ROV PLANET

26

ISSUE

Q1 / 2021

The magazine of choice for Marine & Underwater Robotics focused Professionals

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ISSN 2634-0283 (PRINT)
ISSN 2634-0291 (ONLINE)

EDITOR-IN-CHIEF
Richie Enzmann

COPY EDITOR
Will Grant

SALES DIRECTOR
Nick Search

DESIGN & LAYOUT
Milan Farkas

CONTRIBUTORS
Richie Enzmann, Kevin Taylor, Keith Bichan, Jim Costopulos, Tina Bru, Ed Cassano, Leighton Rolley, Douglas Ramsay

SPECIAL THANKS TO
Åge Holsbrekken, Allan Nygård Bertelsen, Audrey Leon, Bill Mallin, Chris Hyde, Freddy Christensen, Gautier Dreyfus, Graham McAvoy, James Colebourn, Jean-Marie Lapasset, Jeff Vos, John Benson, Julian Lalanne, Katie Hodgson, Katie Marshall, Keith Bichan, Livia Oldland, Luke Alden, Marion Seyve, Lawrence Hislop, Matt Bates, Nicolas Gambini, Paloma Robinson, Paul Fletcher, Peter MacInnes, Rachel McAlpine, Raymond Ruth, Steve Phelps, Thomas Jonsson, Victor Sepulveda, Willard Balthazar

Front Page Cover Photo: Courtesy of REV Ocean
Poster Photo: Courtesy of TechnipFMC-Schilling Robotics

EVENTS CALENDAR

For more information about all events visit WWW.ROVPLANET.COM

APRIL 2021

MCEDD DEEPWATER DEVELOPMENT
London, UK (20-22 April 2021)

MAY 2021

OCEANOLOGY INTERNATIONAL (OI) CONNECT 2021
VIRTUAL (11-14 May 2021)

UNMANNED MARITIME SYSTEMS TECHNOLOGY (UMS)
London, UK (12-13 May 2021)

DEEP SEA MINING SUMMIT
London, UK (27-28 May 2021)

JUNE 2021

UNDERSEA DEFENCE TECHNOLOGY (UDT)
Rostock, Germany (29 June – 1 July 2021)

AUGUST 2021

OFFSHORE TECHNOLOGY CONFERENCE (OTC)
Houston, TX, USA (16–19 August 2021)

SEPTEMBER 2021

SPE OFFSHORE EUROPE
Aberdeen, UK (7–10 September 2021)

MTS/IEEE OCEANS'21 SAN DIEGO - PORTO
San Diego, CA, USA (20–23 September 2021)

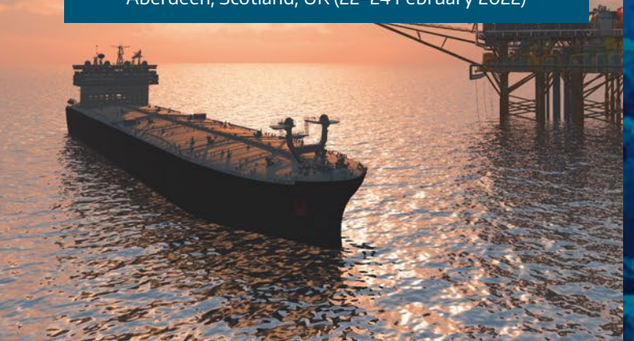
OCTOBER 2021

OCEAN BUSINESS
Southampton, England, UK (12–14 October 2021)

OFFSHORE ENERGY EXHIBITION & CONFERENCE
Amsterdam, The Netherlands (26–27 October 2021)

FEBRUARY 2022

SUBSEA EXPO
Aberdeen, Scotland, UK (22–24 February 2022)



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

WELCOME TO ROVPLANET!

Dear Reader,

I hope this quarter's issue finds you safe and well as we have a lot in store for you!

First, I had the honour of conducting an interview with Tina Bru, the Energy and Petroleum Minister of Norway. I was interested to hear about the future of the Norwegian offshore industry from her perspective. How did she see things progressing in the short, medium, and long term? We started by discussing the different sectors in the Norwegian Continental Shelf including offshore oil & gas, carbon capture & storage, offshore wind energy, and finally subsea mining.

Two new initiatives were launched for ocean exploration in order to understand our environment better. REV Ocean, a not-for-profit company was created with one overarching purpose and ambition: to make the ocean healthy again with any profit generated from their projects reinvested into their work for a healthier ocean. Currently they are outfitting an impressive superyacht that would be available to researchers and scientists from all over the world. Global Oceans, also a non-profit, acquired the 6,000-meter-rated Magellan 725 ROV, Ocean Discovery ROV, and the Ocean Explorer 6000 towed system from Oceaneering to rebuild the ROVs as dedicated advanced science platforms. These iconic vehicles also successfully located and retrieved the lost US Project Mercury space capsule "Liberty Bell 7" in the North Atlantic Ocean in over 4,500 meters depth and have broadcast live video from the wreck of the Titanic at over 3,800 meters depth. It's great to see these vehicles getting refurbed and used for scientific work again!

Finally, there is a unique underwater detection technology that recently entered the commercial market for underwater navigation and inspection purposes. ELWAVE uses an electromagnetic field around the ROV that could be used in murky waters with low visibility. I'm curious to see how this new technology develops in practice.

As you can see, we have a varied array of items for you to dive into, and I really hope you enjoy this issue!

Best regards,
Richie Enzmann

REV OCEAN TO

REVOLUTIONISE OCEAN EXPLORATION AND ENVIRONMENTAL PROTECTION

REV Ocean is a not-for-profit company created with one overarching purpose and ambition: To make the ocean healthy again. Any profit generated from their projects will be reinvested into their work for a healthier ocean. The company was established in Fornebu, Norway on the 20th July, 2017 and funded by Norwegian businessman Kjell Inge Røkke.

Courtesy of REV Ocean

REV Ocean will enable a new generation of ocean solutions and raise awareness of global impacts on the marine environment. Four interconnected initiatives are being developed: the REV Ocean Research Expedition Vessel (REV Ocean), the World Ocean Headquarters (WOH), the Ocean Data Foundation (ODP) and Plastic REVolution.

Kjell Inge Røkke has launched these initiatives with a clear vision to go further than anyone has before and has tapped CEO Nina Jensen (former WWF Norway Secretary General) to champion REV Ocean and implement the goal of going 'from Curiosity to Understanding to Solutions'. The initiative was started as a result of Røkke signing the Giving Pledge campaign in 2017, vowing to give away more than 50% of his fortune to philanthropic causes.

REV Ocean is a game-changing initiative that has an ambitious yet simple goal – to ensure 'One Healthy Ocean'. The ocean is a dynamic, interconnected global ecosystem that can recover if the negative pressures currently affecting the oceans are dealt with effectively. To do that, we need to improve our understanding of the ocean, get key stakeholders – decision-makers, researchers, business and civil society – aligned with that understanding and turn that knowledge into concrete solutions.

The organisation is currently in the process of building its own purpose-built "REV Ocean" vessel and super yacht by VARD shipyards. At 183 metres (600 ft) in length and at 17,440 gross tons, she is the longest motor yacht in the world. Her TIER III hybrid propulsion allows a full-electric mode at eleven knots when the yacht collects samples. Her total operating range is 21,000 nautical miles.

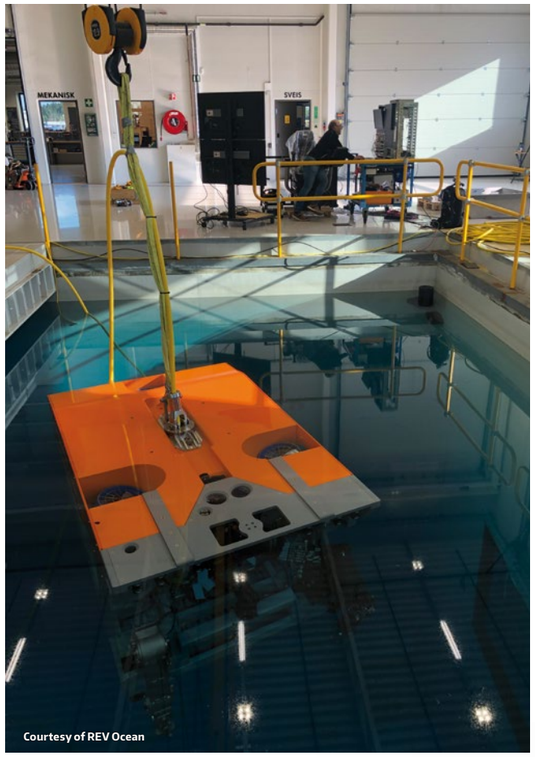
The research equipment on board will also include a forward sonar array in Gondola (under the hull), X2 drop keel for detailed sonar work and sampling, Underwater hydrophone systems, ROV-winch with 6000m umbilical, CTD-winch with 4500m umbilical, Deep sea/CTD-winch with 8000m synthetic umbilical, Net sounding/towed array winch with 3000m cable, 6 science laboratories with multi-functional usage, dry, wet chilled, freezers, and an ROV control room.

The current spread of subsea vehicles includes the Kystdesign Supporter ROV capable of diving to 6000m. Alongside this we will have a Triton 7500 crewed submersible capable of diving to almost 2300m with a pilot and two scientists. REV Ocean are also looking at various deep water Autonomous Underwater Vehicles to supplement their fleet.

KYSTDESIGN 6000M RATED ROV

REV Ocean's 6000 m rated ROV is one of the organisation's most important tools, placing 98% of the world's ocean within range of REV Ocean researchers. The ROV is uniquely designed to fulfil REV Ocean's essential science needs including deep sea geophysical surveys, exploring hydrothermal systems, conducting complex sampling programs, and filming rarely observed deep-sea ecosystems.

Leighton Rolley, the Science Systems Manager of REV Ocean, with the Kystdesign Supporter ROV. (Courtesy of REV Ocean)



Courtesy of REV Ocean

Courtesy of REV Ocean

Courtesy of REV Ocean

Courtesy of REV Ocean

The Supporter technology has developed from years of operational, "hands-on" experience by the talented engineers at Kystdesign. The ROV has a compact architecture that does not compromise on operational capability, has a very consistent track record, and also provides for easy maintenance. It can accommodate up to 24 hydraulic tooling functions, up to 16 scientific sensors and 10 camera connectors. All hydraulic functions are proportionally controlled, and all electrical power supplies are ground fault monitored. The ROV control system offers a variety of auto-functions like AutoPOS and AutoTRACK capabilities.

The ROV manipulators are equipped with delicate jaws for taking targeted samples, and the unit contains 7 high definition cameras. The ROV has a wide range of payload options to carry utility equipment: skid front drawer with dual sampling chambers, pushcores and bladecores, slurp sampler with multi-chamber container, gas sampler, niskin bottles, geochemical and oceanographic sensors and a multibeam system for cm-scale imaging of the ocean floor.

The ROV is deployed through a moonpool and is equipped with a large tether management system (TMS), which has fixed and pan/tilt cameras and lights for observing the ROV operations. Additional sensors can be mounted to the TMS. The moon pool is an opening (7.7 metre x 5 metre) at the base of the hull, giving access to the water below, allowing technicians and researchers to lower tools, instruments, and submersibles into the oce#an. It provides shelter and protection so that even if the ship is in high seas or surrounded by ice, researchers can work in secure conditions rather than on a deck exposed to the elements.

