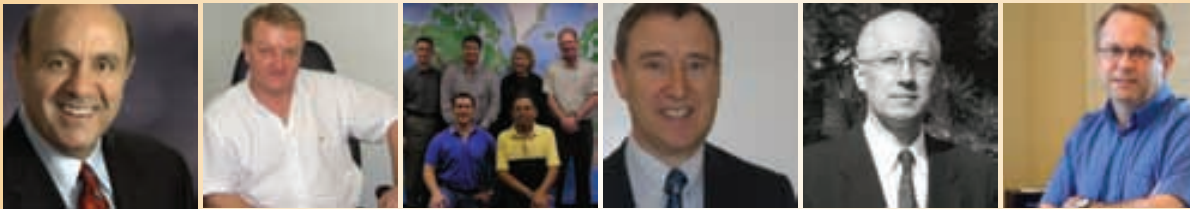
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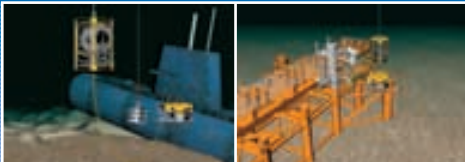
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