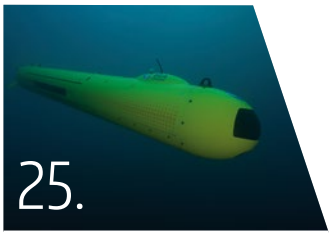
ROV PLANET



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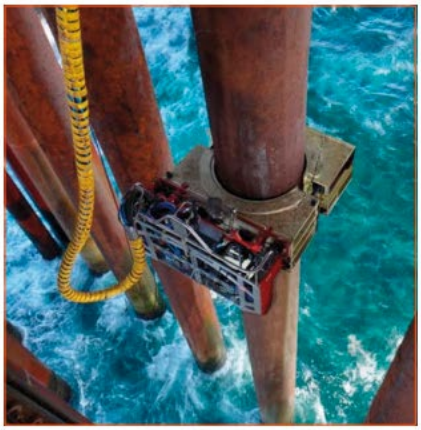

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EDITOR-IN-CHIEF
Richie Enzmann

COPY EDITOR
Will Grant

CONTRIBUTORS
Richie Enzmann, Christina Tran, Torbjørn Goa, Victoria Bosi, Meliha Boucher, Bob Christ, Mark W. Atherton, Jamie MacDonald

DESIGN & LAYOUT
Milan Farkas

SPECIAL THANKS TO
Stephen Gibb, Julien Lalanne, Daniel Roscoe-Hudson, John Benson, Zoe Ogilvie, David Brown, Victor Sepuvelda, Isabel Dias, Critian Gurgu, Bill Mallin, Nick Rettie, Ravi Chandu,

Oceaneering
Nortek
Strategic Robotic Systems
Balmoral Offshore
Eelume
DWTek
Trojan Crates
Sonardyne
SheerTec
SMD
ECA
SubC
Trelleborg
SeaTrepid
Kongsberg Mesotech
ROCOL
iXBlue
Sonavision
Digital Edge
Forum Energy Technologies
QSTAR Subsea Solutions
EPRONS
ToolTec

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WELCOME TO ROV PLANET

My name is Richie Enzmann, and allow me to welcome you all to the latest issue of ROV Planet!

Dear Reader,

After the last thirty months of depression in the industry the signs of recovery seem to be appearing on the horizon. Both Subsea Expo in Aberdeen and Underwater Intervention in New Orleans had a positive upbeat that I have noticed when speaking with many exhibitors and attendees. I sincerely hope that this positive spiral will continue on and we can all get back to business as usual.

This year the theme of UI "doing more with less" is well reflected in the several new mini-ROV/AUV and alternative ROV solutions coming onto the market that we are sharing with you in this issue, such as the Eelume sea snake, the Fusion Vehicle, and the Starfish Drone.

Furthermore, you can read the remarkable story of SeaTrepid that was basically spun off from VideoRay by Bob Christ, as he wanted to pursue his interest in operations instead of manufacturing. Bob was kind enough to share some of his very ambitious plans with us of using several AUVs and USVs to map large areas of the oceans in order to reduce the unit costs of surveys to the fraction of what they currently are.

ROV Planet is a media sponsor of the naval defence show – Undersea Defence Technology (UDT) – in Bremen, Germany. Hence we looked into the application of ROVs/AUVs within the defence domain and featuring the new mine detection and disposal system from ECA that is being used by the French Navy. This system has a combination of autonomous surface and subsurface vehicles to take out the human operator from the line of fire when operating in the danger zone and working with explosives underwater.

Finally, we are working on the ROV/AUV parts and equipment directory, so please feel free to get in touch with us, if you would like your company to be listed!

Best regards,
Richie Enzmann

UPCOMING EVENTS

3-5 April, 2017 – MCE Deepwater Development –Amsterdam, Netherlands
World-class technical discussions focusing on the offshore technology, innovation and experience.

4-6 April, 2017 – Ocean Business – Southampton, UK
The hands-on ocean technology exhibition and training forum.

1-4 May, 2017 – OTC – Houston, TX, USA
The World's largest annual offshore exhibition and conference.

30 May – 1 June, 2017 – Undersea Defence Technology (UDT) – Bremen, Germany
The underwater defence & security community's most relevant exhibition and conference.

19 - 22 June, 2017 – MTS/IEEE Oceans'17 – Aberdeen, UK
World class technical event focusing on marine science and ocean technology.

5 - 8 September, 2017 – SPE Offshore Europe'17 – Aberdeen, UK
The largest oil and gas sector trade show in Europe.

Please check out our website on:
www.ROVPlanet.com

60th

A Vision for our Marine Future:

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Aberdeen, Scotland, 19-22nd June 2017

This flagship conference covers all aspects of ocean science, technology and engineering and returns to Aberdeen, highlighting the importance and size of the oceanic industry to the region. The conference programme will include not only the traditional OCEANS themes but there will also be special topics focusing on the region's expertise.

- Subsea Engineering and Subsea Operations
- Subsea Optical Sensing, Imaging and Instrumentation
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- Emerging Technologies for IRM
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- Marine Renewables (offshore wind, wave, and tidal)
- Unmanned underwater vehicles in defence

For more information on the conference, exhibition, patronage opportunities, and attending the event please visit the conference website: **www.oceans17mtsieeeaberdeen.org**

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OCEANEERING ANNOUNCES CONTRACT WITH STATOIL

FOR E-ROV CONCEPT DEVELOPMENT AND TESTING

Oceaneering International, Inc. announced that one of its subsidiaries has been awarded a technology development contract by Statoil Petroleum AS. The contract provides for the development, manufacturing, testing, and mobilization of a self-contained, battery-powered work class remotely operated vehicle (E-ROV) system deployed on the seabed. The system will interface with Oceaneering's onshore Mission Support Center via a 4G mobile broadband signal transmitted from a buoy on the water's surface, without a surface vessel required onsite.

"We are pleased Statoil has given us the opportunity to develop a revolutionary, battery-powered work class E-ROV system. This award provides opportunities for continuous improvements and developments that will create increased value for both parties. We will use our Oceaneering® eNovus work class ROV and new technology to supply the required battery power and communication links needed to support the project," said Erik H. Sæstad, Vice President and Country Manager for Oceaneering in Norway.

Development, manufacturing, and pool testing will commence immediately at Oceaneering's workshop in Stavanger, Norway. An offshore mobilization test of the system is scheduled for May 2017. During the test, the E-ROV system will be deployed and recovered from a Statoil-operated IMR vessel at the Troll field in the North Sea. The system will perform specified subsea operations while Oceaneering maintains continuous, uninterrupted control from its onshore Mission Support Center in Stavanger.

Oceaneering is a global provider of engineered services and products, primarily to the offshore oil and gas industry, with a focus on deepwater applications. Through the use of its applied technology expertise, Oceaneering also serves the defense, entertainment, and aerospace industries.

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Connect with what's next at **Oceaneering.com/WhatsNext**

ENABLING A BREAKTHROUGH

IN HYBRID UNDERWATER VEHICLES

The Fusion is a breakthrough in hybrid underwater vehicles. In a unique way, it combines AUV and ROV capabilities with diver navigation and propulsion- into just one system. Why was Nortek's DVL essential to make this leap forward possible?

Crafty engineering and high-end bespoke sensors have produced an underwater vehicle with efficient, capable and robust design.

Jesse Rodocker, President at Strategic Robotic Systems, emphasizes the importance of Nortek's innovations in DVLs to make this possible.

"Both the electronics and transducers are smaller and have a better form factor for the Fusion underwater vehicle. The higher frequency for increased accuracy is of huge value for aiding the Fusion's automated control and navigation system. The added dedicated altimeter provides more accurate altitude directly below the Fusion for better terrain following."

Nortek's 1 MHz DVL has a bottom track that ranges from 20 cm to 50 m, and its housing is available with a 4000 m pressure rating. Even when offering this capacity, it is the industry's smallest DVL, and is easy to integrate and operate.

ADCP specialist Nortek helped set up underwater vehicle Fusion's unique transducer arrangement. (Photo: Strategic Robotic Systems)

MORE EFFICIENT, CAPABLE AND COST EFFECTIVE

The Fusion underwater vehicle has a unique in-line transducer arrangement and Nortek has been there to help with this design. Nortek's contributions included recommendations and minor tweaks to make the vehicle work optimally.

"The Fusion is a real first", says Jesse Rodocker, emphasizing that it is a true hybrid that has extended capability in all modes.

The Fusion breaks with tradition by uniquely combining several underwater systems into a single platform.

"There isn't a system on the market that combines the AUV, ROV and diver functionality in the same way. Fusion is also really the only system to be built from the ground up with a specific suite of sensors in such a tightly integrated package", Rodocker explains.

The specific suite of sensors refers to inclusion of a multibeam forward-looking sonar, side-scan sonar, USBL, DVL and AHRS. Most other platforms do not include these as standard and are certainly not integrated as tightly as in Fusion. This design makes the Fusion more efficient, capable and cost effective. For example, its design means reduced need for training and greater mission capability.

A FRESH PERSPECTIVE ON UNDERWATER SYSTEMS

Strategic Robotic Systems was founded with the premise of developing the next generation in underwater systems by approaching this challenge from a fresh perspective. They needed a partner with an equally fresh perspective as they were looking for navigation technology to be integrated in their new underwater vehicle.

Nortek's 1 MHz DVL is the industry's smallest DVL, and is easy to integrate and operate. (Photo: Nortek)

The Fusion combines AUV, ROV and diver navigation and propulsion into just one system. (Photo: Strategic Robotic Systems)

Crafty engineering and high-end bespoke DVL sensors from Nortek have produced an underwater vehicle with efficient, capable and robust design. (Photo: Strategic Robotic Systems)

"One of Nortek's clients recommended us to work with Nortek because of the new technologies in its portfolio and the company's ability to collaborate with partner companies. I was struck by Nortek's progressive, forward-looking thinking and soon found out we had common interests", says Jesse Rodocker.

"The collaboration has been fantastic. The team at Nortek has been very knowledgeable and responsive. There hasn't been a "it can't be done" or "too hard" or "very expensive"."

POTENTIAL FOR FUTURE PRODUCT DEVELOPMENT

As Strategic Robotic Systems shifts into production and delivery of the Fusion, collaboration with Nortek will continue to make the Fusion truly the best vehicle out there.

"Who knows what future products might be developed from this fruitful collaboration?", Jesse Rodocker concludes.

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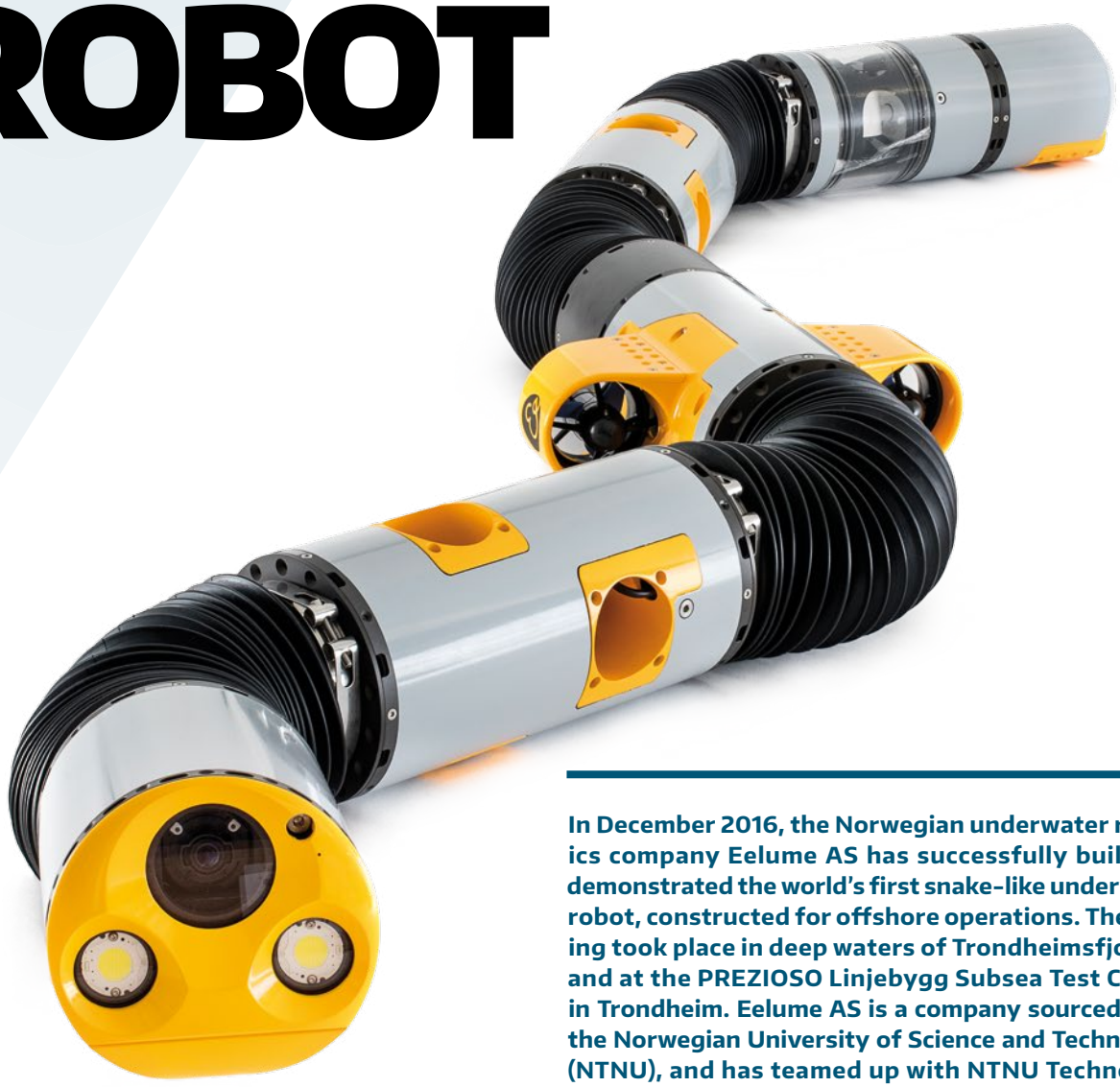
EELUME HAS SUCCESSFULLY BUILT AND DEMONSTRATED THE WORLD'S FIRST