TRITON 7500/3 PERSON SUBMERSIBLE

Using a proprietary technology, developed in collaboration with Triton's exclusive acrylic manufacturing partners, the Triton 7500/3 is the world's deepest diving acrylic hulled submersible.

The Triton 7500/3 is a spacious, 3-passenger submarine. It achieves its remarkable 2,286 m (7500 ft) diving depth by using a pressure hull thickness of 300 mm and certified, aircraft-grade materials, lithium phosphate battery technology, and pressure-balanced-oil-filled subsystems. The fully transparent, acrylic pressure hull creates the potential for more extensive science operations, new discoveries and even greater versatility.

Observation is fundamental to scientific enquiry. Triton's proprietary Easy-Entry Hatch System enables passengers to enter the submersible with ease, while offering all passengers an uninterrupted view.

AUV TECHNOLOGY

Currently REV Ocean is in the process of procuring an AUV that will be capable to support the organisation's deep sea science missions.

Courtesy of REV Ocean

Courtesy of REV Ocean

The ROV Planet Team has caught up with Leighton Rolley the Science Systems Manager of REV Ocean responsible for the submersibles to find out a bit more about the missions:

RICHIE ENZMANN: What are the technical requirements of the REV Ocean team? What are you going to achieve with your ROVs and submersibles?

LEIGHTON ROLLEY: The vehicles will be primarily used to support our ambitious science program that will include high profile expeditions across all the world's oceans. These missions will focus on the many threats faced by our oceans including plastic pollution, climate change and overfishing. Our emphasis is to expand scientific access to the deep ocean and identify and address threats to its health through the development of innovative solutions.

RE: How a typical dive would look like in this type of science missions?

LR: When it comes to science there is no "typical". The missions are incredibly dynamic and will change frequently by what our vehicles and their operators find or not find. While a dive plan is created for each dive that usually outlines the core requirements of a dive, such as sampling geology, biology and water – everything else is a series of surprises and decisions that make no two dives the same.

RE: Is there any special kit or instruments bespoke for the missions?

LR: The ROV and Sub are full flexible platforms for scientists. All our vehicles are designed to be flexible and to mount a huge array of tools, cameras and science equipment and sensors. The scientists sailing with REV will often supply bespoke sampling systems, tooling, and sensors to integrate on a mission-by-mission basis. With vehicles like our Sub and ROV flexibility is key. Within this flexibility we do have "core" systems such as 4k cameras, sensors monitoring the chemical makeup of the water, sediment sampling equipment (cores/grabs) and multibeam systems for the subsea assets. We also have a blue comms system that will enable the ROV to act as a data mule for the submersible and enable live broadcasting from within sub.

Courtesy of REV Ocean

GLOBAL OCEANS TO RELAUNCH THREE ICONIC 6000-METER DEEP-SEA VEHICLES

Jim Costopulos, CEO/Founder, Global Oceans, global-oceans.org

Global Oceans is a US-based nonprofit corporation based in New York that has developed a model for expanding ocean science and exploration capacity on manned vessels, on a demand basis, utilizing a logistically optimized process for mobilizing time-chartered Offshore Service Vessels (OSVs), installing advanced modular laboratory and workspace systems on deck, and managing operations within the region of project deployment in collaboration with our global port services partners. The model is called MARV™ for Modular Adaptive Research Vessel. MARVs are a nimble, globally scalable, non-capital-intensive approach for deploying fully-functional scientific research vessels worldwide.

THE 6000-METER MAGELLAN 725 AND OCEAN DISCOVERY ROVS

Over the past few years Global Oceans has worked with Oceaneering International, Inc. to design a series of modular scientific sampling and storage platforms that can readily be integrated with any of Oceaneering's 250 globally-distributed work class ROVs rated to 3,000 and 4,000 meters that will convert these commercial ROVs to fully-functional science platforms on demand and on the fly. In the context of this relationship, discussions with the Oceaneering Technologies (OTECH) division about the status of OTECH's 6,000-meter-rated Magellan 725 ROV, Ocean Discovery ROV, and the Ocean Explorer 6000 towed system led to a proposal for Global Oceans to acquire these vehicles and for Oceaneering to rebuild the ROVs as dedicated advanced science platforms. We commissioned an extensive engineering and design analysis from OTECH in 2020 for updating and converting the two ROVs to scientific vehicles and have contracted with another US firm to rebuild the Ocean Explorer 6000.

Oceaneering was the first to deploy a "teamed" vehicle approach using a Towbody with side-scan sonar together with a deep-sea work class ROV on search and recovery projects. The Magellan 725 ROV, Ocean Discovery ROV, and Ocean Explorer 6000 were part of this legacy and participated in several historic projects. These vehicles were used to successfully locate and document two sunken WW2 ships in the Atlantic Ocean, the German battleship Bismarck, located at 4,666 meters of water depth, and the British Navy battle cruiser H.M.S. Hood in 2,788 meters. These vehicles also successfully located and retrieved the lost US Project Mercury space capsule "Liberty Bell 7" in the North Atlantic Ocean in over 4,500 meters depth and have broadcast live video from the wreck of the Titanic at over 3,800 meters depth.

Jim Costopulos, CEO of Global Oceans plans to rebuild the Magellan 725 ROV and two other vehicles as dedicated scientific research platforms. (Courtesy of Global Oceans)

6,000-meter Magellan 726 ROV (Courtesy of Global Oceans)

Jim Costopulos, CEO of Global Oceans and the 6,000-meter Magellan 725 ROV acquired from Oceaneering International, Inc. (Courtesy of Global Oceans)

In 2020, OTECH offered to donate all three vehicles and their operational support assets to Global Oceans, including winches, umbilicals, operations modules, workshop module, crane, power systems, and related components required for operating the vehicles.

Global Oceans' plan for the ROVs is to upgrade internal systems to current technology including the telemetry, hydraulics, and thrusters, and with COTS components where possible. The Magellan 725 ROV will be redesigned as an advanced 6000-meter scientific sampling and documentation platform with interchangeable modules containing push cores, variable suction sampling, sample storage, biogeochemical sensors, analytical instrumentation, water samplers, high-powered lighting, and high-resolution cameras and video. For the near term, the internal components on the Ocean Discovery ROV will also be upgraded for basic operational function and ease of maintenance and will be used primarily as a 6000-meter backup and rescue vehicle for the Magellan 725 ROV, retaining its own winch and umbilical system. The Ocean Discovery ROV will routinely travel with the Magellan 725 as a redundant system and offered at marginal incremental cost.

Both ROVs will remain 2-body vehicles with depressor systems. Operational protocols for the 2-body system deployed from a standard A-Frame crane that have been successfully utilized by Oceaneering on several projects will be the standard ongoing deployment method for these vehicles. A new depressor concept for the Magellan 725 ROV is being designed with a rechargeable, modular battery array to serve as an auxiliary power source for ROV operations at depth. This approach will facilitate a greater range of power options for thrusters and on-board instruments. Global Oceans has contracted with Oceaneering for piloting and operational support for the ROVs on a project basis, with ROV pilots from Oceaneering's Global Explorer (GEX) ROV program. GEX pilots have over 20 years of experience working exclusively with the scientific community on research ROV applications and projects.

Global Oceans is also exploring specialized applications and tool designs for these deep-sea vehicles including systems for sampling "piezophilic" organisms adapted to high pressure and extreme temperature environments, and an ROV-deployed deep-sea microscope.

THE OCEAN EXPLORER 6000 TOWED SENSOR VEHICLE

The original Ocean Explorer 6000 is a 2-body passive towed system with a depressor and side scan sonar. Global Oceans is converting this vehicle to an actively-controlled, maneuverable, single-body system that will be powered from the surface and will dynamically communicate with the winch system to control umbilical management.

The new Ocean Explorer 6000 will incorporate advanced technology to enable precision attitude control and vehicle steadiness (high-precision INS with acoustic positioning and GPS), precision altitude control (+/- 0.3 meter), geodetic positioning (to < 10-meter CEP), Multibeam Echo Sounder (MBES), embedded magnetometer, autonomous behavior and fault management, and system redundancy. Vehicle exostructure will also be modified to enable actuated control fins.

The redesigned system will solve several problems inherent with towed vehicles of this type. For one, a passive Towbody acquiring data at depth requires a long vessel turnaround time when conducting gridded transects, between five to eight hours, during which the vehicle is usually unsteady and unable to maintain speed during the turn, leading to an inability to collect data during this phase of the transect.

Maintaining steadiness and heading with these systems is difficult. In the case of a towed vehicle operating at a depth of 6000 meters, with cable deployment of three to five times depth, the vehicle will be at least 18,000 meters or more away from the vessel and keeping the vehicle safe

6,000-meter Ocean Explorer 6000 Towed Sonar System (Courtesy of Global Oceans)

and off the bottom during a turn is a challenge. With a control system altitude can be maintained during the turn and the steadiness of the system required by sensors that collect data can be maintained. This means the vehicle can collect data through the entire turn, through a smaller radius, in a shorter period of time.

As an actively-controlled system, the new Global Oceans Ocean Explorer 6000 will essentially drive itself, sending signals back to the winch from the vehicle's control system to dynamically control umbilical deployment, so the vehicle controls the winch from its vehicle control system. This configuration enables performance superior to a passive Towbody and has advantages over an AUV.

Sending power down to the Ocean Explorer 6000 eliminates the need to charge batteries on long surface intervals. The new Ocean Explorer 6000 will not need to surface to maintain full power over an extended period and could run at depth for weeks at a time collecting data. The new system will deliver its data stream in real time, for analysis in real time, compared with an untethered AUV which must surface and come aboard to offload data, review the data, and to program the next sortie. A surface-powered vehicle also means instrument power consumption is not an issue compared with battery-powered systems. We can run more instruments and sensors on full continuous power without regard to onboard power consumption.

The new Global Oceans system will also have navigation capability. A redesigned exostructure with actuated fins, buoyancy control, and an internal control system, coupled with hydro-dynamic control, will eliminate the need for a depressor body. The new vehicle will be converted to a single body system for more simple launch and recovery with a standard A-Frame crane or other handling system. For shallower deployments we can add the depressor for improved decoupling from ships' motion if needed. By linking the forward-looking sonar with active control of the vehicle, the risk of losing the vehicle at depth is low relative to other technologies.

Extensive computational modeling for redesign of the Ocean Explorer 6000 is being conducted with a physics-based modeling of vehicle hydrodynamics and cable dynamics in six-degrees of freedom, incorporating wave effects, variable water density, variable currents, and other factors. Each individual component and instrument placed on the vehicle is being modeled separately to predict its hydrodynamic impact.

A comparative productivity analysis compiled by our design team on relative performance between a new actively-controlled Ocean Explorer 6000, a passive towed sensor system, and an AUV provides a quantitative estimate of Operational Time (project-deployed time when the vehicle is generating environmental data) vs. Non-Operational Time, or "operational overhead" (project-deployed time when the vehicle is not generating data).

For this comparison, we designated bottom time, coverage area, deployment, and maintenance time (including ascent/decent, topside data processing, maintenance and battery recharging turnaround, OPS planning, Launch & Recovery, and estimated turn time at depth during which the vehicle is not gathering useful data).

The calculation assumes AUV bottom time increments of 24 hours before ascent for maintenance, data download, etc. and redeployment (not including possible AUV ascents/descents for taking GSP bearings); and towed system bottom times of 240 hours (for both passive and active towed

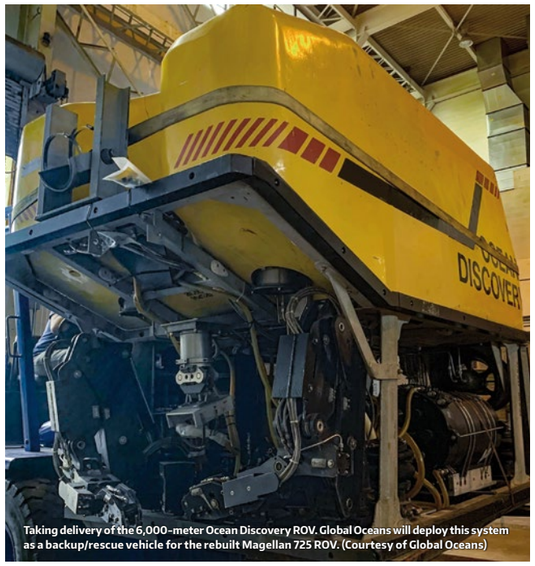
systems) before coming to the surface; then running the model for 30 sorties. Calculating average total percent of operating vs. non-operating time for each type of system showed the following productivity estimates:

VEHICLE PRODUCTIVITY COMPARISON	Operating Time	Non-Operating Time
Autonomous Underwater Vehicles (AUVs)	45%	55%
Passive Towfish	67%	33%
Actively Controlled Towed Vehicle	90%	10%

Roughly half of the operational time for the AUV is devoted to non-data-gathering activities. The passive Towfish improves on this performance by about 20% but remains burdened by the inefficiencies of passive-body management mentioned above. The significant productivity gains shown for the actively controlled towed system, reflected in the technology strategy for the new Ocean Explorer 6000, stem primarily from two factors: the ability to conduct continuous data collection through the turn on a gridded transect, and the continuous full-power supply available from the surface, without the need for battery recharging, data downloading, and re-programming on long surface intervals. This enhanced efficiency translates directly to cost savings and greater capacity for a range of deployed sensors and instruments.

A particular cost advantage of the new Ocean Explorer 6000 will derive from coupling the capacity for high-resolution bathymetric mapping at depth utilizing the on board MBES, with deployment on MARVs as project vessels. Given that MARVs are assembled as science-mobilized time-chartered OSVs, which have become largely commoditized from a cost standpoint, this approach will enable lower-cost seafloor mapping as a function of data output, resolution, and quality compared with using high-cost survey vessels.

The ability to supply continuous, direct power to the vehicle from the surface will also enable long-range deployment of high-powered lighting and video or photographic systems for deep-sea benthic imaging in connection with a project in development by Global Oceans, the Global Seamounts Project, which seeks to generate new biophysical behavioral models of seamount ecosystems. In this application we will conduct visual transects with the Ocean Explorer 6000 across abyssal regions adjacent to seamounts to generate geomorphic proxies for biological activity, including for biomass and biodiversity. To achieve this, a statistical machine learning process for pattern recognition will be employed to analyze wide-area visual data, coupled with analysis of representative core samples to generate a set of training data for the AI.



Taking delivery of the 6,000-meter Ocean Discovery ROV. Global Oceans will deploy this system as a backup/rescue vehicle for the rebuilt Magellan 725 ROV. (Courtesy of Global Oceans)


15-ton ROV umbilical storage winch for the Magellan 725 ROV (Courtesy of Global Oceans)

A deep-neural network, or perceptron, will be developed to relate biophysical proxies to biological indicators. Once developed, classification algorithms will enable real-time in situ predictions of biological characterization of the benthic seabed utilizing an edge-computing device installed on the survey vehicle.

Once the redesigned Ocean Explorer 6000 is launched into successful operation, Global Oceans plans to build a second new towed system modeled from, and improved upon, the first vehicle. Updates on the current rebuild will be posted on the Global Oceans website at www.global-oceans.org and posted regularly on our social media platforms.

ROVING EYE: AN INSIDE LOOK

Keith Bichan, Founder and CEO of Roving Eye Enterprises gives us a peek at the history of their multi-faceted survey and tour operation.

Roving Eye Enterprises was founded in 1997 to provide Orkney with a unique tourist attraction during peak months: to view the Scuttled German Fleet "without getting your feet wet."

THE ORIGINAL CONCEPT

My initial idea, back in the 80s, was to buy a salmon farm drop-camera, and dangle that over the side of the passenger vessel to give the passengers a peek at the wreck. After thinking about it, it was obvious this would be complete hit or miss, and you would need a diver to swim around the interesting parts to give the desired experience. This was totally impractical, and the HSE rules would have made the cost of such an operation prohibitive.

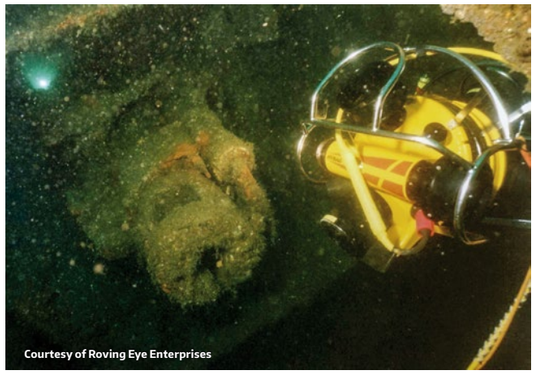
The idea was put on the back burner for about 10 years, during which time I got married and gave up scallop diving. However, the idea was explained to my wife, and this time – having a little knowledge about the concept of an ROV – we decided to research the market.

There was not a large choice of suitable ROVs at the time. After having gone to Denmark to view Deep Ocean Engineering's Phantom, and a more local trip to Hydrovision in Aberdeen where I saw the Hyball, it was decided to take Chris Tarmey's (MD Hydrovision) kind offer of a demo in Scapa Flow.

Courtesy of Roving Eye Enterprises


Courtesy of Roving Eye Enterprises


David Stevenson ROV Pilot (Courtesy of Roving Eye Enterprises)


Courtesy of Roving Eye Enterprises


Courtesy of Roving Eye Enterprises

MAKING WAVES AND CATCHING SPARKS

One month later Chris, alongside Gordon Dempsey, arrived at our house with the system packed in the back of a Discovery. It was arranged the next day to use a local dive vessel skippered and owned by John Thornton. We had a convivial evening at a local restaurant that night which set us up for the next day's adventure.

Gordon set up the Hyball ROV system on the MV Karen, and he powered it up. Or should I say fired it up, as the little ROV's viewing port promptly filled with smoke due to a component exploding.

Chris was quite taken aback as this wasn't the best start to the demo. However, Gordon split the ROV in two to gain access to the offending capacitor, and promptly fixed it. This actually impressed me that it was so easy to fix, and after that we set off for the German wreck of the F2. After we anchored over the top of the wreck, the Hyball was deployed and the images sent topside were great. Game on!

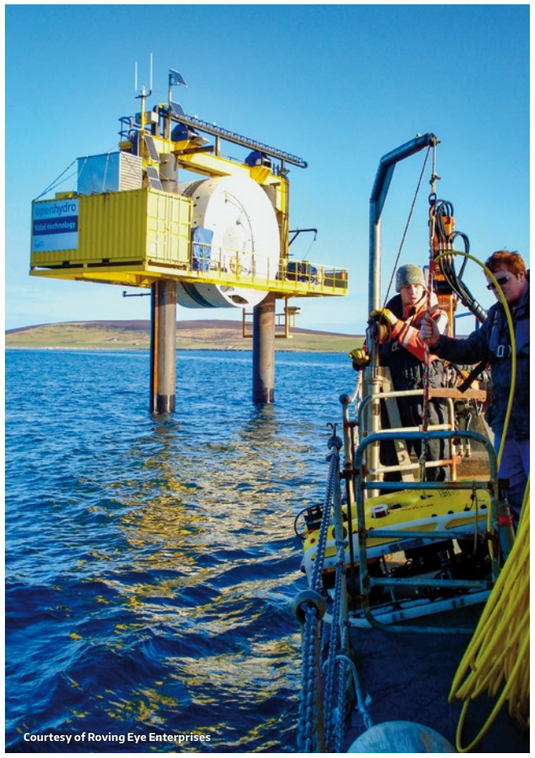
We ordered a new Hyball and bought a fifty-five foot passenger vessel which could accommodate 40 passengers. In the meantime, I had met an ROV pilot who was interested in working a summer in Orkney with us on this new venture. Nick Yeats helped us deck the MV Guide out with TV monitors, and we installed the Hyball as a permanent fit. I fitted moorings on four of the wrecks after gaining all the appropriate permissions, and then we started our tours.

GOING ON TOUR

I was skipper, Nick was the pilot and Kathy, my wife, was umbilical person. We were all rookie tour guides. Kathy's marketing experience was put to good use in designing brochures, writing up magazine ads, and advertising the business. We had the local tourist board sell the tickets for us.

What followed was a successful season running tours to the wrecks, and under the tuition of Nick, I became a competent ROV pilot (although I did have my course certificate from Hydrovision). I taught Nick the skills of piloting the Guide. We were featured on the BBC's Holiday program, as well as ITV's Wish You Were Here and Scotland the Wild. We also won in the Highly Commended category of the British Archaeological awards, Vision in Business for the environment, and were given a four-star Scottish tourist board rating. We did 13 successful seasons averaging 1000 passengers a year before we had to finish doing the tours. The survey side of the business took off, and we simply didn't have time to do both.

That same year we started the tours we landed our first contract with a local oil company, and subcontracted Difftech to supply an USBL system and engineer to allow us to survey the pipelines and SPMs. I perfected a technique of "following sub" using the MV Guide. It was single screw and had no bow thruster. This meant you had to use the wind on her bow and the transverse thrust of the propeller going


Courtesy of Roving Eye Enterprises


Keith Bichan working on Hyball (Courtesy of Roving Eye Enterprises)


Courtesy of Roving Eye Enterprises

astern to ensure you kept the ROV on the same side of the vessel as you launched from, to ensure the umbilical kept clear of the propeller. We successfully carried out the survey and with the rep being suitably impressed, we have kept this survey to this very day.

The Hyball was to say the least a little gutless and you had to be very careful with the management of the umbilical. Also, the brushed motors were prone to shorting due to the carbon build up from the brushes. If the springs came off, it was guesswork how long it would take to get them back into place. The other problem was failure of the power modules, which could result in the loss of a thruster, rendering the Hyball floundering around like a drunken sailor. However, when it was fully operational it was highly manouverable, and an exceptional ROV for gaining access to tight spaces. The camera could rotate 360 degrees in the viewing port, so you could get an upside-down view of your trapped umbilical!

EXPANDING OPERATIONS

By 2006 the surveys became much more plentiful with the start of the marine renewables revolution, and the environment of operations switched from the benign waters of Scapa Flow to the fast moving waters of the newly incepted tidal site at the Fall of Warness. After we were involved with several bathymetry contracts on the tidal site, the cables were laid and requiring surveyed. Tidal strengths of close to 8 knots (4ms) are the attraction of the site. The Hyball would no longer cut it, and a new more modern breed of ROV was required.

The Seaeye Falcon was the ROV of choice, as I had seen the MOD's Falcon onboard the Guide when we had been surveying HMS Royal Oak. We had been involved with Briggs Marine in the pioneering hot tapping method to remove the oil left in her portside tanks.

By a happy coincidence Chris Tarmey had sold Hydrovision to SMD and had acquired Seaeye, so it was an easy decision to purchase Falcon1267.