SUBSEA SNAKE-LIKE ROBOT



In December 2016, the Norwegian underwater robotics company Eelume AS has successfully built and demonstrated the world's first snake-like underwater robot, constructed for offshore operations. The testing took place in deep waters of Trondheimsfjorden, and at the PREZIOSO Linjebygg Subsea Test Center in Trondheim. Eelume AS is a company sourced from the Norwegian University of Science and Technology (NTNU), and has teamed up with NTNU Technology Transfer Office, Kongsberg Maritime and Statoil.

Photo: Marius Rua

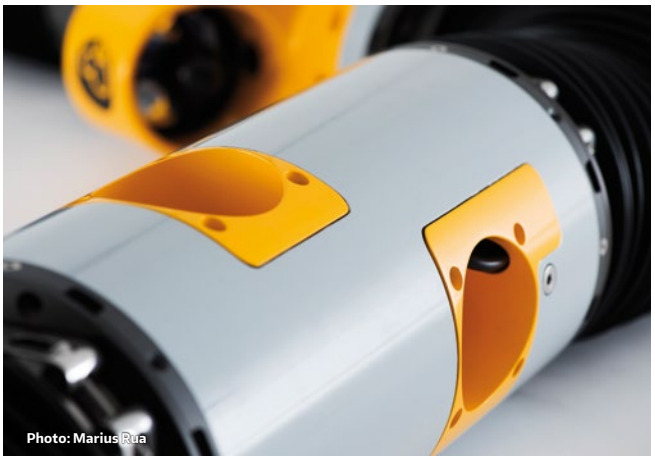


Photo: Marius Rua


Photo: Marius Rua

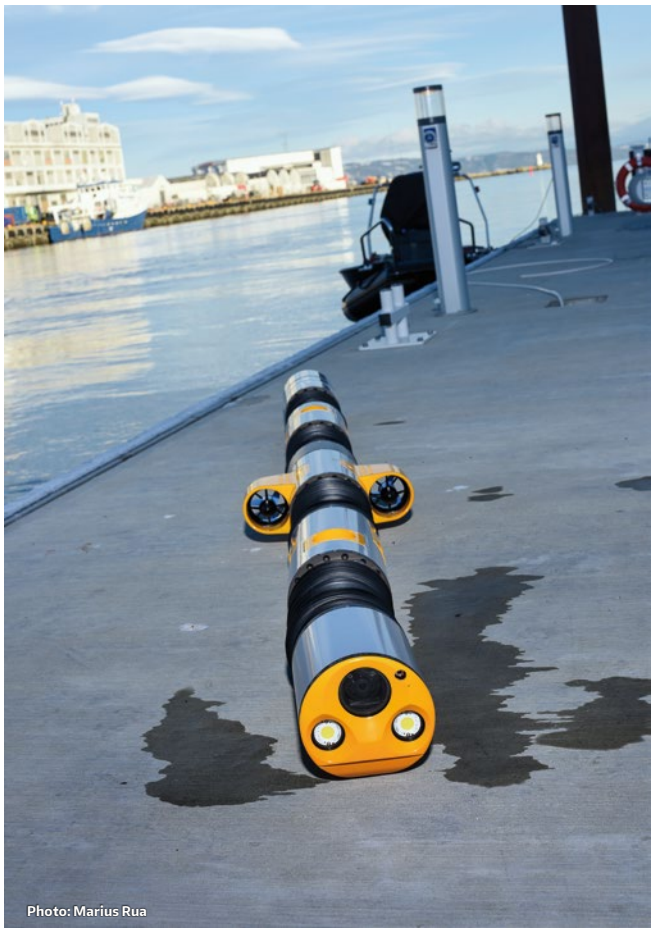
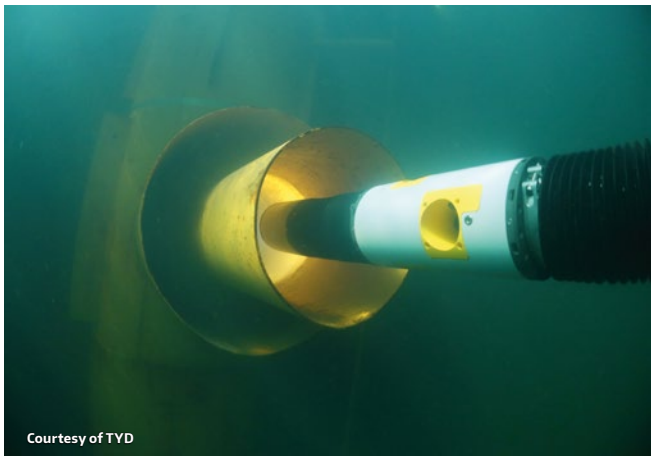


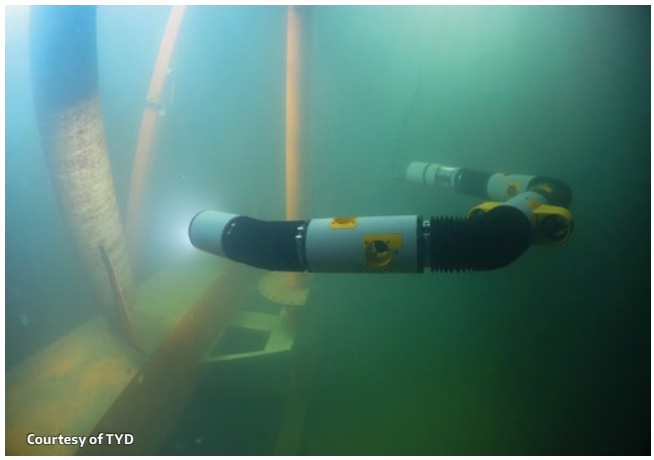
Photo: Marius Rua

The purpose of the testing was to verify and demonstrate the features of Eelume's snake-like underwater robot in a deep-water, marine environment. Eelume confirmed that their vehicle has superior maneuverability, is a stable sensor and actuator platform, and has easy access to constrained areas not accessible by conventional underwater vehicles.

The Eelume vehicle represents a versatile platform for various kinds of underwater operations, and will in the future be equipped with several types of sensors and tools needed to fulfill its mission. An important application of the robot is to carry out inspection and light intervention jobs on subsea installations.

Eelume robots will be permanently installed on the seabed being ready 24/7 for planned and on-demand inspections and interventions. This solution will dramatically save costs by reducing the use of expensive surface vessels, which are needed to support such operations today. Eelume vehicles can be installed on both existing and new fields where typical jobs include; visual inspection, cleaning, and operating valves and chokes. These jobs account for a large part of the total subsea inspection and intervention spend.


Courtesy of TYD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A DRONE THAT ALLOWS YOU TO EXPLORE INNER SPACE

Courtesy of SheerTech

Starfish is a new underwater tethered robot that can search, grapple and retrieve objects from a lake, river and ocean floor. It can be used to explore the underwater realm, retrieve items lost overboard from a boat or even to anchor a boat to an underwater mooring. It could be used to inspect the inside of enclosed underwater environments.

Powered from a standard 12VDC power supply, Starfish is controlled by a compact hand controller for precise control underwater. It has positive buoyancy and therefore can be deployed on the surface of the water while the system is made ready for use.

The four thrusters operate in the same manner as those found on Starfish's airborne cousins, the quadracopter, allowing the unit to manoeuvre and hover underwater. The on-board camera feeds HD video to a daylight bright video screen mounted on the hand controller, making it easy to manoeuvre Starfish as desired.

Retrieval of Starfish is easy since turning off the thrusters allows the positively buoyant Starfish to rise to the surface. After grappling an object the umbilical is wound in by hand or other means to retrieve the sunken treasure.

Starfish is the brainchild of the designers at *SheerTech*, a small four person industrial animation and design company based in Sarnia Ontario Canada.

Starfish is on sale now for $3,195 USD and you can purchase one at https://starfish-underwater-drone.myshopify.com/

iXblue

ANNOUNCE A NEW VERSION OF GAPS USBL

INCLUDING NOW A WIRELESS DATA COMMUNICATION LINK

As of now, Gaps USBL features a wireless data communication link for subsea vehicles and remote monitoring applications

Gaps is able to simultaneously perform tracking and data communication without compromise to Gaps' legendary performance levels. Using its own iXblue wideband telemetry modulation, robust even in adverse conditions, Gaps and beacons have a half-duplex acoustic communication link capable of up to 160 bits per recurrence. The acoustic communication link is open for any user application. Users can implement the acoustic link for their own subsea communication needs.

MAIN APPLICATIONS

CONTROL/COMMAND YOUR AUV

Gaps enables simultaneous tracking and acoustic coms without the need to install a dedicated modem transducer on the AUV or on the surface vessel. You can now track, send commands and receive AUV status, all with the same equipment.

WIRELESSLY SEND A POSITION TO RECALIBRATE AN INS IN AN UUV

For AUV and ROV applications, GAPS enables a position to be sent wirelessly to a subsea INS:

- Gaps estimates the position of the beacon (USBL)
- Gaps sends its position to the beacon
- The beacon broadcasts the position to the subsea INS

COLLECT DATA FROM ANY SUBSEA SENSOR

Any sensor can be interfaced to a subsea beacon. The beacon broadcasts the measurements to the GAPS through the acoustic channel. GAPS outputs the information on serial or Ethernet communication port.

Courtesy of iXBlue

A decade ago Gaps USBL was a revolution in its field, integrating an INS (Inertial Navigation System), Phins, into an acoustic system for the first time ever. Gaps has since earned an enviable reputation in the most difficult use cases where existing solutions generally proved deficient.

Constantly attentive to customers' needs, iXblue has since evolved GAPS up to the current version, introducing many more features and ever-higher performance levels. Key developments to the product have included:

- Shift from titanium to carbon fiber structure, much lighter and easier to handle with no loss of performance.
- Opening of the system to existing acoustic beacons on the market.
- Creation of a new web-based user interface (MMI) and an Ethernet link for managing/using the product.
- Addition of a bi-directional telemetry link (latest evolution to date).

Courtesy of iXBlue

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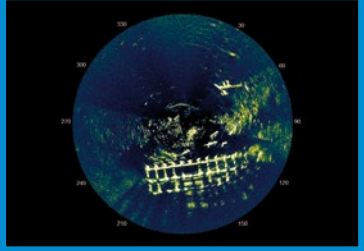
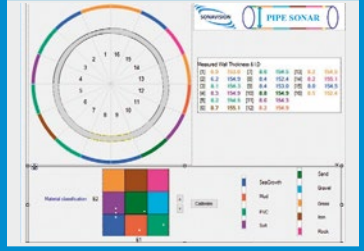


SV Pipe Sonars



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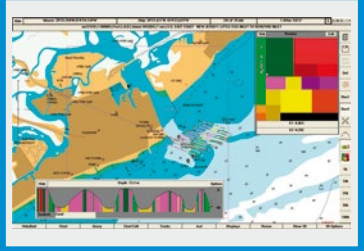

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SMD IS PIONEERING THE WAY IN SYNTHETIC SUBSEA TECHNOLOGY

Tyneside-based subsea engineering specialist Soil Machine Dynamics (SMD) is set to transform the way offshore operations are managed from concept to delivery with a new synthetic environment virtualisation platform.

Sentio™ is a highly advanced synthetic environment and virtualisation tool designed to optimise and significantly improve the efficiency of operations and projects in offshore environments. It has been developed by SMD over the last eighteen months.

Sentio™ enables the user to virtualise any operational environment from topside to subsea. Its aim is to improve operational safety, identify and mitigate risk and significantly reduce costs by understanding operational requirements before an operation is undertaken.

Dr Mahesh Manon, SMD Digital Services Product Manager, believes it's an ideal solution for clients in today's cost and risk driven marketplace. He said: "We developed Sentio™ by applying SMD's deep understanding of subsea engineering challenges to create a tool which allows unique insights into complex offshore operations.

"The enhanced synthetic environment means the user is able to make highly informed decisions about operations. De-risking in this way ensures these operations are safe, reliable, and optimised, prior to actual implementation. This is extremely valuable to a number of players in the offshore industry, especially in today's challenging oil and gas economic climate."

The Sentio™ platform is highly flexible allowing tailor-made scenarios to be created quickly. These can meet the specific requirements of any stage of an operational lifecycle, from engineering assessment, through training and mission validation, to de-commissioning. Sentio™ eliminates the need for high-cost physical testing and resources.

Sentio's™ key differentiator is the speed at which it lets the user create new models and environments. Rapid creation and modification allows reliable and immediate insights into how a real-world operation will play out.

Dynamic working environments, challenging geography and deepwater operations can all be realistically modelled using the Sentio™ platform. The outputs of a Sentio™ simulation provide clarity and understanding on how every element of a complex operation works and are interconnected.

Graham Puntis, Managing Director of SMD Services, adds: "Our customers are squeezed like never before. SMD recognises this, together with the need to optimise operational costs and provide reliable through-life support for subsea intervention assets owned by our clients.

"SMD Services will continue to offer the traditional support options that our customers have always enjoyed. At same time I am developing the business to provide a range of solutions focused on increasing availability and reliability of ROVs, trenchers and ploughs. Ultimately, our aim is to reduce the costs of ownership and maintenance. Sentio™, our state-of-the-art synthetic environment tool, forms an important part of this range. It has the ability to truly change the way customers test, validate and plan their operations."

Courtesy of SMD

UK SUBSEA EXPERTS REACH SEMI-FINALS IN GLOBAL XPRIZE COMPETITION TO ADVANCE OCEAN EXPLORATION

A multi-skilled team of subsea engineering experts representing the UK has advanced to the semi-finals in the $7 million Shell Ocean Discovery XPRIZE, a prestigious international competition which aims to create the next generation tools, technologies and techniques for rapid, unmanned ocean exploration and discovery.

Teams are challenged to design and build new ways to map the ocean floor at depths and a resolution never achieved before using advanced deep-sea technologies for autonomous, fast and high-resolution ocean exploration.

Based in the National Centre for Subsea and Offshore Engineering in Newcastle, Team Tao is the only UK team to make the semi-final and will compete against 21 teams from 13 countries vying for their share of the $7 million prize purse.

Team Tao brings together industry experts from Tyneside-based subsea engineering specialist Soil Machine Dynamics Ltd (SMD) and Newcastle University who are together developing an autonomous swarm system for rapid surface to deep ocean exploration.

SMD and CRRC TEC, both subsidiaries of Chinese parent company CRRC Corp Ltd, are the main sponsors behind Team Tao. SMD is the number one independent designer and manufacturer of specialist subsea remotely operated vehicles (ROVs) working in hazardous environments worldwide. CRRC TEC is the world's largest provider of propulsion and power control systems.

Chris Wilkinson, Tao Team Advisor and Chief Technology Officer at SMD explains: "SMD has a long history of creating subsea technology solutions, our equipment has played a major role in laying over 80% of the world's physical connections for the internet between continents. Team Tao being the only UK team


Courtesy of SMD

in the second round of the Shell Ocean Discovery XPRIZE Challenge is a great achievement for them and something we are extremely proud to support."

"The competition is all about finding faster and cheaper ways to create maps for all our oceans' seabeds, the current estimated cost and time to do this is $3 billion by 2030. The technologies which will come out of the XPRIZE will give us the ability to finally discover underwater resources, geological features, new species and safer methods of mapping and exploring the world's oceans."

Team Tao operates with a core team of four engineering experts from SMD, Newcastle University and CRRC TEC Ltd and is backed by a panel of seven industry and academic advisors. Their approach to the Shell Ocean Discovery XPRIZE involves international collaboration through partnerships with companies in China, the US and France, as well as research and innovation experts at Newcastle University.

Professor Nick Wright, Pro-Vice-Chancellor for Research and Innovation at Newcastle University, said: "Team Tao represents industry and academia working together to solve a global problem. If we can increase awareness and understanding of our oceans there are significant and wide-ranging economic and environmental opportunities from eco-tourism to bio prospecting."

Teams competing in the semi-final hail from Canada, China, France, Germany, Ghana, India, Japan, New Zealand, Portugal, South Africa, Switzerland, the United Kingdom and the United States. Groups include university teams of undergraduate and graduate students, non-profits, start-ups and professional scientists and engineers.

Dale Wakeham, Tao Team Leader and Industrial Design Engineer at SMD, adds: "It's fantastic to go through to the next round of the competition. Ultimately our mission is to help kick-start the new 'ocean economy' by redirecting the market to use multiple, simple, low value assets which come together to create a complex industry-leading ecosystem survey, offering data that is attainable and relatable to inspire positive change. For us it's all about discovering, monitoring and learning how to best protect our oceans through the development of rapid sensing big data technology."

The Shell Ocean Discovery XPRIZE semi-finalists now move forward to Round 1 testing starting in September 2017, this will aim to reach depths deeper than the Grand Canyon and map an area that is nearly five times the area of Paris.

Qualifying teams will then move on to Round 2 in September 2018 undergoing deep-sea tests challenging the teams to operate their solutions at depths of 4,000m. The winning team will be announced in December 2018.

The competition is part of XPRIZE's 10-year Ocean Initiative – a commitment made to launch five multi-million dollar prizes by 2020 to address critical ocean challenges and inspire innovation that helps create an ocean that is healthy, valued and understood.

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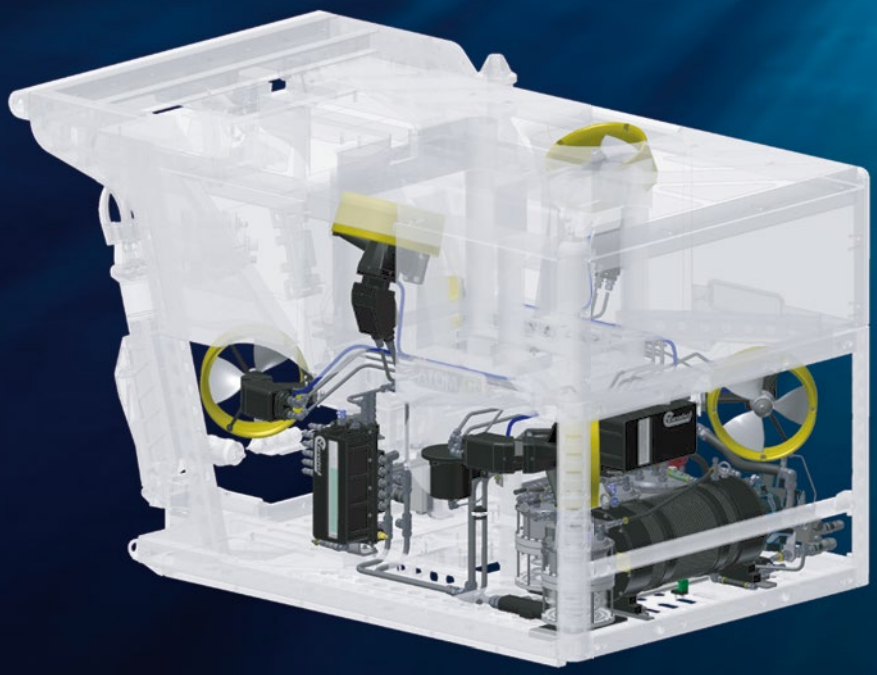

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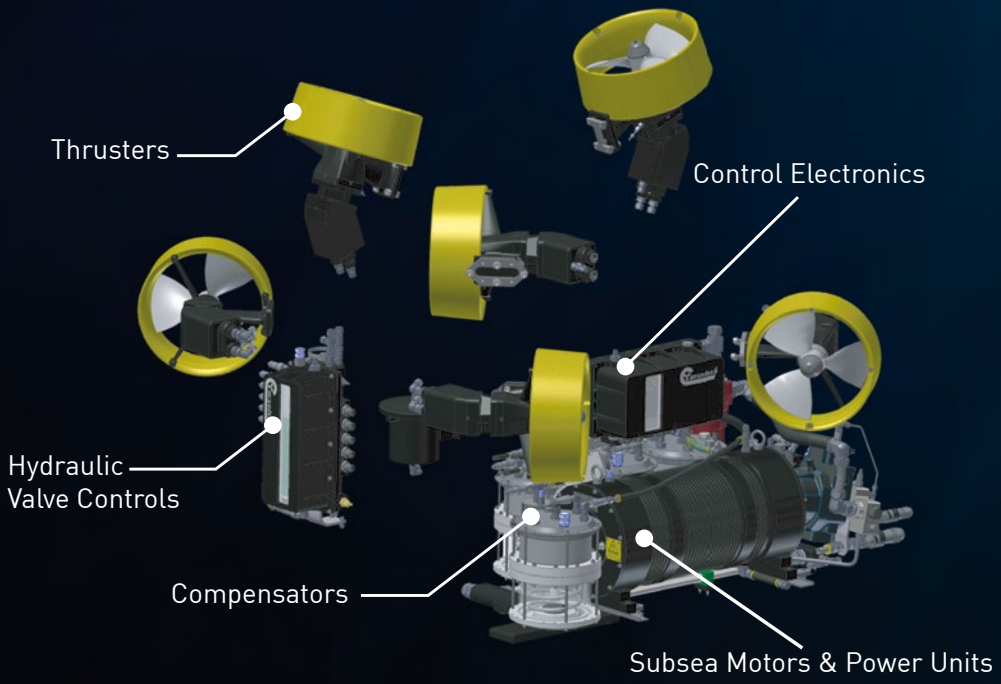