The performance of the Falcon compared to the Hyball was breath taking. Holding onto the umbilical while giving it full thrust reminded me of my farming days, trying to hold on to a wild bullock at the end of a rope! Coupled with it's easy diagnostics for fault finding and the magnetically couple brushless motors, it was a world away from the old 80s technology of the still much more aesthetically pleasing Hyball.

The Falcon handled the tidal cable surveys admirably, but it was also due to the skill of my then skipper John Flett who managed to keep the Guide in the right position. I was pilot and my wife was the umbilical person. The calculations required for the drift required was worked out by practice drifts and the skill of the USBL operator who happened to be a local man, Tris Thorne, working for Andrew's Survey. Tris now runs Triscom Ltd and still works with us, although the crew now can operate the installed USBL system for most surveys.


John Phillips skipper/survey (Courtesy of Roving Eye Enterprises)


Keith Bichan viewing ROV live streaming (Courtesy of Roving Eye Enterprises)


Courtesy of Roving Eye Enterprises

Courtesy of Roving Eye Enterprises

The ROV system was upgraded, so it was now time to source a more manouverable twin engine vessel, capable of transiting to the West Coast and Shetland more comfortably than the MV Guide. The MV Lodesman was purchased in 2008, which ticked most of the boxes. The vessel was large enough to be comfortable and small enough to allow us to do cable landfalls. We have been doing cable surveys since 2003 and often required long steams down the West Coast. The twin engines allowed more precise vessel movements especially during demanding tidal site surveys. The Lodesman size and power also allowed us to do the first tidal turbine deployments on a dummy base in Shapinsay sound in 2009.

We used the Lodesman to tow the turbine to the base, and the Falcon had a special tooling skid required to decouple the turbine's own umbilical after deployment.

LIFE ON THE FISH FARM

The last 5 years or so has seen an explosion in aquaculture and having seen the first developments in the early 80s and having tried shellfish farming around the same time as the salmon industry in Orkney began, it was an obvious industry to offer our services to. After all it was a fish farming magazine where I first saw an underwater drop camera advertised.

The farms are very well secured to the seabed using multiple anchors and rigging which has to be inspected annually or more. It became apparent to me that an HD camera would be very advantageous over the standard Falcon camera. Having used GoPro cameras to record at source to give HD or even 4k in the past, which complimented the overlaid ROV camera footage, it was a natural progression to trial the NETmc Marine HD camera over copper. This allowed us to provide HD video and video grabs stamped with the positions of the anchors from the USBL. The reports can run to 100 pages for a reasonably sized salmon farm.

As we picked up the salmon farm surveys for Cooke Aquaculture and Scottish Seafarms, it was obvious we needed a faster vessel. We bought the first prototype Ctruk vessel: MPC Advance, which had a Kameway water jet system fitted. The vessel handles like an ROV with twin joystick controls, and the added advantage of not having propellers, it fitted the bill well, except at 14M it was a bit small for winter transits, so we upgraded to the 18M version in 2017. The crew enjoys the vessel, and it can operate at 20 knot transit speeds, so can reach the more remote salmon farms situated on the North Coast within 2 hours from Stromness.

The average salmon farm is surveyed in a day, due to the expertise of skipper, pilot and crew. This may be up to 30 moorings to inspect.

We are very happy with the present setup but are always looking at the new developments in the industry, which are now developing at an incredible pace as illustrated in ROV Planet every quarter.

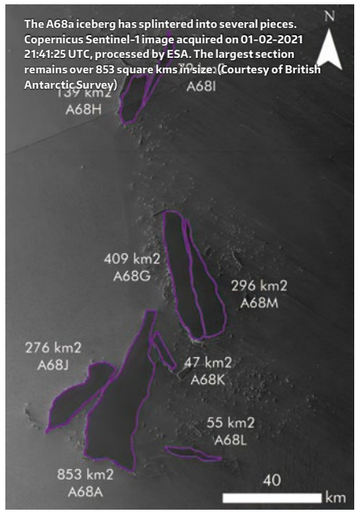
THE GIANT ICEBERG MISSION BEGINS.

A research mission to determine the impact of the giant A-68a iceberg on one of the world's most important ecosystems departed from Stanley in the Falkland Islands on the 2nd of February 2021. A team of scientists, led by British Antarctic Survey (BAS), set sail on the National Oceanography Centre's (NOC) ship bound for the sub-Antarctic island of South Georgia.

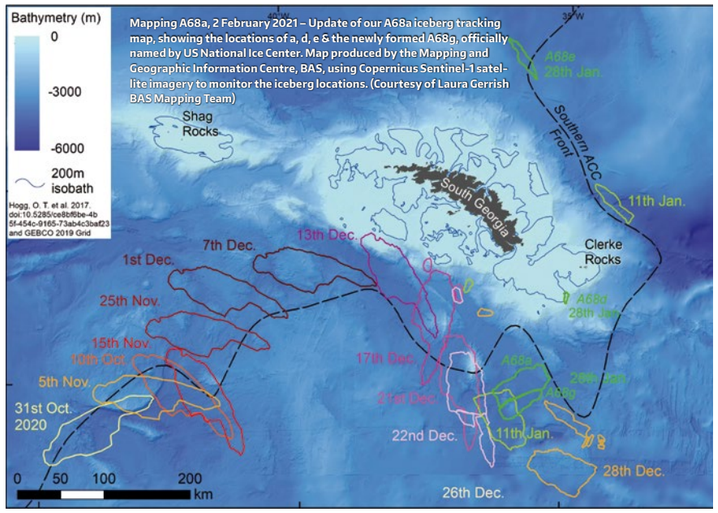

Scientists will deploy two Slocum gliders to collect data from the A68a iceberg. (Courtesy of David White)

The huge berg broke away from Antarctica's Larsen C Ice Shelf in 2017. After satellite images revealed its movement towards South Georgia, the science team put a proposal to Natural Environment Research Council (NERC) to fund an urgent mission south. Images captured from the air by the MOD in late 2020 show that the iceberg is breaking up. It now consists of several icebergs named A68a-m. The team will investigate the impact of freshwater from the melting ice into a region of the ocean that sustains colonies of penguins, seals, and whales. These waters are also home to some of the most sustainably managed fisheries in the world.

Two Teledyne Webb Research Slocum G2 gliders from the NOC, Southampton, will be deployed for 4 months to understand the dynamics and impacts of the breakup of the A68 iceberg near South Georgia. A68, which was initially twice the size of Luxembourg, originally calved from Larsen C Ice Shelf, on the east side of the Antarctic Peninsula, in 2017. Having transited across the Scotia Sea from the Antarctic Peninsula over the last year, the iceberg is now rapidly breaking up and melting, but the effects of this meltwater on both the ocean dynamics and the South Georgia ecosystem are poorly understood. Researchers at the British Antarctic Survey will use these observations alongside ship data collected from RRS James Cook to understand the pathways that this meltwater takes and how it impacts biological productivity in this region, which is rich in biodiversity and the site of a major fishery. The autonomous platforms form a vital component of the experiment as they allow data to be collected from much closer to the berg, and over a much longer time period, than the ship-based measurements alone. The gliders will be piloted jointly by personnel from BAS in Cambridge and the Marine Autonomous and Robotic Systems group at NOC.



The A68a iceberg has splintered into several pieces. Copernicus Sentinel-1 image acquired on 01-02-2021 21:41:25 UTC, processed by ESA. The largest section remains over 853 square kms in size. (Courtesy of British Antarctic Survey)



Mapping A68a, 2 February 2021 – Update of our A68a iceberg tracking map, showing the locations of a, d, e & the newly formed A68g, officially named by US National Ice Center. Map produced by the Mapping and Geographic Information Centre, BAS, using Copernicus Sentinel-1 satellite imagery to monitor the iceberg locations. (Courtesy of Laura Gerrish BAS Mapping Team)

The gliders will be deployed for up to 4 months, obtaining profiles of temperature, salinity, chlorophyll and backscatter between the surface and 1000 m. Rather than using a propeller, they move by changing their buoyancy, and wings convert this into forward motion. A dive-climb cycle will typically take 4-6 hours, with a decimated version of the data being returned at each surfacing via the Iridium satellite network. This allows the health of the sensors to be monitored in near-real time, and updated piloting instructions to be relayed to the gliders as required. The full high-resolution dataset will be downloaded once the vehicles are recovered in June/July 2021.

Each vehicle is equipped with a Sea-Bird Scientific pumped conductivity-temperature-depth (CTD) sensor, from which temperature, pressure and salinity are obtained, and a Sea-Bird Scientific ECO Puck combined fluorimeter/backscatter sensor, from which chlorophyll, backscatter and coloured dissolved organic matter in the ocean will be quantified. Combined with the ship-based measurements that will be taken from the RRS James Cook, these will elucidate the impact of the iceberg melt on the ocean stratification and the biological productivity of the surface ocean around South Georgia.

Waters around South Georgia are recognised as one of the most biologically rich places on the planet with more described marine species than the Galapagos and is one of the world's largest Marine Protected Areas. The icebergs, if they ground near the island, pose a risk to penguins and seals during the breeding season.

Professor Geraint Tarling, an ecologist at British Antarctic Survey, says: "The icebergs are going to cause devastation to the sea floor by scouring the seabed communities of sponges, brittle stars, worms and sea-urchins, so decreasing biodiversity. These communities help store large amounts of carbon in their body tissue and surrounding sediment. Destruction by the icebergs will release this stored carbon back into the water and, potentially, the atmosphere, which would be a further negative impact."

Photo taken by the MOD as they flew over the iceberg on a reconnaissance flight last month. (Photo: RAF photographer Corporal Philip Dye)

The National Oceanography Centre's ship RRS James Cook (Courtesy of British Antarctic Survey)

Courtesy of British Antarctic Survey

Recovery of a Slocum glider from the ocean (Courtesy of British Antarctic Survey)

The mission is taking place on the National Oceanography Centre's ship RRS James Cook. (Courtesy of NOC)

"However, whilst we are interested in the effects of A-68a's new arrival at South Georgia, not all the impacts along its path are negative. For example, when travelling through the open ocean, icebergs shed enormous quantities of mineral dust that will fertilise the ocean plankton around them, and this will benefit them and cascade up the food chain."

Steve Woodward, the NOC's Glider Technical Lead, who will be managing the National Marine Equipment Pool (NMEP) glider operation, says: "Autonomous submarine gliders are an excellent, cost-effective, and sustainable means of gathering and recording important marine data. In this case, we will program the NMEP gliders to get as close to the edge of the icebergs as we feel is safe and practicable, and collect the data that will be needed to enable the team to understand the implications of what is taking place with A-68a."

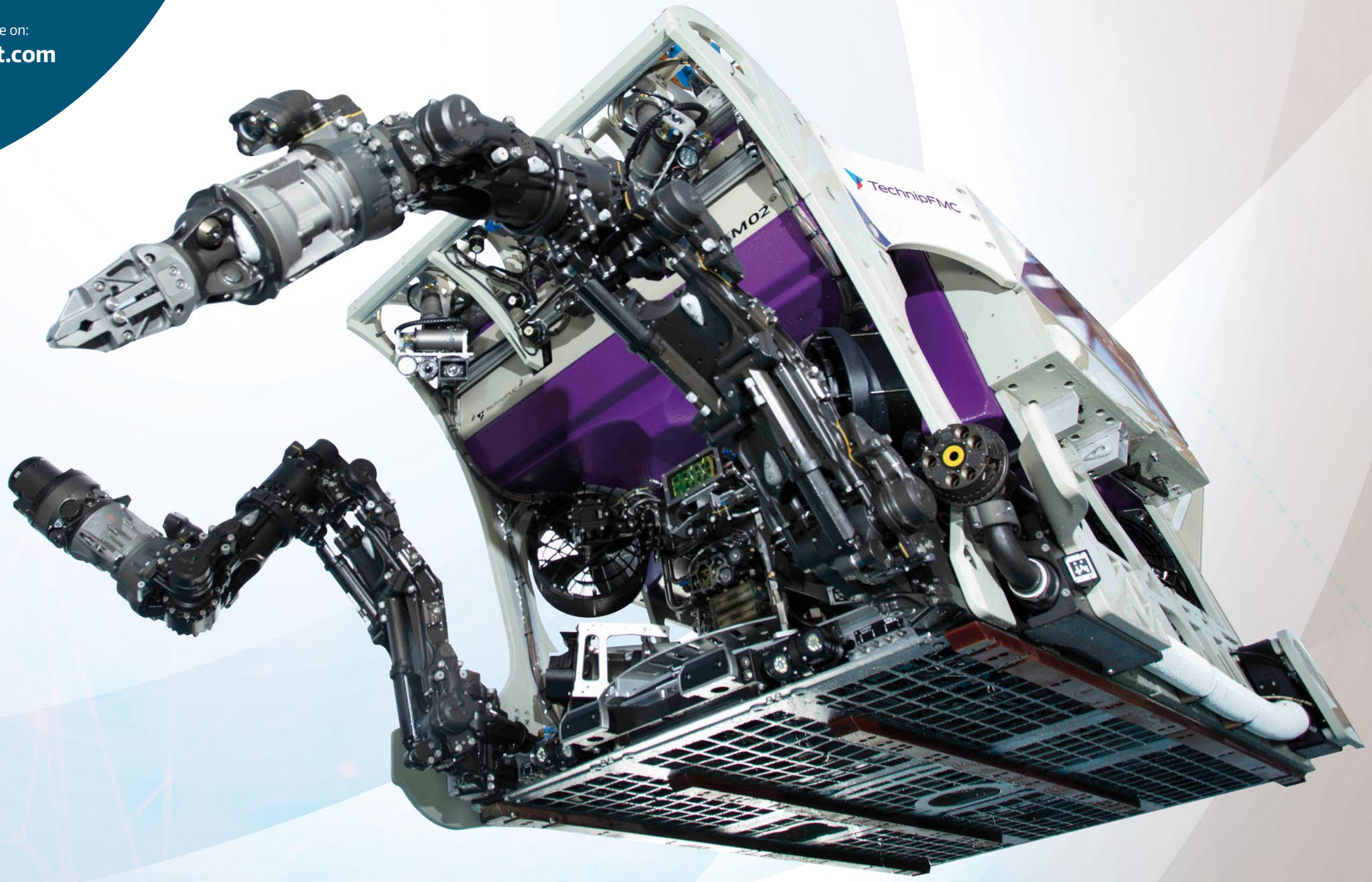
Andrew Fleming, Head of Remote Sensing at BAS, has been tracking the iceberg's journey on images from the Copernicus Sentinel-1 and other satellites. He says: "We are watching the progress of the A-68a iceberg very closely as we haven't seen a berg of this size in the area for some time. As it breaks up, thousands of smaller icebergs have the possibility to obstruct shipping lanes in the area, especially as they disperse. The European Space Agency has delivered regular Sentinel-1 images and we will use these to continue tracking in the coming months.

"The images and footage collected by MOD flight missions have helped enormously in confirming some of the features we can see in the images from space. Close up images provide detail on how the berg is starting to break up and allow us to better understand these processes."

The research expedition to A-68a has been funded by a combination of the Natural Environment Research Council, the Government of South Georgia and the South Sandwich Islands, and the UK Government's Blue Belt Programme.

ROV PLANET

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



TechnipFMC-Schilling Robotics GEMINI ROV (Courtesy of TechnipFMC)

INTERVIEW WITH TINA BRU, PETROLEUM AND ENERGY MINISTER OF NORWAY

THE FUTURE OF THE NORWEGIAN CONTINENTAL SHELF

In our fast-changing environment there seem to be a lot of talk about renewables and a net-zero future. But the World is ever-hungry for energy, especially once the Covid lockdowns have been lifted and life gets back to normal. Renewables are a way to provide part of this energy mix. However, in my opinion, this transformation from hydrocarbons towards a greener future must be gradual in order to save jobs, companies in the supply chain, and know-how.

Recently I had the opportunity to speak to Minister of Petroleum and Energy for Norway, Tina Bru. Primarily I was interested to hear about the future of the Norwegian offshore industry from her perspective. How did she see things progressing in the short, medium, and long term? We started by discussing the different sectors in the Norwegian Continental Shelf (NCS).

OFFSHORE OIL & GAS

RICHIE ENZMANN: I have spoken to many business leaders in the industry in the past couple of years about the industry's future. Many were confused by the mixed messages received from both media and policy makers about the future of our industry. Some argue that oil is outdated and dirty; others that it's still a vital asset, and that hydrocarbons will still be needed, for example for plastics, even if electric cars are to be the future of transportation.

Recently, I saw news of the new oil and gas production licences awarded by Norway's Ministry of Petroleum and Energy. How do you see the offshore industry developing in the NCS?

Tina Bru, Norwegian Minister of Petroleum and Energy (Photo: OED - NTB Scanpix)

TINA BRU: It's not very complicated. We know that we have to reach some very ambitious and important climate goals. We know that globally we need to reduce our fossil fuels. At the same time, we know that we still need to be using a certain amount of fossil fuels in that long term scenario when we reach our climate goals, for fuel, plastics, etc.

You need to keep up investments into oil and gas projects and maybe possibly increase these investments in the next few years. We are seeing a lot of resources that are in production today... Even in the scenario where we reach our climate goals, we would still have to produce oil and gas.

In Norway its very simple: we have an ambitious oil and gas policy and a very ambitious climate policy. For us it's not an either-or situation, it's being able to have two thoughts in our heads at the same time. It's about making sure that we are producing profitable oil and gas resources, whilst cutting emissions here in Norway, and backing many different policies that are important for stopping climate change on a global scale. We are doing both things at once basically.

RICHIE ENZMANN: That's a good point. You can try and synergise the two options into one.

TINA BRU: Sometimes I think people forget that it's not like it's one policy. We don't produce resources that are not profitable. We produce things that are profitable, good projects that have – in many cases on the NCS – an incredibly low breakeven price on the different fuels we produce. Our continental shelf is also very robust for the lower oil prices, and with the very strict climate regulations that we have on our productions we can actually deliver a product that the world is still in demand of and maintain lower emissions than many other places in the world.

RICHIE ENZMANN: It's true that in the Norwegian sector you have one of the highest standards in the world when it comes to technological requirements, emissions, and environmental legislations. You probably have the greenest technology for producing oil. At the same time, it's also true that in the past 5-6 years in the downturn there has been an underinvestment in oil and gas. In order to sustain supply for the demand we need to invest more.

TINA BRU: Every country that is part of the Paris agreement has an independent responsibility for cutting emissions. If we were to stop production on the NCS that would not have an effect on the global climate impact. Then our production would probably be replaced by somebody else. For me that's a meaningless discussion to have, especially considering we have the strictest regulations on the NCS and the highest carbon prices in the world. Not only our sector has to comply with the EPS regulations and pay the price for any EPS system, but they also have a separate Norwegian carbon tax on production of their emissions. That's the reason why our emissions are so low. The companies have a very clear tax incentive to cut emissions from production, and it works.

CARBON CAPTURE AND STORAGE (CCS)

RICHIE ENZMANN: Could Carbon Capture technology also contribute to the emission losses?

TINA BRU: It is important to clarify that the Northern Lights Project is a storage facility for CO_2. Our CCS project is called "Longship". That has to do with carbon capture from industry processes, so not capturing CO_2 from our oil production per say. It has to do with cement production at a factory on shore on Norway's mainland. It captures the CO_2 from cement production and ships it to sea, where it's stored by the Northern Lights Project in a reservoir under the seabed.

This storage facility will also facilitate the ability to produce clean hydrogen from our natural gas resources. In order to do so you have to have somewhere to store the CO_2 of course. In the long term this will also create the possibility for natural gas to be emission free through hydrogen production. But the CCS project focuses on industrial problems from cement production, not oil and gas.

RENEWABLE ENERGY

RICHIE ENZMANN: How do you see the opportunities for offshore renewable energy generated in Norway? What is the estimated energy capacity available? Could offshore renewables cover the domestic Norwegian energy needs from the increased consumption from the use of electric vehicles?

TINA BRU: Well, I think we have a great possibility for offshore renewable production here in Norway. Naturally, we have excellent wind conditions due to our geographical location. Recently we've just opened new areas for offshore wind production in two different places off the southern part of Norway. We're working on the details concerning how the concession process would work. Norwegian technology and competence through the maritime and oil and gas industries is very well suited to the needs of these giant wind farm projects.

Many Norwegian companies are already heavily involved in this. Equinor is a very good example, but we also have many other businesses in Norway that have already delivered to this market. We are seeing great opportunities there. However, in Norway we are not in dire need of any more renewable energy for our power sector; we already have an abundance of that through our hydro power schemes and wind energy production on land. Our power sector is basically 100% renewable. We are looking at a surplus of energy by at least 2030, so we're very lucky in that sense that we have cheap and clean energy here in Norway.

SUBSEA MINING

RICHIE ENZMANN: What are your thoughts on Subsea Mining and what we can expect to see in Norway? This is an industry that everyone has been talking about for decades. In my opinion, previously the main issues were ownership rights and legal framework in international waters. Investors weren't prepared to part with money when the ownership of minerals could be questionable a few years down the line. However, in a mature, stable, and low risk basin like Norway, perhaps the time has finally come for the creation of this industry.

TINA BRU: This is something that I also think is very exciting here in Norway. If we know that we are to succeed in actually cutting greenhouse emissions, various metals will be needed in order to build for example all the wind turbines that we have just talked about, or solar panels, or batteries for electric vehicles, etc. The possibility to actually mine these minerals is something that is very exciting here. Right now, we're mapping the resource potential of the NCS and so far, we've seen that there are very interesting deposits of both sulphites and so-called manganese crusts in the deep ocean. The analysis of the collected samples has shown that they contain copper, zinc, and cobalt, in addition to iron and some other rare earth minerals.

Right now, the Petroleum Directorate have been given the task to map the potential for seabed minerals on the NCS. We actually had a drilling expedition last autumn that was really exciting and a success. This was the first time the technology – which is called coil tubing technology – has been used to drill in water depths of more than 3,000m. This was the first time ever such drilling technology was used for exploring seabed minerals. This is very interesting and exciting!

RICHIE ENZMANN: Do you have any ideas about the timelines with regards to starting production?

TINA BRU: Right now, for opening these areas to mining we have to conduct strategic impact assessments to highlight the aspects of a potential opening's effect on the environment, as well as this type of effect on business, economic, and social affairs.

A proposal for an impact assessment programme has just been submitted for a three-month consultation. The aim of this is to include all of the interested parties in the early stage of this process so that all the relevant issues will be addressed in this impact assessment. The whole opening process – including this impact assessment – will have an expected timeframe of 2-3 years.