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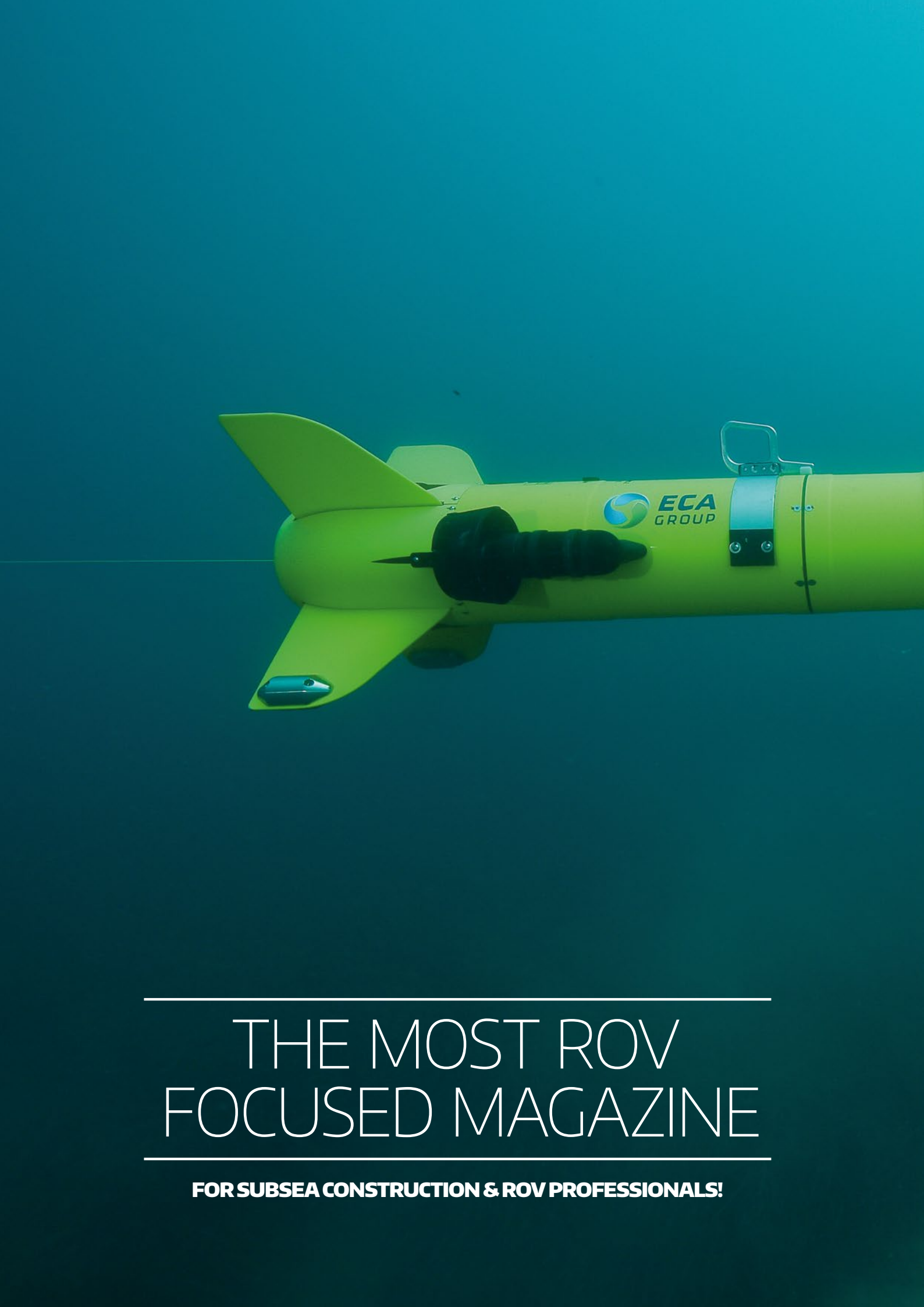

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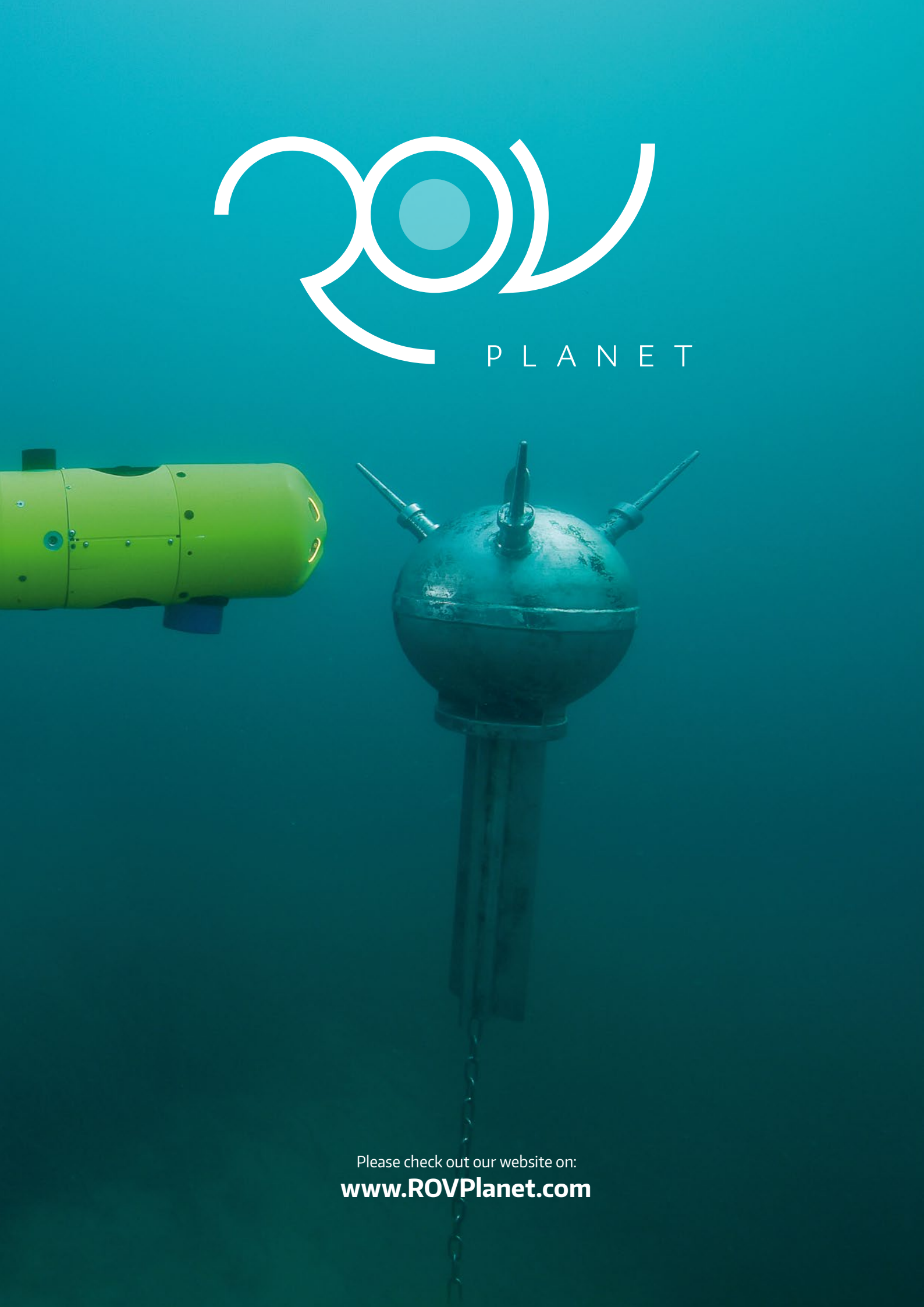
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ECA GROUP'S UMIS MCM SYSTEM MAKES OBSOLETE CONVENTIONAL MINE HUNTERS

UMIS is ECA Group brand new Mine Counter Measure (MCM) unmanned system able to carry out any MCM missions, using a collaborative system of surface and underwater robots, thanks to an advanced Command & Control System.

Delivering the UMIS system to the first customers in 2016, ECA Group's solution made conventional mine hunters obsolete. It has proven to be faster in fulfilling operations, more efficient, cost-effective and safe, as the crew is kept away from minefield.

Using conventional mine hunters on a minefield have indeed many drawbacks.

First, the high cost to reduce the ship's magnetic signature to a very low level. Secondly, the ship detects mines using a Hull Mounted Sonar (HMS) of which mine classification depends, on its range and resolution. ECA Group sonar expert Dr. Marc Pinto explains;

"Physics of sonar dictates that you can't have both range and resolution: long range sonars have poor resolution. High resolution sonars have very limited range. With conventional mine hunters, it is either required to approach and manoeuver close to the possible mine for a good classification, which is risky and time-consuming, or, the minehunter stays far from the targets, leading to a low resolution and a high probability to miss some mines, which is also a high risk".

In comparison, ECA Group's UMIS deploys Autonomous Underwater vehicles (AUVs) carrying the sonar and Unmanned Surface Vessels (USVs) which bring identification and disposal vehicles on the minefield, leaving the mothership away in a safe zone. UMIS manages a set of drones which cooperate autonomously into the dangerous area.

Courtesy of ECA Group

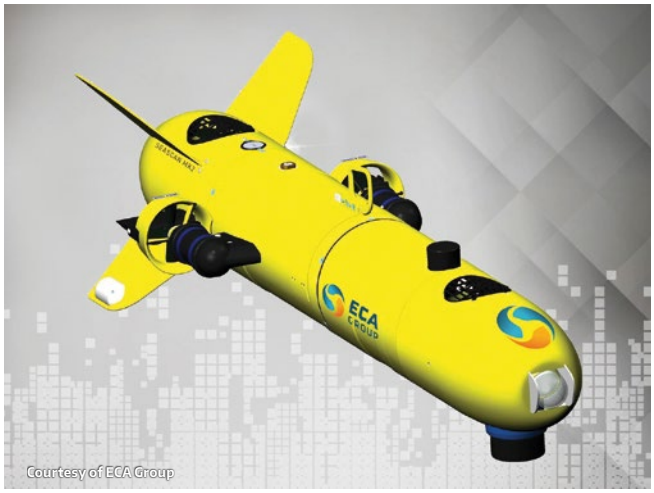
"It is proved that, operating in parallel, the UMIS system can divide by at least 3 , the time of missions, and comes with a higher efficiency and clearance rate." reports VADM (Ret.) Christian CANOVA, FRN, Undersea Warfare Expert and former NATO Maritime Command Deputy Commander.

UMIS system uses SEASCAN MK2 for identification and the K-STER C mine disposal system for neutralization and can be used collaboratively with the embedded Automatic Target Recognition (ATR) in A9-M AUV or A18-M AUV, to reduce the MCM Missions duration.

Courtesy of ECA Group

INSPECTOR MK2 USV

ECA Group's Unmanned Surface vehicles (USVs) are an essential component of UMIS, as it acts as an intelligent docking system for AUVs or ROVs, allowing them to be automatically deployed and recovered: it enables recharging and data download, as well as fast transits. The USV can be equipped with satellite, radio and WiFi for easier communications, as well as acoustic modem and short baselines for underwater communications and positioning. This allows underwater inspection and intervention to be supervised by an operator based on a safe spot. Last, the Unmanned Surface vehicles equipped with down-looking sonars are the ideal platforms for detection of in-volume mines as well as obstacles (such as nets) for safe AUV navigation.



Courtesy of ECA Group

The ECA Group has a full range of AUVs, spanning from the most compact A9 to the largest versions A272 and ALISTAR3000. They all share the same IT architecture, autonomous software and supervision interface.

The A9 range is a recent line of small AUVs of between 50kg and 120kg. Available since the end of 2012, they can be put into operation by two people without any particular method of launching the vehicle. The French Navy has been equipped with an A9 AUV since 2013. Three other countries purchased one in 2014. They are well suited to coastal and harbour surveillance.


Courtesy of ECA Group

The new A18 range comprises robots of 350kg to 650kg that can operate at depths of up to 3,000 metres. They represent ECA Group's new mid-range AUVs. They can be deployed from a light naval platform from 12m, using different launching and retrieval systems also offered by ECA.

Courtesy of ECA Group

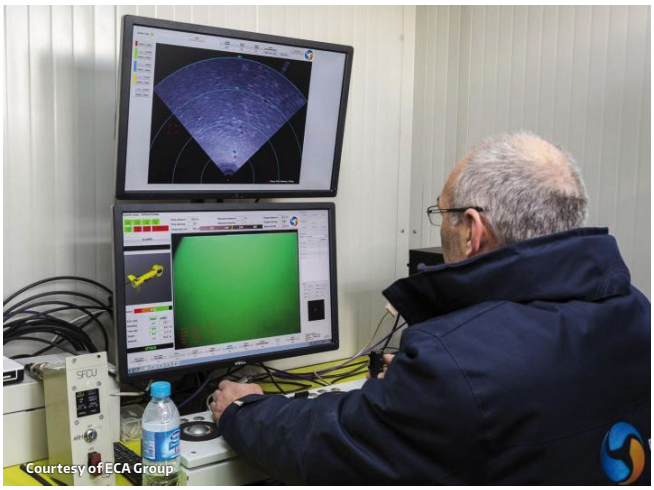
The A27 and ALISTAR3000 AUVs are the ECA Group's standard range. Developed between 2003 and 2013, they have substantial dive endurance (more than 30 hours) and great sensor-carrying capacity. They can be used in the most demanding operations. The French Navy uses the A27 AUV for hydrography and long-range underwater surveillance operations.

SEASCAN MK2

Seascan MK2 is a light weight self-propelled ROV dedicated to inspection missions. Its unique architecture ensures second to none performances in terms of hovering capability and stability in turbulent water. Easy to deploy from any kind of platform, the user friendly command and control software offers auto piloting functions to improve mission efficiency. Powered by a rechargeable battery, the Seascan MK2 takes benefit of the real time sensor data gathering through the optical fiber without the limitations of classical ROV towing its umbilical. Thus it will be preferred for harsh environmental conditions (strong current), in obstructed area where umbilical may be caught or for long range inspection (e.g. water pipe).