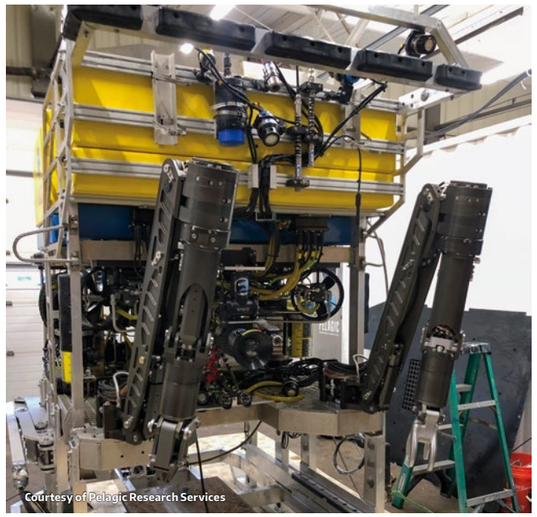
We still don't know whether extraction from seabed minerals will be commercially viable here in Norway, but it definitely has the potential to become a very new and very important maritime industry for us. So, we're looking forward to the future and what we can find out from this assessment.

RICHIE ENZMANN: Thank you very much for explaining all this to me. It was an incredibly interesting discussion, and I hope to hear more about this in the future.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR

DEEP SEA MINING

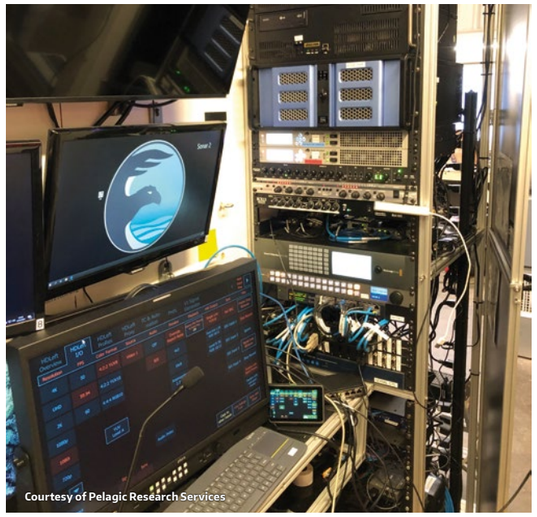
Ocean services company Pelagic Research Services, LLC (PRS) is proud to announce its selection by DeepGreen Metals Inc. (DeepGreen) to provide ROV services to support their environmental and social impact assessment (ESIA) for its proposed polymetallic nodule collection project. PRS will be providing its 6000-meter, work/science class ROV System Odysseus staffed with an outstanding team of ROV pilots/subsea technicians working around the clock.


Courtesy of Pelagic Research Services

PRS's ROV Odysseus will conduct video and oceanographic vertical and horizontal transects to depths beyond 4000 meters using a 4K Insite Pacific Mini-Zeus camera and two Deepsea Power and Light HD cameras mounted as a stereo pair – all recorded in full, pro-resolution for the entire duration of all dives. PRS has designed a specialized skid to provide a fiber and power link to support an additional camera suite, provided by the science team, that includes specialized lighting, multiple 4K, paired stereo cameras, a shadow graph camera and an 8K camera – all designed to quantify and characterize life in the pelagic zone.

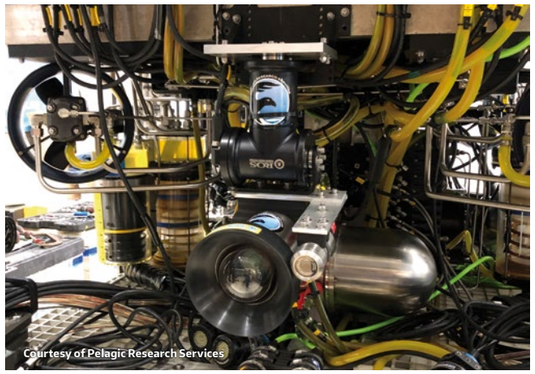
In addition to science-quality video PRS has integrated a multi-sensor suite from Seabird Electronics that will document the water column in real time and that will be linked to all video data through timecode. Sensors include conductivity, temperature, depth, dissolved oxygen, PH, a transmissometer (red 650 nm) to determine turbidity, and chlorophyll.

Another focus of the research dives includes gelatinous animal capture utilizing Odysseus's two, seven-function proportional Orion manipulators from Schilling and a custom-built chambered suction sampler and multiple D-samplers on hydraulic swing arms. DeepGreen will utilize the data collected by PRS to enable informed decision-making and regulatory development in advance of their new resource industry, which has the potential to provide billions


Courtesy of Pelagic Research Services

of tons of critical battery metals that are required for society's transition to clean energy. All output and data generated by this intensive research program will be shared with the international community via the International Seabed Authority, and samples collected from the deep sea will be sent to labs around the world for analysis. This collaborative effort which brings together some of the world's leading ocean research institutions and pre-eminent ocean scientists will advance the wider fields of ocean science, medicine, and technology.

This project is taking place in close collaboration with Maersk Supply Service and aboard their ship Maersk Launcher.


Courtesy of Pelagic Research Services

Courtesy of Pelagic Research Services


Courtesy of Pelagic Research Services


Computer generated image of the AUV and the dock subsea. (Courtesy of ISE)

ENABLING PERSISTENT MARITIME SURVEILLANCE

Douglas Ramsay, Electro-Mechanical Technologist at ISE

Over a two-week period in late 2020, in the protected waters of Vancouver, Canada, International Submarine Engineering Ltd (ISE) tested its prototype of an underwater dock. The dock is a platform for which an Autonomous Underwater Vehicles (AUVs) can upload data to and charge their onboard batteries from, all the while staying submerged. Setting aside the technical achievement, in this article we are going to discuss why this is important and what this means for general AUV operations as well as with regard to maritime surveillance.

Monitoring and mapping the waterways has always been a priority for sea-faring nations. Whether it be for defence purposes or for scientific research, understanding these places has been critical for the success of the civilizations that surround them. The knowledge of one's own coast includes the ability to defend against foreign entities before they have the chance to do harm. This can be achieved by using preventative measures such as the constant monitoring of these coastal waters.

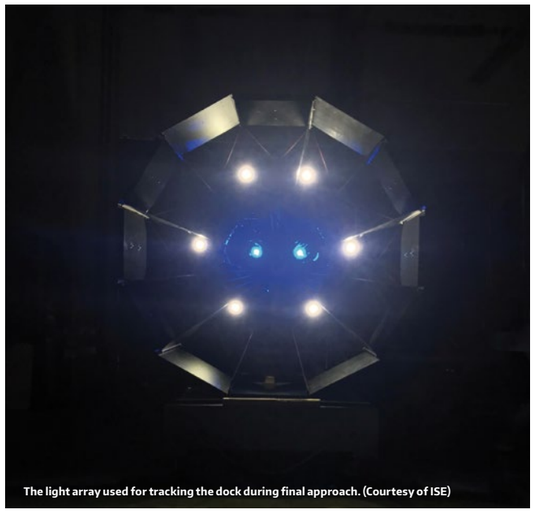

First stage testing was to dock while still on the surface to prove the system works before subsea docking was tested. (Courtesy of ISE)

Currently this monitoring is done in a variety of ways, the two most common being the use of fixed systems such as hydrophone arrays and secondly, ship-based monitoring, of course both have their pros and cons. In a nutshell, fixed systems are easy to deploy and can monitor continuously as long as they have shore power of some sort. The catch is that they require shore power, meaning they need a power grid to stay continuously on. Furthermore, as the name implies, they are fixed, so if someone knows of their location, they can easily be avoided.

Ship based systems are mobile, and that is their greatest asset. Also, every major coastal country has some form of navy which of course would possess some ships. Adding some sensors or even some marine robotics to an already existing infrastructure is simple. Conversely, ships are costly to operate and they are easy to spot; therefor, minimizing some of the desired requirements in coastal surveillance.

AUVs are increasingly becoming more common in their use as survey and subsea monitoring vehicles. They can have high quality sonar systems installed on them and can operate a lot closer to the survey target than the surface ship can. Furthermore, they are much quieter than a ship, which would allow hydro-acoustic systems to perform much better. The main downside of AUVs has always been the energy capacity that they are able to carry. An AUV can only travel so far on a single charge, and this has generally meant missions under twenty-four hours duration. Once the energy is depleted the AUV must be recovered so the data can be downloaded, and the batteries recharged. The physical act of launching and recovering an AUV from a support vessel for this purpose is often regarded as the point of the mission with the highest likelihood of failure. Adverse weather conditions further increase the risk of failure and can lead to damage to the assets or the personnel involved. Underwater is where an AUV is designed to operate, and it is there that it is the safest.

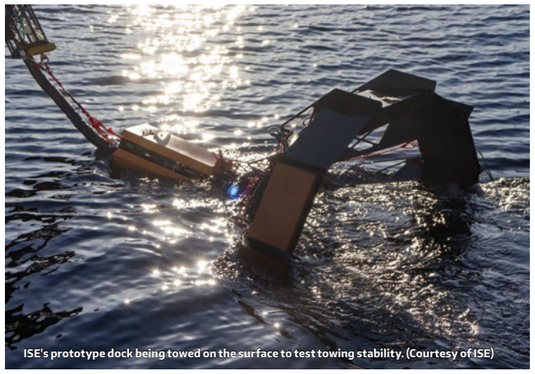
Using the dock eliminates the need for launch and recovery onto a ship or surface platform. Simply put, when the AUV runs low on energy, it will autonomously navigate itself to the subsea dock where it latches to be charged


The light array used for tracking the dock during final approach. (Courtesy of ISE)

and have its data offloaded. This can all be done regardless of the weather at the surface. With the ability to charge AUVs on the fly, (much in the same way that an airplane can be refueled by a tanker plane while in flight), continuous subsea AUV missions can be achieved. This is a step forward in subsea surveillance and is a significant force multiplier to one's defence strategies.

The ability to charge an AUV on the fly also changes the approach that one could take with their AUV fleet. Currently AUVs are increasingly getting bigger so that they can handle more batteries; this is all done with the goal to increase mission durations. By adding the ability to recharge oneself during a mission, energy capacity onboard an AUV is less critical and smaller battery banks can now be used. This would mean that smaller AUVs can be utilized which of course would mean less costly AUVs.

One step further, consider the idea of replacing one large surveillance AUV with several smaller AUVs that can recharge on the fly and thus achieve continuous monitoring. This is a big step with regard to surveillance.