K-STER C

K-STER C vehicle is a light weight expendable mine disposal vehicle dedicated to mine warfare. It is fitted with a shape charge in a tilt-able head to aim at the target to dispose of. Its unique architecture ensures second to none performances in terms of hovering capability and stability in turbulent water. User friendly command and control software offers auto piloting functions.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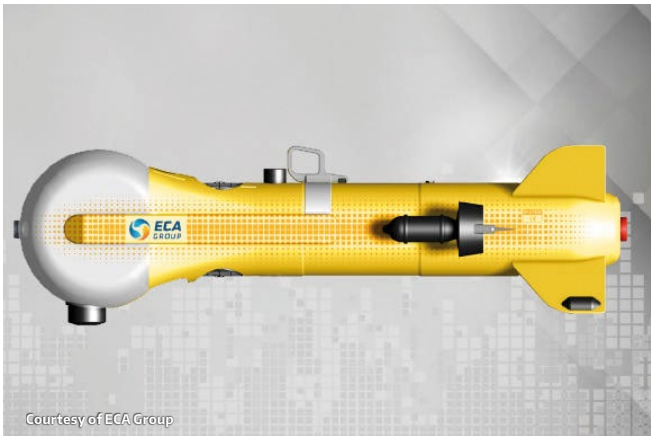

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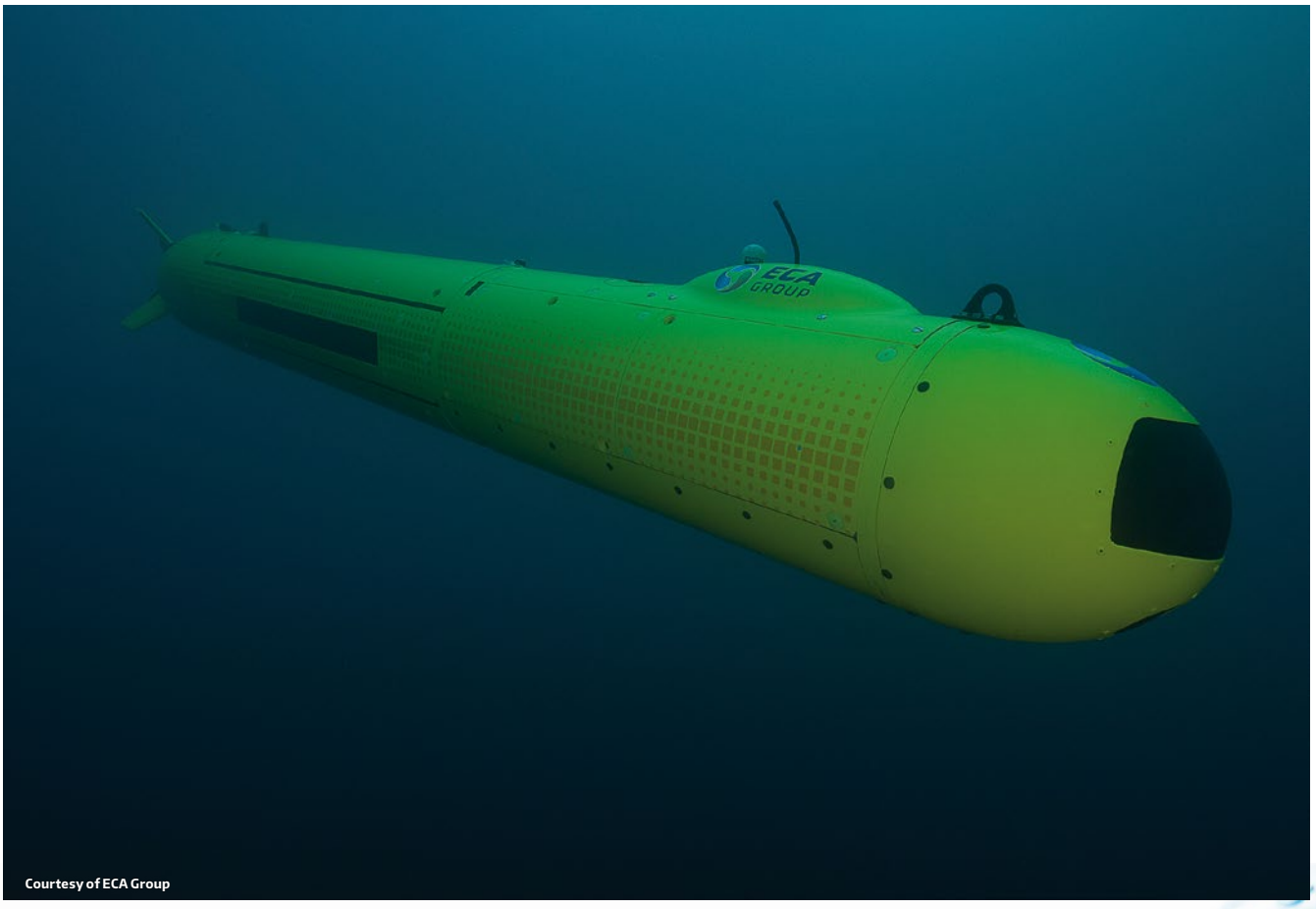


Courtesy of ECA Group

TRELLEBORG

COLLABORATION LEADS TO FIRST DBMS FOR INSTALLATION BY ROVS

To meet customer demands, Trelleborg's offshore operation collaborated with SubC Partner to design, manufacture and test a Distributed Buoyancy Module (DBM) for installation by a Remotely Operated Vehicle (ROV) on to on to a Floating Production, Storage and Offloading (FPSO) vessel's 12 inch production riser in a steep wave configuration. By having an ROV installable DBM, Trelleborg and SubC Partner were able to successfully execute a world first offshore project, which succeeded in replacing buoyancy modules on a live riser, without shutting oil production.

Courtesy of Trelleborg

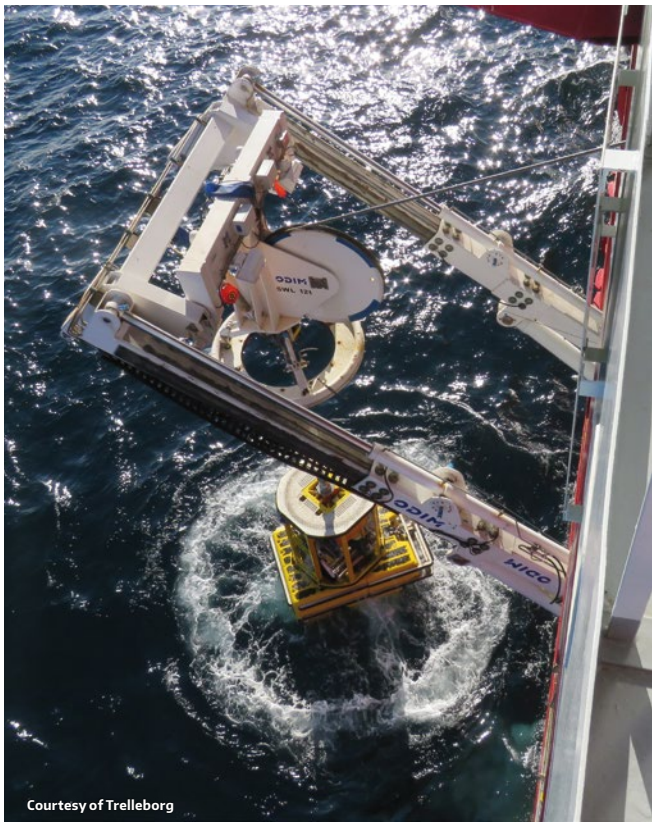
In floating production scenarios, pipelines such as flexible risers, cables and umbilicals are often required to be held subsea in specific geometric configurations to prevent over utilization of the system. To achieve this, one favored method is to attach discrete buoyancy modules to the outside of the pipeline. This process is usually done topside prior to the installation of the riser itself. Until now it has not been possible to attach the buoyancy on a live riser; the riser would have to be disconnected to perform the operation, causing production to stop, requiring expensive setups and significant cost in downtime.

SubC Partner works with its customers to lower cost of energy by developing innovative engineering solutions and executing well planned and efficient offshore campaigns. In this instance, to enable fitment of buoyancy on a live riser, a bespoke suite of ROV tools was developed by SubC Partner, while Trelleborg engineered a new type of buoyancy module.

Andy Hey, Sales Manager at Trelleborg's offshore operation in Skelmersdale, says: "A variety of installation features and precise datum points had to be built in to the buoyancy modules to provide a known and repeatable interface between ROV installation tooling and the DBM components. Dimensional tolerances on a buoyancy element shell are generally intrinsic to the roto-molding manufacturing process. Attaining the stringent tolerances required for this project was made a success through collaboration between design, suppliers and tooling engineering."

Lars Wigant, Director & Partner at SubC Partner commented: "Installation of the new ROV installed DBMs was a complete success. We were able to safely remove and install multiple modules in a very limited timeframe. We look forward to the next opportunity where we can use this field proven design on another project."

Subsea Distributed Buoyancy Modules are typically used between a subsea structure and a surface vessel or platform. The clamping solution allows the DBMs to be fitted at any point along the length of the pipeline and the buoyant load must not migrate or degrade over the design life of the product. The two main functions of the DBMs are to provide uplift and maintain location along the riser.



The internal clamp to riser interface was based on a hinged version of Trelleborg's 'Type 2' friction clamp with nylon segments and rubber pads for added compliance. The clamp had no loose components and the tightening mechanism was redesigned to suit the ROV interface. During testing, clamp performance was excellent, achieving a slip load in excess of 33 kN at 'end of life' condition and in prototype testing the hinged crossbars within the design meant that the fastener tightening was tolerant of a variance in tightening sequence.

In addition, buoyancy element fasteners, the mechanism that holds the two buoyancy halves together, had to be captive. To accomplish this, Trelleborg opted to make use of a bolted flange tightening system instead of circumferential securing straps and tensioners. This presented a challenge by increasing the risk potential for buoyancy element misalignment when elements were paired. To overcome this bespoke 'floating' nuts and bolts were used. The 'floating' nuts self-aligned upon engagement, ensuring every buoyancy element was aligned correctly and secured.

THE SEATREPID STORY


Courtesy of Bob Christ

Bob Christ

SeaTrepid started out with a wedding engagement. I asked my friend Scott Bentley to be my best man. But the bride chose the location – the wedding was to take place at the Geographic North Pole. Scott was stoically nonplussed.

While traveling to Russia on a Delta flight for staging to the high Arctic, Scott and I were introduced to two scientists with the Shirshov Institute in Moscow. They were developing a micro-ROV for commercial use: the GNOM. That was the start of VideoRay.

Three years later, Scott and I had built VideoRay into a major manufacturer of observation class ROVs with annual revenues of $3 million and sales of over 300 vehicles. However, my heart was – and still is – in operations, so I left VideoRay behind and started my new service business, SeaTrepid.

SeaTrepid spun off from VideoRay in October 2003. We continued work began with the implementation of the US Coast Guard's ROV program into their new MSSTs (Marine Safety and Security Teams), formed in the wake of the 9/11 terrorist attacks. SeaTrepid's governmental work led to commercial work that turned into a brisk business.

Then came the storms of 2005 in the US Gulf of Mexico. Hurricanes Katrina and Rita hit the coasts of Texas, Louisiana, and Mississippi, the effects of which can still be seen over 10 years later. What was less well-known were the 187 oil and gas platforms left resting on the bottom of the Gulf after the storms had subsided. Practically every offshore oil and gas platform received some level of damage from winds and waves ranging from minor to catastrophic, and the resulting mess needed to be cleaned up by somebody.


Courtesy of Bob Christ


Courtesy of Bob Christ


Courtesy of Bob Christ

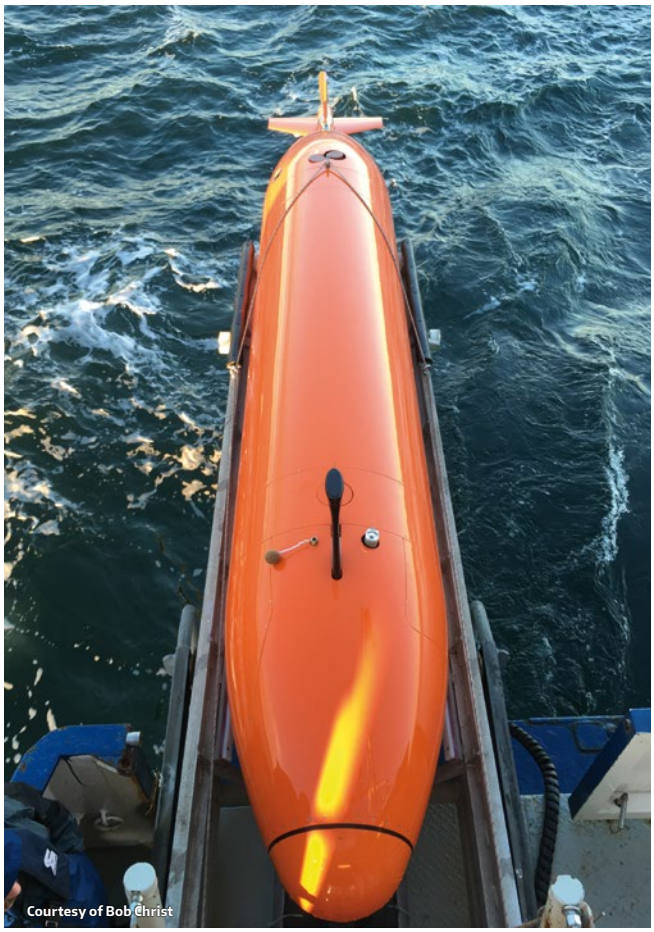

Courtesy of Bob Christ

In June 2006 SeaTrepid moved its headquarters from Pennsylvania to Louisiana in order to get closer to the action. Since then, things have continued to accelerate.

In 2007, SeaTrepid constructed its purpose-built facility in Robert, Louisiana to develop larger ROVs and match the changing market. Under the mantra of 'Doing more with less', SeaTrepid is now in charge of a fleet of over 30 small to light work class ROVs, alongside a pipeline division (Remote Inspection Technologies) that specializes in robotic inline inspection systems. This in addition to running remote sensing for assessing pipeline depth of burial both on and offshore.

Then in 2015, SeaTrepid was approached by a British entrepreneur with a passion for Ocean exploration and a simple question 'Why does no one operate more than one AUV per host vessel?' Underlying his question was a desire to transform the industry based on the concept that if you could double, triple, or even quadruple the work product per unit of vessel time, costs would be lowered and results delivered faster than ever thought possible. If he was right the impact for our customers and the wider offshore industry in the form of increased efficiency and cost savings would be incredible.

The quality of SeaTrepid's people and experience led to an invitation to join the Briton, and his company Ocean Infinity, in his quest and thus SeaTrepid DeepSea was born. With the addition to the team of Swire Seabed from Bergen, Norway,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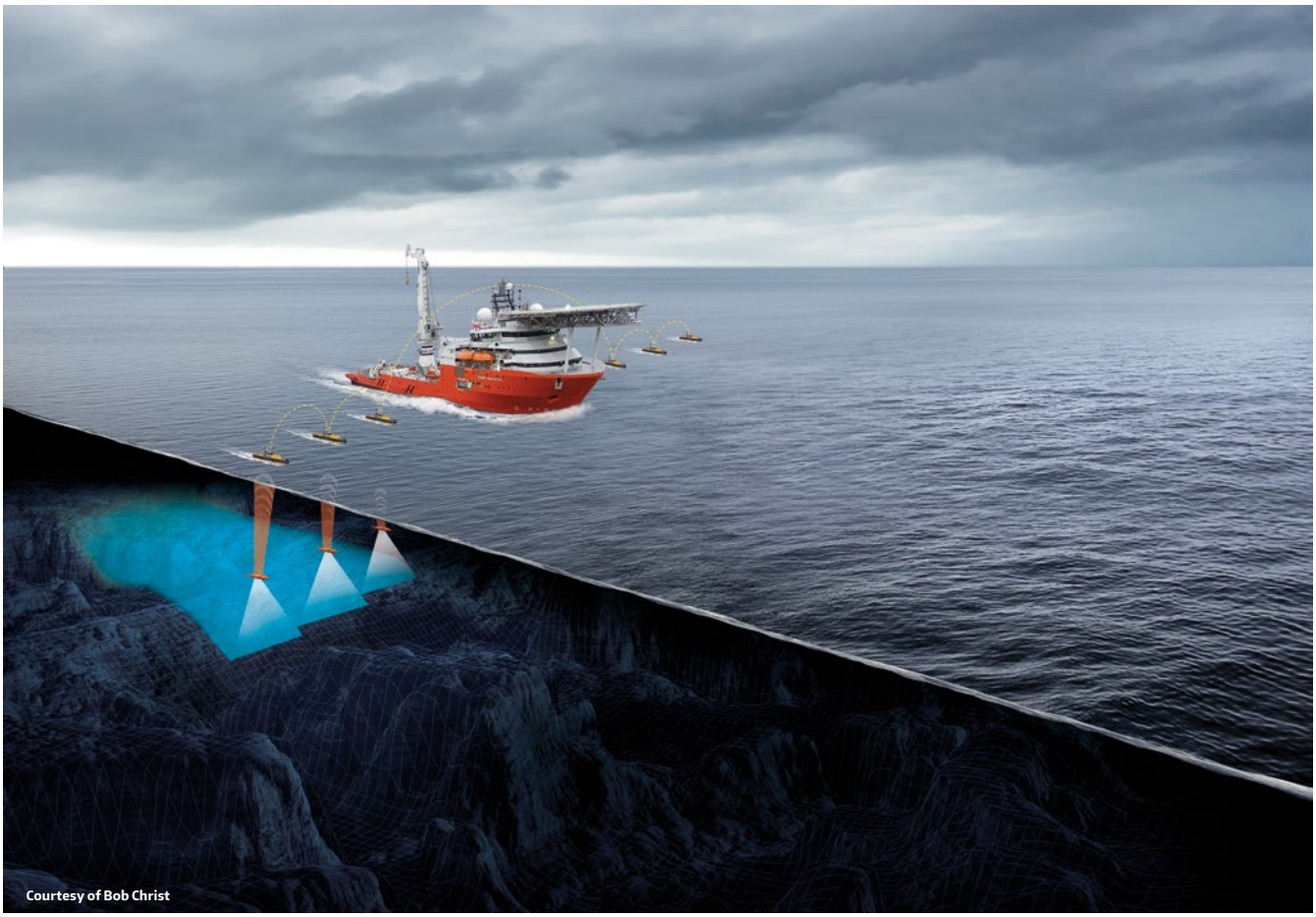

Courtesy of Bob Christ

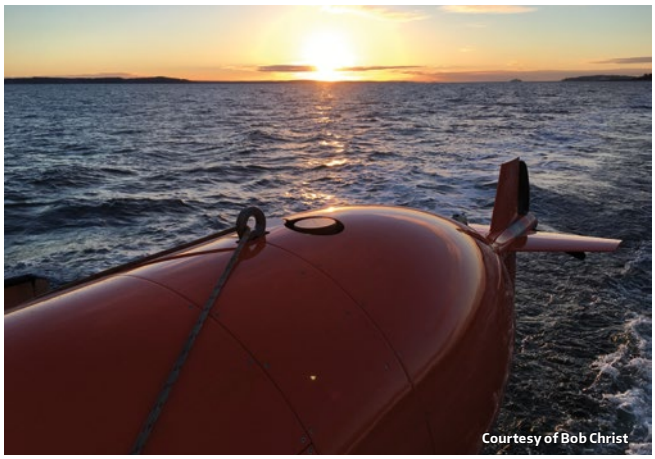
who provide Ocean Infinity with its service vessel – the Seabed Constructor – a 2014 built MT-6022 MkII class MPSV – as well as survey services, SeaTrepid's newest business unit became a key part of a world class global operation.

From the single host vessel, SeaTrepid's is in operational command of Ocean Infinity's fleet of six Kongsberg Hugin 6,000m depth-rated Autonomous Underwater Vehicles (AUVs) and its partner Unmanned Surface Vehicle (USV). The USVs, built by ASV Global of Portchester, UK, then relay tracking and telemetry back to the host vessel via IP-based packets, switching radios for constant communications from the 'mother ship' to the AUV (via the USV).

Some of the innovative concepts for fielding this spread include the efficient use of mission planning software to optimise the fleet coverage of the survey area, as well as to provide clients with end-to-end mission simulations in advance of offshore operations, and the deployment of USVs to maintain constant tracking and communications with the AUVs.

During times of economic prosperity, the incentives to innovate are not quite as pressing as when times get tight. In the current depressed offshore oil and gas market, we all must find ways to deliver more value to our customers so as to stay ahead of the competition. Our very survival depends upon it.

Alongside my business partner Steve Walsh and our management team, we operate a well-established world-wide niche in the market that is not being serviced by our larger competitors. Now in our fourteenth year of business, we continue striving to do things differently in order to "deliver more for less".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THE SINGLE-BEAM STORY:

THE EVOLUTION OF SINGLE-BEAM IMAGING SONAR FOR ROVS

By Mark W. Atherton, Special Projects Manager, Kongsberg Mesotech

This first article focuses on single-beam scanning sonar and its operational strengths and weaknesses. In a future issue, I'll be discussing the pros and cons of multibeam sonars.

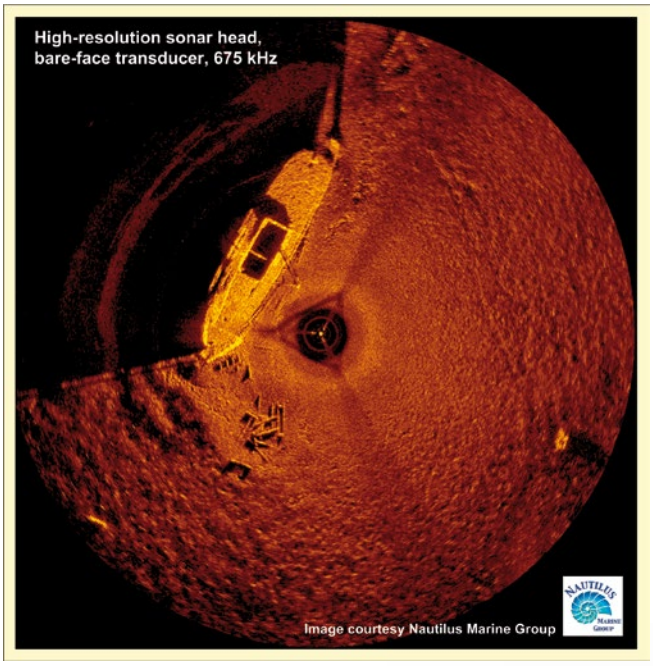
1973 is ancient history for most people in the offshore business. However, there are a few of us who remember the emergence of commercial ROVs. They were little more than flying eyeballs equipped with a black-and-white camera and a simple fluid-filled magnetic compass.