ISE's prototype dock being towed on the surface to test towing stability. (Courtesy of ISE)

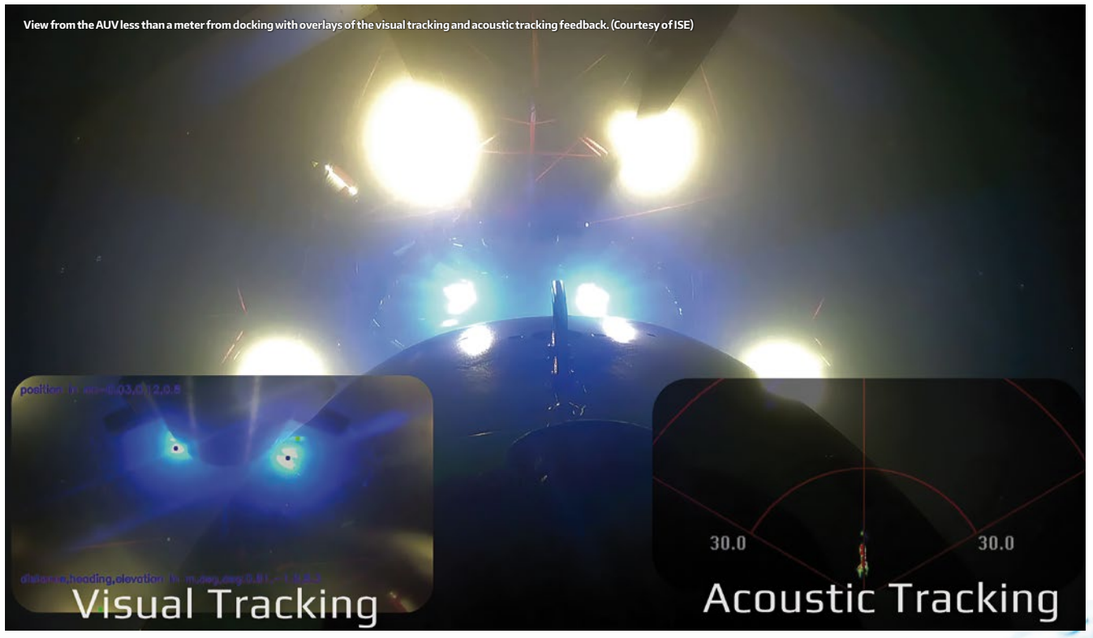
The next big question with the dock must be: what is the dock attached too? Will it be towed, or will it be fixed? There is much flexibility with this question because of the very nature of what the dock is. Towing the dock can be done using either a ship or an autonomous surface vessel (ASV). Both have the ability to provide power down the line to the dock as well as providing a surface support station to upload the data too.

With the technological gains that AUVs have made in the last few decades, so have the ASVs. It is little wonder that they are the future for surface vessels as they are cheaper to operate and can navigate in harsher climates without the downside of endangering a crew. The ASV can tow the dock along a coastline for example, all the while the AUV is doing its survey. As needed, the AUV can then find the dock to recharge and upload its latest data. Pairing an AUV or even a fleet of AUVs with an ASV is an ideal match, ASVs are well suited to play a part in persistent maritime surveillance.

While a mobile dock is very versatile, the use of a subsea fixed dock platform might better suit some applications. The idea is to fix the dock in one location that the vehicle would again return to as needed to charge or upload data. In this configuration the dock can be wired directly to shore power but also hidden because it would never have the need to surface. This could possibly be best suited for areas where constant monitoring is important such as around a port or along popular shipping routes.

Aside from defence strategies, the constant monitoring can also be a great asset to the science community for the same reason, persistent surveillance. Current scientific stations are, for the most part, fixed systems. While these have many benefits, they can only collect data on points of interest that are in close proximity to the sensor. A mobile platform has the obvious advantage of scanning larger areas. In the past this may have been too costly for private institutions to afford as it may typically need a support ship, crew and a way to launch and recover the AUV. With a permanent dock, there is no longer a need for daily support thus reducing the cost of the surveillance.

Persistent subsea maritime surveillance is an important key to ensuring a safe coastline and can add valuable data to the science community. AUVs have proven to be very effective in gathering this data in a costly and timely manner. Of course, they have had their limitations, with the greatest challenges attributed to their battery range and launching and recovery of the vehicle. The dock provides a forward-thinking solution as it all but eliminates these limitations by providing an in-water power charging and data transfer station.



View from the AUV less than a meter from docking with overlays of the visual tracking and acoustic tracking feedback. (Courtesy of ISE)

FORUM'S NEW TECHNOLOGICALLY ADVANCED SUBMARINE RESCUE VEHICLE, THE LR11

Forum Energy Technologies (FET) has recently completed its most sophisticated Submarine Rescue Vehicle (SRV) to date. Characterised by a robust design, and incorporating all the latest technologies available, the SRV has been developed to become the worlds most advanced rescue submersible and joins a small group of rescue systems in use around the globe.


Figure 1- SRV during Harbour Trials (Courtesy of FET)

Named LR11 and built for a foreign navy in the Asia-Pacific region, this is the most recent SRV built by FET. It follows the success of previously delivered systems including the NATO Submarine Rescue System (NSRS) which entered service in 2008 and "remains the benchmark", according to industry experts.

The system was designed, built, and tested in FET's state of the art facilities in Kirkbymoorside, North Yorkshire (UK) which includes a 600 cubic meter test pool and a hyperbaric chamber which facilitates testing of the SRV up to her 750m test pressure (or up to 2,400m where required). The in-house capabilities twinned with an experienced aftersales support team provide FET with a distinct advantage over its competitors.

As the SRV is built to include full Lloyds class certification, all aspects of the design and build were witnessed and approved by Lloyds Register. The vehicle is due to receive full class status following sea trials which are scheduled to commence during Q1 this year.

POWERED FOR CRITICAL OPERATIONS

Housed in cylindrical pods each side of the SRV are the Rechargeable Energy Storage Systems (RESS), which are based on the most suited Lithium chemistry available to provide maximum performance, lifespan and safety. The RESS is made up of six batteries to provide energy for the propulsion and life support systems, and has the ability to provide redundancy for each of these critical systems. The submersible uses the latest automotive technologies incorporating CANBUS networking as well as the High Voltage Interlock Loop (HVIL) safety feature.

These supply power to a pair of 20kW electric propulsors which provide forward thrust, as well as a pair of 46kW hydraulic power units providing fluid power for auxiliary thrusters and a multitude of control and tooling systems. Power conservation and redundancy were primary considerations during the engineering phase with advanced technologies incorporated in the design to conserve power and provide back-up in the event of a failure. The auxiliary thruster control systems on board also allows for speeds of approaching four knots, enabling it to operate effectively in high currents.

Figure 2- Side View of SRV (Courtesy of FET)

Figure 3- ROV during Sea Trials (Courtesy of FET)

SRV's provided by FET are typically designed to operate throughout the world at 500m to 650m water depth, this is not a limitation of the technologies but a constraint of the operating/crush depths of the distressed submarines. FET can supply a vehicle to operate at any depth required, with vast experience of supplying ROV's where typical depths are 4,000m and above. Many older generation SRVs only have the capabilities to rescue crew in calm waters, at depths around 400m which limits their ability to support in harsher environments.

SPECIALIST ENGINEERING FOR EFFECTIVE RESCUES

With over 500 military submarines in operation worldwide and 16 major incidents reported in the last decade alone, the requirement for a reliable and effective rescue system has never been higher.

Following a 'SUBSUNK' alert, the rescue system is mobilised, this can be via containerisation for a portable system with the equipment sent by air or (more commonly) the mothership containing the full rescue system is deployed.

The mothership would typically carry the SRV, a remotely operated vehicle (ROV) the launch and recovery system (LARS) and a hyperbaric chamber facility. The latter is required to safely depressurise the rescues in the event of elevated pressures onboard the distressed submarine (DISSUB).

Upon arrival at the site of the DISSUB, communications are established and depending on the mode of failure the ROV can be deployed to resolve the situation. This could be simply cutting the DISSUB free from entanglement (typically fishing nets) or posting rescue-pods which can contain nourishment and medical supplies. Even if the ROV cannot provide assistance, it would survey the 'crash site' and record data including DISSUB orientation, obstructions, currents and visibility. It can also leave a locating 'pinger' so that the DISSUB is quick to locate on further visits.

This information would be utilised by the SRV team to set up for the rescue operation which includes the charging of all systems. It should be noted that when the SRV is first deployed it contains life support for up to 108 hours (with 20 personnel onboard) which endorses the fact that every scenario has been accounted for.

Utilising the reconnaissance information provided by the ROV when available, the SRV is deployed and proceeds towards the DISSUB. It can locate the submarine with or without the ROV's data as the SRV is equipped with a complete suite of the latest navigation and communication technologies. This includes Doppler Velocity Log (DVL), fibre optic gyro, sonar, under water telephone (UWT) and Pinger locator. All sensors systems are fully embedded into Forum's software to deliver advanced functionality, including auto depth, auto heading and autopilot.

EXPERT PERSONNEL FOR COMPLEX RESCUES

The SRV is piloted by two senior pilots. The first sits up front in the Command Module and manoeuvres the craft, the second sits towards the rear of the same compartment and operates the majority of the sensors, the life support system and also moves ballast water as required. Both pilots are regularly ex-military and always highly experienced. The other compartment of the SRV is the Rescue Chamber – this is the rear two-thirds of the SRV, and the third crew member named the Rescue Chamber Operative (RCO) is located here. It is their job to prepare the chamber for the rescue, operate the rescue hatch and assist with the safe transfer of the 17 rescuees (maximum per rescue trip). The importance of the RCO cannot be over-emphasised. The highly trained member of the team is not only responsible for the rescue hatch, which is a critical feature, but also has to be able to assist and communicate with the rescuees who may be injured or in an unknown mental state due to being trapped or exacerbated by toxic gasses or decompression sickness (the bends).

Once the DISSUB is located, and any obstructions are carefully removed – perhaps cutting fishing nets using the cable cutter, or blowing sand/silt away from the submarines rescue hatch using an onboard water pump, the SRV then carefully navigates so that the transfer skirt (this is the hemispherical weldment underneath the rescue vehicle at the base of which is a rubber seal to facilitate the removal of water) is above the rescue hatch on the DISSUB. The vehicle is able to attach to submarines at highly precarious angles, above 40 degrees, so can support even the most complex rescues.


Figure 4- Manipulator Claw, Command Module in Background (Courtesy of FET)

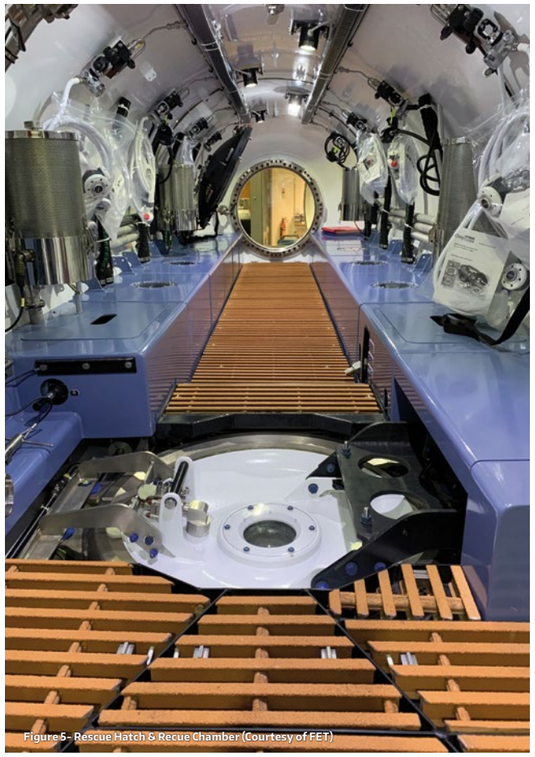


Figure 5- Rescue Hatch & Recue Chamber (Courtesy of FET)

Once in position (and generally forward into the current), the submersible is lowered until the skirt seal is concentric over the rescue hatch and the seal becomes energised. Water is then pumped out using a pair of ballast pumps. It should be noted that the majority of equipment on the SRV is provided in pairs to provide a level of redundancy.

With the seal energised and the water removed, the SRV and DISSUB effectively become one solitary unit – depth pressure providing the physics to facilitate safe transfer, with the SRV held to the DISSUB with over 800 tonnes at 500m.

An intentionally basic, yet critical communication protocol is then followed to ascertain certain details including the potential for pressure differential or the presence of toxic gasses, but ultimately both hatches are opened and the rescues are transferred into the SRV for safe recovery back to the mothership.