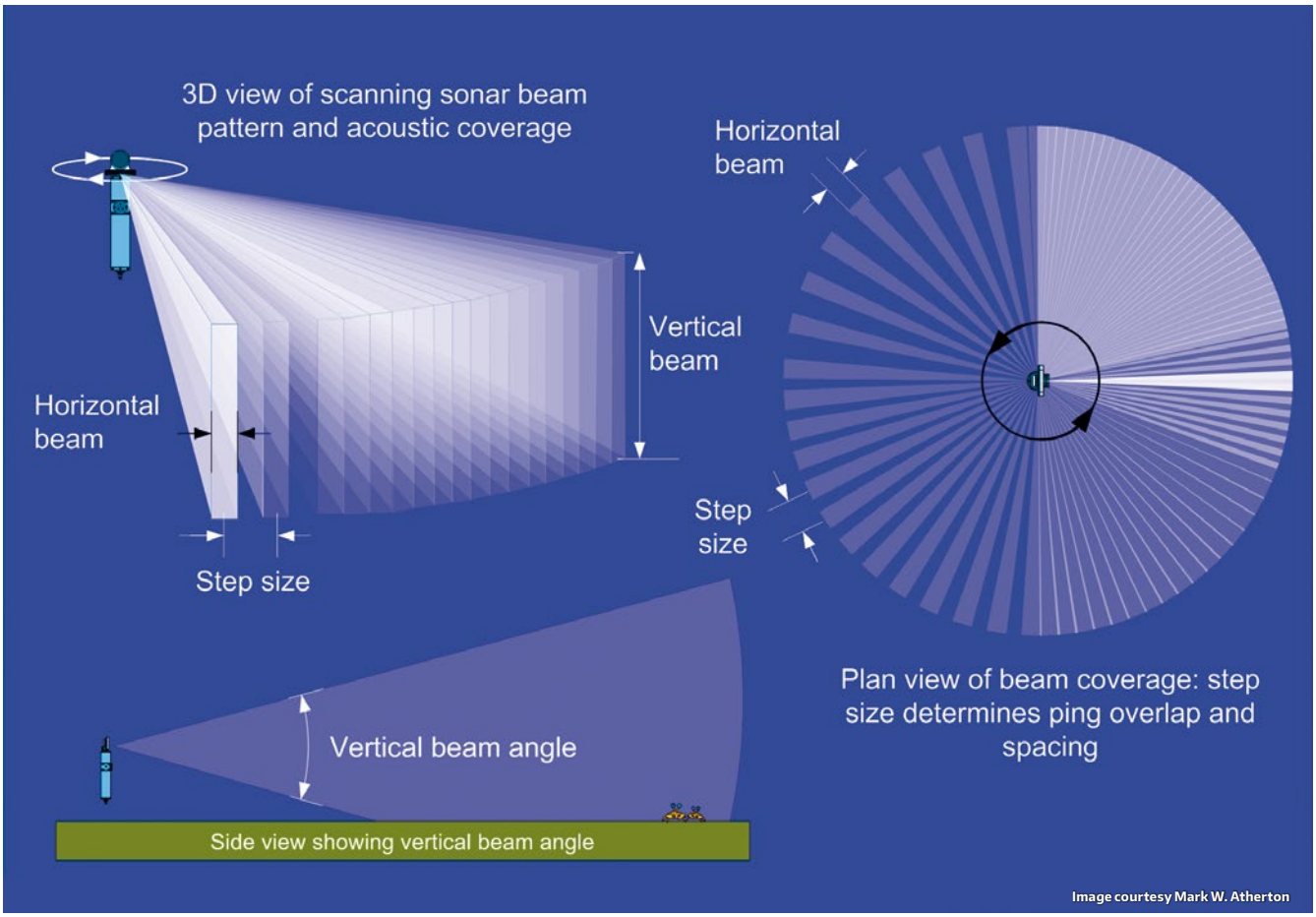
Initially, commercial divers didn't view ROVs as too much of a threat to their exclusive business. They broke down on a regular basis. Also, ROV entanglement was seen as a quick way for a diver to make a few bucks doing "snatch and grab" rescues.

But the teething period was soon over – and the design, quality, and performance issues of ROVs improved. Divers were forced to change their attitude. Now an ROV could sit on the bottom (or hover mid-water) and complete the simple observation jobs that were traditionally part of the diver's work repertoire.

Unfortunately, when visibility was poor, the ROV television camera could not image, making the vehicle pilot operationally blind. This limitation was especially exasperating when maneuvering around structures with entanglement risk.

Sonar was the answer to this problem. Today, virtually every observation-class or larger ROV is equipped with sonar to provide an ROV pilot a set of acoustic eyes.





SONAR IN THE 70S

The marriage between sonar and ROVs started in the mid-1970s, when Ametek Straza kick started a technological leap in the fledgling ROV business. They launched the first commercial Continuous Tone, Frequency Modulated (CTFM) sonar for ROVs. Although this sonar provided a very low-resolution image, it had a unique audio output that allowed a pilot to acoustically guide an ROV to a target.

With CTFM sonar technology, the operator could hear the echoed return from a target. The frequency component of the audio provided a reasonable idea as to the target's range. A distant target had a high-frequency response that became progressively lower as the ROV closed the gap to the target.

The introduction of the 971-series scanning sonar by Mesotech Systems Ltd. (now Kongsberg Mesotech Ltd.) in 1983 was a game changer for the ROV world. With scanning sonar, the transducer turns (using a stepper motor), so that from a fixed position it provides up to 360° of acoustic view. The display resolution of the 971 was far better than its CTFM counterpart and the sonar head was small enough to fit on most observation-class and larger vehicles.

The 971 was not only an obstacle-avoidance sonar. With a 1.8° horizontal beam width, it also had the resolution to define shape and locate small targets. The 971 was soon being used on ROVs in the oil patch of the Gulf of Mexico for pipe-lay projects, rig support, underwater construction, and search and salvage operations. But scanning sonar technology came with a price – early systems were in the fifty-thousand-dollar range.

There was another problem with the early scanning sonar: it used an open-faced transducer attached to a shaft with o-ring seals to keep water out of the electronics housing and motor end. In depths greater than 1000 meters, and sometimes less, even a slight bump to the transducer often resulted in deflection of the shaft/o-ring and water leaking into the sonar head electronics. Effectively, a minor accident turned the sonar head into a very expensive aquarium!

DILEMMA OF THE DEEP

By the late 1980s, oil companies were moving to drill in deeper water, and the operational depth of both ROVs and onboard sensors subsequently increased. The push was on to solve the water ingress problem.

The answer turned out to be covering the transducer with an oil-filled dome and using a bulkhead penetrator to isolate the transducer/motor from the electronics. This domed-head design was adopted by scanning sonar manufacturers and significantly increased the depth rating of different scanning head models. Problem solved – sort of!

Although different oils are used by manufacturers to fill the sonar domes, no oil follows the same speed of sound characteristics as water. As temperature, salinity, and pressure change, so does the in-water sound speed. It is this sound-speed difference in the oil and water that causes a problem.

Even though there are only a few centimeters of oil separating the transducer and the dome, the different speeds are enough to cause acoustic refraction. The result is a defocusing of the sonar beam. A measured horizontal-beam angle of a degree or two at the surface degrades significantly with pressure, especially at depths greater than 2000 meters. Interestingly, similar defocusing occurs with a domed oil-filled head in warm tropical water.

One option in solving the refraction problem was to remove the dome and thus design for a bare-faced transducer. By 1999, Kongsberg Mesotech started to manufacture a high-resolution scanning sonar that exposed the transducer to seawater and isolated the pressure-compensated motor end from the housed electronics.

The pressure-compensated motor solved the flooding problem encountered with the first generation of exposed transducer heads from the 1980s. And with the transducer exposed, there was no refraction.

Freedom from the dome also opened the design door to increasing the transducer length and narrowing its horizontal beam angle. Image clarity (transverse resolution) is highly dependent on the horizontal width of the sonar beam. The narrower the beam, the easier it is to discriminate between two targets.

The high-resolution head took transverse resolution to a new level. In the Gulf of Mexico, one sonar services company dumped 25 domed heads and eventually purchased 132 of the new high-resolution design. Oil companies were clearly demanding image clarity.

But with this new innovation came one inherent drawback – size. A domed head is smaller than its high-resolution counterpart. Also, ROV operators liked the protection offered by having the transducer covered.

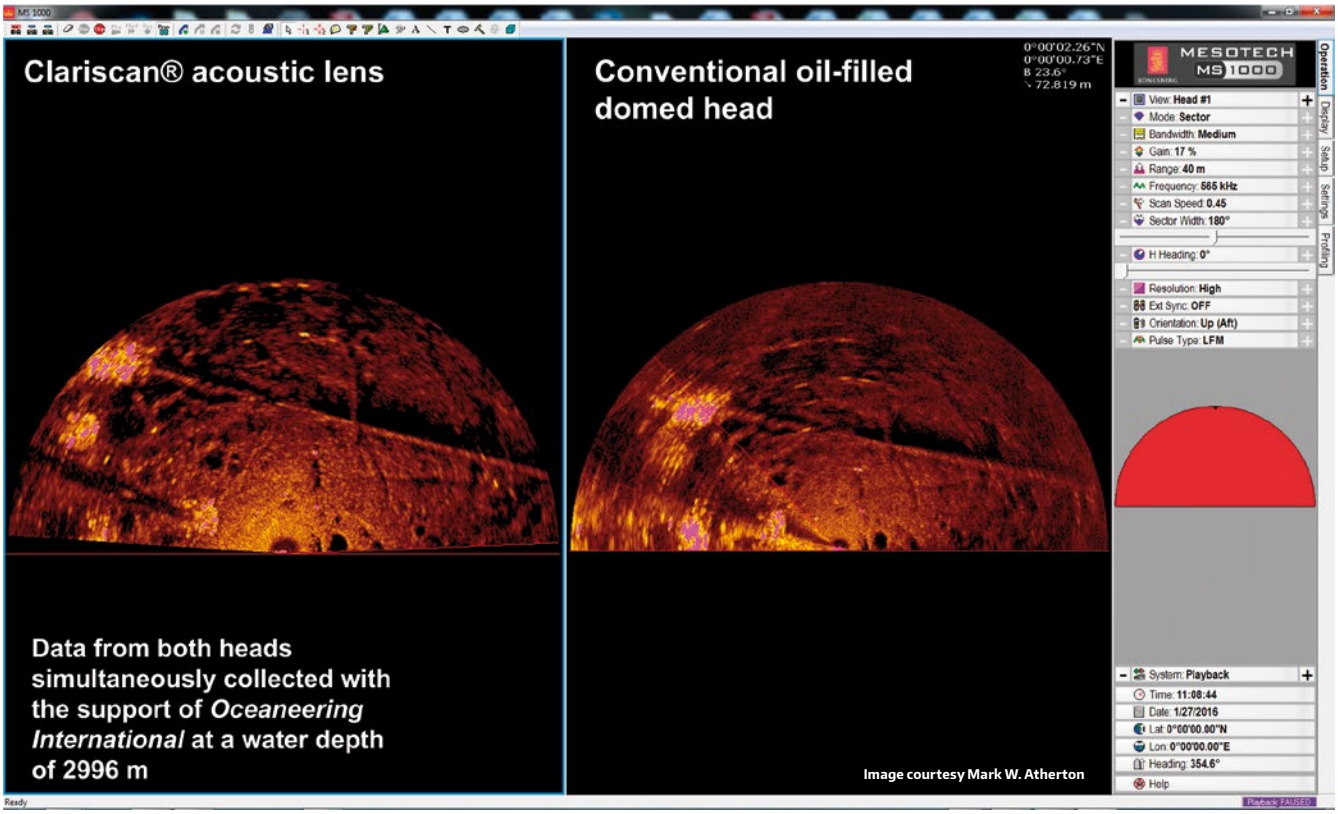
A TECHNOLOGICAL REVOLUTION

The mid-1990s also brought other technology changes: computers, DSP chips, and digital telemetry. A mass market for digital technology brought the price of electronic chips down and fostered wide-bandwidth, high-speed data transmission.

With the oil companies moving further offshore into deeper water, ROV umbilical lengths were pushing the limits of analogue data transmission over copper wire. To meet new depth requirements, ROV companies had to transition to longer umbilicals with optical-fibre and digital-data transmission.

With the ROV industry turning digital, so did the sonar manufacturers. Sonar manufacturers realized that hardware-based surface processors were expensive to both design and build.

The first computer-based scanning sonar was the MS 940 that operated using Windows 3.1. It was comprised of an



ISA PC board, software, and external power supply. Ancient technology by today's standards, the MS 940 was the start of using computers instead of hardware-based sonar processors. This change also reduced cost. Using off-the-shelf consumer computers eliminated having to design expensive topside hardware.

One of the key components to active sonar is the transducer. By the early 2000s, transducer design was in transition. Scanning sonars began using dual-frequency transducers – typically in the frequency range of 300 to 600 kHz. Dual-frequency transducers provided an operator with long-range capability when using the low frequency (typically 200 meters), and better resolution when switching to the higher frequency. With computer-based sonar processors, switching between different frequencies was as simple as a software selection.

In addition, transducers have evolved from a monolithic to a composite design. Most high-frequency sonar systems use monolithic Piezo crystalline Lead Zirconate Titanate (PZT) ceramics or Piezo-composite PZT elements for the transducer because of their electro-acoustic properties. In particular, PZT elements exhibit a high dynamic range of transduction to transform high-voltage signals into acoustic energy (acoustic pressure). Conversely, when impacted by very low amplitude acoustic pressures, PZT elements convert them into voltage.

The past ten years have seen the move from conventional "slab" monolithic transducer elements of a fixed frequency to wide-bandwidth, composite transducers. A typical composite transducer is made of a PZT-pillar matrix (columns). These columns are made either by injection molding, or precisely sawing a slab element and filling the matrix voids with a non-conductive resin or polymer.

The radiated acoustic energy of a composite design can be better controlled due to the geometry of the pillar matrix. When electricity is applied to the element, the pillars oscillate primarily along the long axis. This oscillation reduces perpendicular axis stress and tends to reduce transducer side lobes. It also provides a wider frequency bandwidth, which offers signal transmission techniques, such as Compressed High Intensity Radar Pulse (CHIRP) and tunable frequency.

BACK TO THE DOME

But composite transducer technology has not solved the domed oil-filled head issue of acoustic beam defocusing due to pressure or temperature. ROV operators still want to use domed heads due to their size, transducer protection, and cost. But they have had to deal with image degradation at depth. Finally, this problem has been solved using a patented acoustic lens that attaches to the face of the transducer. Called Clariscan®, it reverses the refraction and the resulting image is hard to distinguish from that collected with a bare-faced transducer.

We now have image resolution that is close to photographic. But there is still one constraint to using single-beam sonar. This constraint has been with us ever since the introduction of the scanning sonar 34 years ago to the ROV industry.

The speed of sound in water will always limit the update rate of a single-beam imaging sonar. And it's tough to beat physics.

The sonar has to ping and wait for the echo before the transducer turns and repeats the cycle. With an average in-water sound speed of 1500 meters per second, this limits the maximum number of pings per second to 7.5, as the round-trip distance is 200 meters.

And this maximum update rate does not take into account the time needed to telemetry the data to the surface, turn the transducer, and reset to ping again which can take a few milliseconds. Realistically, a ping rate of six per second at a 100-meter range is a better number to use. Assuming a beam angle of 1°, the maximum coverage is 6° per second or 60 seconds for a contiguous 360°.

Those looking for a faster image refresh have been lured into the world of multibeam sonars. Multibeam sonars, it turns out, have their own sacrifices to make. But that, as they say, is a story for another day.

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QSTAR ROV PILOT TECH TRAINING MODULE NO.02

ELECTRICITY AND ELECTRICAL SYSTEMS

By Richie Enzmann

In March I have been back to Las Palmas to continue the second part of the ROV Pilot Tech Training with QSTAR ROV Training and Subsea Solutions – the Electricity and Electrical Systems module. Despite the oil and gas downturn there are still opportunities to work in several other industries.

According to Victor Sepulveda, Managing Director of QSTAR; "The Oil & Gas industry is the reference for ROV technology development and their biggest user, but not the only one. In the past decade, other sectors started using ROVs and therefor the job opportunities expand to other fields as fish-farming, energy sector from wind to water dams, municipalities, oceanography, search and rescue, subsea mining, forensics. We are looking forward to these markets, although lower value compared with oil & gas, but yet significant as potential for offering training, services and technology."

The participants in this cohort have come from England, France, and Brazil – like Julio Almeida, a 28 year old mechanical technician.

"About a year ago, I decided to look deeper into the industry, when I have heard about the use of ROVs in my robotics classes. It sounded like a profession that one could enjoy as a job. I have already attended several courses in Brazil, including a short ROV course and a more in-depth hydraulics course provided by Rexroth. However, I still felt incomplete and wanted to increase my knowledge. That's when I found out about QSTAR. When I started the course at QSTAR all my doubts were taken away, as I have arrived to the training and seen its facilities. In the last two weeks I had a great experience and Cristian, the trainer has been very professional and his teaching methods are revolutionary!" said Julio.

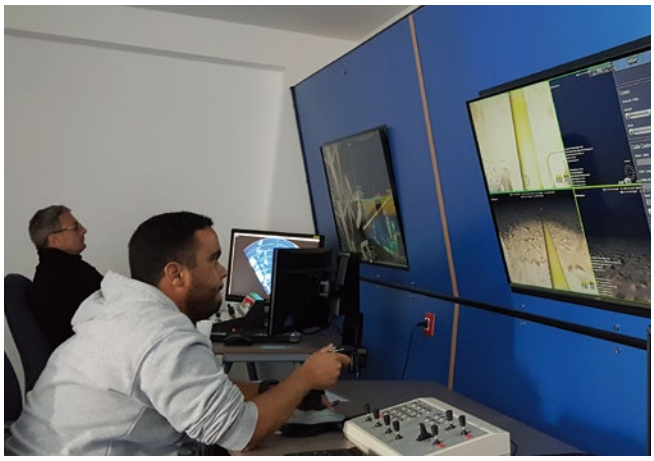
Some of the other trainees had military and diving backgrounds. Their vision is to continue their careers in UXO related operations. These types of missions are becoming more common in the offshore wind energy sector due to the large number of underwater mines left behind from WWII off the coasts of Denmark, Germany, the Netherlands, Belgium, France, and the UK. The underwater mines need to be detected and cleared before the wind turbine monopile jacket construction can actually begin in shallow water (0–50m).

"After deciding to pursue the career path of ROV Pilot/Tech and receiving excellent feedback from acquaintances that previously participated in the course at the QSTAR facility, I decided to sign up! I am currently mid-way through the 7 week premium course and could not ask for more. The content and presentation delivered by Cristian the instructor is to an exceptionally high standard, who is very engaging. The rate of delivery is very challenging but if any member struggles, Cristian is very good at altering his techniques to deliver his point. I was very surprised at the size of the setup here too. Highly recommend QSTAR to any prospect ROV P/T." said Dean Hamilton, who has a background in Offshore Security Project Management looking after oil & gas installations in high risk areas. Previously he served in the Royal Marine Commando with a specialty in anti-tank wire guided weapons systems – basically flying missiles. He hopes that this skill will give him a steady hand with the ROV.

Another trainee attending the course was Cyril Ibrahim, a former French Foreign Legion special forces who also served in the special diving unit and was awarded with the Cross Combat medal. After retiring from military service he retrained as a saturation diver and worked for 15 years before becoming an Offshore Client Representative.
"The location, the facility and management are all fantastic. The course itself is pretty challenging, but captivating and adding value. Highly recommended!" summarised his experiences Cyril.

After a relaxing weekend on the beach, enjoying the sunshine and the entertainment the island had to offer, we were eager to immerse ourselves into the world of Electrics! Cristian Gurgu, ROV Trainer was keen to make sure that the whole team could understand everything. As we progressed, he has well and thoroughly explained even the basic mathematics needed to understand electrical systems. The members of the group needed to refresh their memories in that domain.

"Everybody that worked with ROVs can advise the fresh attendees that the most issues will come from the electrical and electronic side. Understanding electrical concepts enlightens the future Pilot Technician to be more comprehensive in front of all the other technical and operational challenges that await. The recently updated IMCA R 010, to which QSTAR actively contributed, requires the students to develop a certain pack of basic knowledge and skills during their training. We take this very seriously and respect every student's background and rhythm of learning, helping with everything we can to bring the entire group to a common level. In a team, we



are only as strong as our weakest link, therefore the spirit is to polarize the students as a team and work together, the same way they will probably work again onboard a vessel or platform, caring and operating their ROV."

"The electrics and electrical systems module impacts some more than others, as it might appear to be a journey outside the comfort area. But as any exit from a comfort zone, it brings the joy and satisfaction of comprehension over things that looked untouchable until recently.
Our goal is not perfection, but to get better and better every day!"

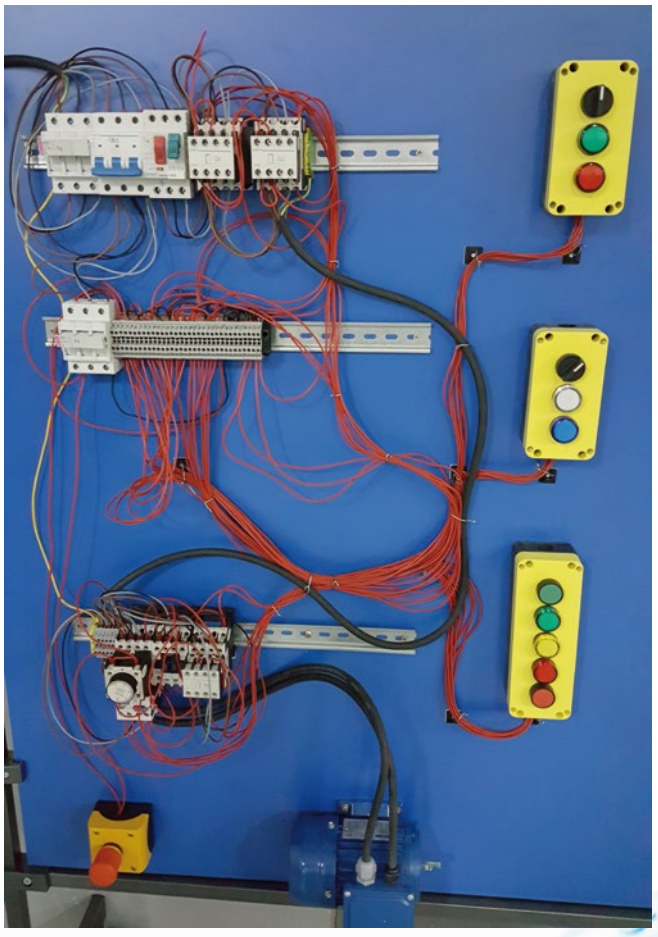
"Solid basis boost up the confidence of the future Pilot Technicians and with faith through responsibility they have the toolbox to fix, maintain and operate the ROVs." explained Cristian.

This module focuses on themes relevant to ROV electrical systems (Introduction to electricity – from atom to Ohm, Kirchhoff and power; Signals, Measurement instruments; Reactive components and filters; Power generation, Motors, Transformers, Power Factor; Electrical systems, Automation Components, Motor controls and drives), assorted with practical lessons to fundamental skills as workshop/laboratory work and hands on ROV piloting. In my opinion the practical part is always good to validate the theory and helps the knowledge to sink in.

We also had the chance to take a closer look of the starter circuit of an electrical motor that we were able to modify to practice trouble shooting. This circuit is in essence the circuit one would find on an ROV launch and recovery system (LARS).

Finally, the participants had a chance to enhance their piloting skills using the Forum VMAX and Marine Simulation's ROVsim. QSTAR has 3 units of these simulators, ensuring that 6 people can practice simulations as pilot and co-pilot at a time.

This module has passed away way too quickly, but I will be back soon to continue the ROV Pilot tech training. In our next issue, we will look into Module No.03, which is focusing on High Voltage Electrics.



Courtesy of Forum Energy Technologies

USING RIGID BODY SIMULATION TO ACCURATELY PREPARE FOR WORK OFFSHORE

Onshore simulation plays an effective role in minimising risk and training for live situations when work takes place offshore. As the industry adapts to the new lower oil price environment, we still find that the primary driver of cost is the time spent on site and the equipment itself. Therefore, getting it right first time and within the required timescale whilst working in what can be remote and inhospitable environments is key in ensuring project profitability and safety.

Where this approach can go awry is when the preparation onshore doesn't fully account for the scenarios faced in the field. To counter this, rigid-body simulation can be used to determine acceptability of equipment and procedures in an artificial setting.

Most subsea activities are performed by ROVs controlled from the surface. Whilst ROVs can perform a range of tasks, there are occasions when the work is more complex than anticipated. As an example, indicators, handles and valves may be inaccessible for larger vehicles.

Rigid-body interactive simulation provides an immersive look into the tasks and equipment in a virtual environment that mimics the real life environment ROV operators will face. The experience can help operators and equipment manufacturers understand where improvements can and must be made weeks or months before equipment is manufactured and operations begin. The simulation can also provide a dry run for pilots which can lead to reduced time on-site.

To support this, VMAX, the premier subsea simulation product of Forum Energy Technologies, focuses on the rigid body simulation space for engineering analysis and training. Over the past 10 years, the product has been in service throughout the world with training and engineering simulators in Asia, Europe, Australia, Africa and the Americas.

The VMAX product line includes full console ROV simulators, portable ROV simulators, engineering analysis services, as well as development products that provide customers with the capability to create their own unique simulations within their own company.

As Forum prepares to release version 3.1.4 of VMAX, Geoffrey Bixby, Software Development Manager, said: "We worked together with training supervisors from the major ROV companies from Brazil, Europe and the US to fine tune the product, focusing on updating stability, performance and usability. The refined system includes the ability to have 1080p resolution and also the updated state-of-the-art VORTEX physics engine which gives our simulator an amazing level of realism."

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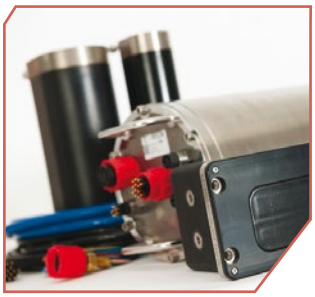

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