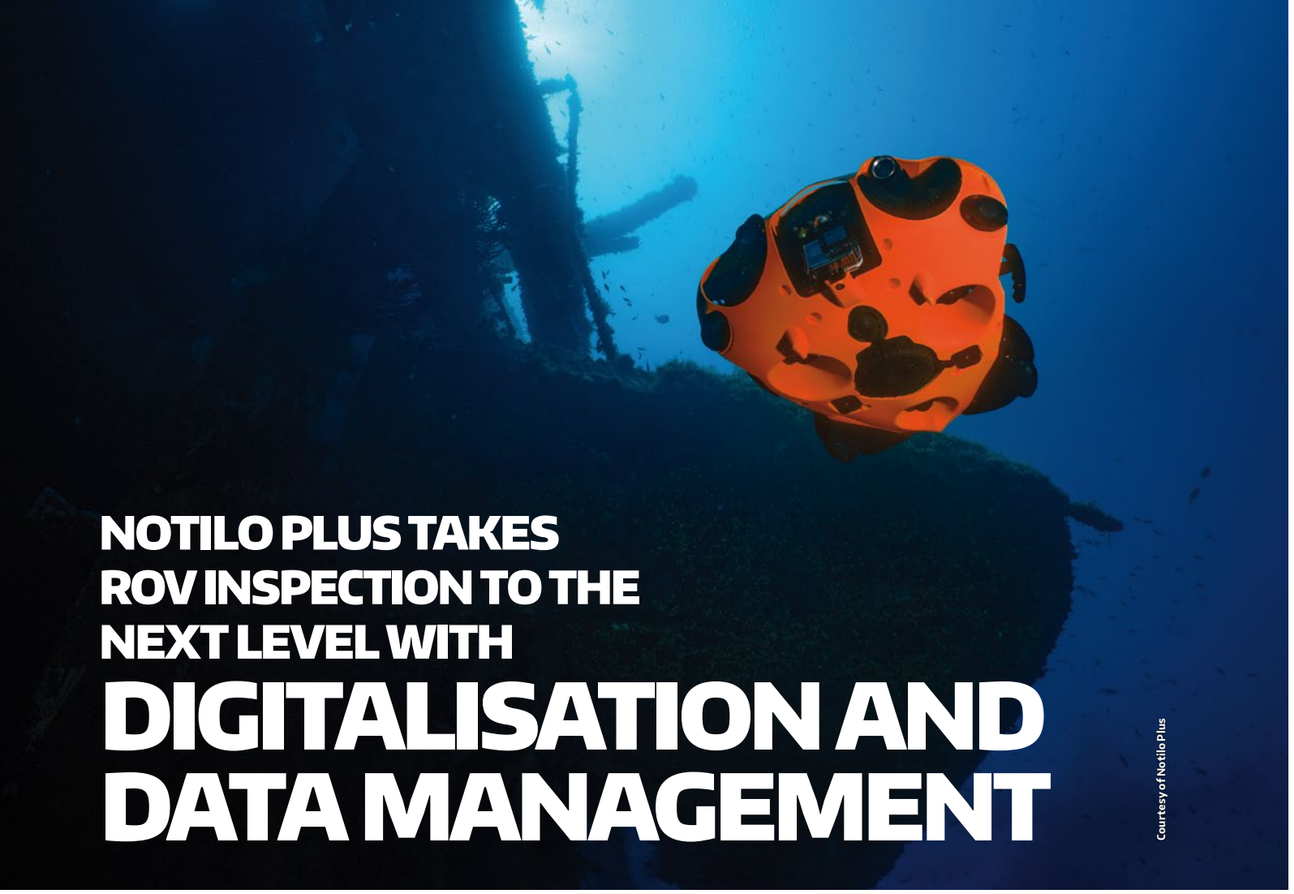
Once on deck, the rescuees are treated accordingly and where necessary, they are transferred under pressure into a hyperbaric treatment complex to be supported by specialist medical personnel.

During the transfer of personnel, the critical breathing air, oxygen and battery systems are recharged if required before the SRV is re-deployed to repeat the process until all rescues are safely recovered.

When a navy submarine runs into trouble, the rescue mission quickly becomes a time critical military operation to save those on board so the SRV must be highly reliable and equipped for any eventuality. FET's new underwater rescue vehicle ultimately brings added peace of mind for a safer, more effective rescue than any other SRV on the market.

KEVIN TAYLOR,
FORUM'S VICE PRESIDENT – SUBSEA VEHICLES,
COMMENTED:

"We have pioneered the development of manned submersibles since 1975 and have supported military organisations and naval forces all around the globe. The completion of the SRV is a huge achievement for the business and testament to our highly experienced engineering, QHSE, purchasing, planning and production teams. I would like to commend these groups for their hard work to realize our vision for the future of specialised submarine rescue vehicles."



Courtesy of Notilo Plus

NOTILO PLUS TAKES ROV INSPECTION TO THE NEXT LEVEL WITH DIGITALISATION AND DATA MANAGEMENT

The 2010's have seen the exponential curve of interest for data of all kinds, from geological survey to facial recognition. Companies quickly understood how valuable the right kind of data can be for them, and we have seen many new data-based companies rise in the last few years. Notilo Plus, a French-based start-up, is one of these quickly rising companies – and a pioneer in a brand-new field: Underwater data management.

When you think about underwater environments, it is important to keep in mind that most of our land-based technologies cannot simply work out of the box. For instance, you can get a phone signal almost anywhere in the world – even in a plane or on a boat. But try to get a signal one meter underwater anywhere on the globe, and you will not get many results. This is where companies like Notilo Plus come in: their professional underwater solution, Seasam, is made to collect this data for you.

It all started with an idea: What if we could have autonomous underwater drones, just like the ones we can see in the air? Back in 2016, the first iteration of this generation of underwater AUV was created by a young entrepreneur in Lyon, France: Nicolas Gambini, CEO of the brand-new company Notilo Plus.

This proof of concept – composed of mainly PVC. pipes, an acoustic sensor, and motors – was able to track and follow an underwater acoustic pinger wirelessly. With this first success, the company launched its crowdfunding campaign to finance the development and industrialization of its first product, iBubble.

The concept of iBubble was simple: an autonomous underwater drone which can follow and record divers. Loaded with pre-recorded scenarios and equipped with seven propellers, the drone is much nimbler underwater than a diver, allowing it to bring new ways to film underwater. It is also able to transform into an ROV controlled by a smartphone by simply plugging a cable to it.

In only two years, the start-up managed to design, develop and mass produce its first product, which was launched in late 2018. Thanks to many ambassadors from the diving, free-diving and scientific communities, iBubble was a hit in the diving world, with hundreds of drones shipped across the world.

Notilo Plus was then ready to work on their next project: an industrial-grade AUV dubbed Seasam. The company initially planned a more robust and industrial ROV, using the knowledge it gained during iBubble's development, but it had not yet fully grasped the extent of the market's needs. But working on iBubble made the Notilo Plus realize how much artificial intelligence and big data management could bring to the maritime industries.

DATA VACUUM

Anyone who ever worked underwater knows how delicate diving operations can get. Between planning, diver safety, weather & water conditions, and lengthy operations, it takes a lot of organisation to have a well-oiled machine.

This difficulty grows even more when it comes to data collection: while some maritime fields have understood the preciousness of collecting underwater information quickly and precisely – especially when it comes to scientific research –, most actors don't have accurate tools to monitor their underwater data efficiently. However, the whole maritime sector is in a road for overall digitalization, and underwater data collection is a missing link for a modern company in this field.

Let's take an example: A large shipping company has a fleet of 200 ships, each of them requiring regular inspections and maintenance operations in order to keep low operating costs. Each hull inspection requires a great deal of human and time resources: inspection dives, ship immobilisation, report classification generation, maintenance operations and more are all necessary to keep such a fleet afloat.

But what if most of these tasks were streamlined, simplified and most importantly synchronized on a single platform? That's where the Seasam ecosystem comes into play.

A COMPLETE SOLUTION

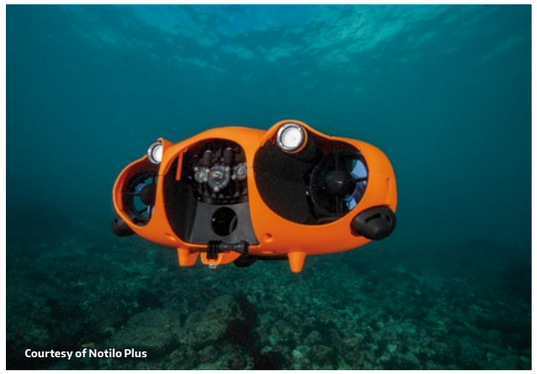
While working on their first industrial-grade product, Seasam, the French engineers from Notilo Plus discussed with several maritime industries actors in order to adapt the drone's hardware and embedded software up to their expectations. What quickly became apparent is that there was a need for a turnkey design which allowed them not only to collect large amounts of underwater data easily, but also to classify and exploit them.

FROM HARDWARE...

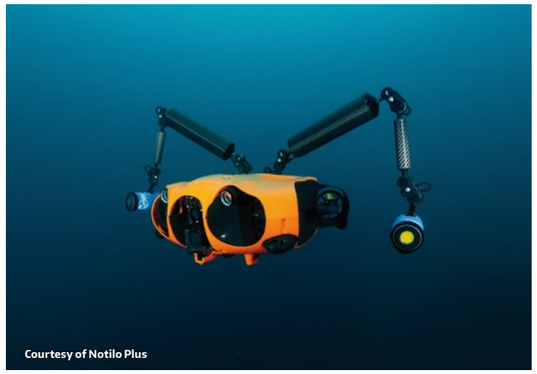
Using its technological bricks approach in its research & development, Notilo Plus was able to design an AUV / ROV hybrid which meets most requirements of the many fields it is aimed at. With a 100m depth rating, seven propellers allowing 6 degrees of freedom, deployable by only one person, requiring little to no training when it comes to operating it in ROV mode and lightweight – only 9 kilograms -, the Seasam Underwater Drone is meant to be a robust and agile solution for ROV operators across all industries.

But its main strong point comes from its ability to perform autonomous structures inspection and generating automated reports of what it has scanned during its operation. Thanks to its in-house developed software, the drone is also able to precisely geo locate the points of interest it detects, allowing for detailed reports.

The drone is also used underwater for diver safety and real time communication through its dedicated monitoring mode.



Courtesy of Notilo Plus



Courtesy of Notilo Plus

Using a pinger located on a diver, the drone autonomously follows and tracks a target underwater without any inputs from the surface operator, and relays video in real-time.

To specialize the drone to the various tasks it was designed to perform, the French team focused its development on modularity and sensor integration. From water quality sensors to acoustic cameras, there are a myriad of high-end, specialized sensors for all kinds of underwater data collection.

The diversity and abundance of these data tools can also be a problem for industry players. The Sensor Hub is Notilo Plus' solution to streamline their usage by adding any sensor to the drone and being able to use them directly. By turning any data collection tool into a plug-and-play system, maritime actors now have an ergonomic, easy-to-use system that can fit their precise needs.

... TO SOFTWARE

To create meaningful reports for companies, high-quality data acquisition and big data analysis need to be combined in just the right way. Using its software engineers' knowledge in neural networks and artificial intelligence, the company began working on a cloud-based data analysis & storage platform. Named Notilo Cloud, it quickly grew to become a standalone service, available to all ROVs and not just the Seasam ecosystem. The data collected by the ROVs is processed and classified in accordance with the requirements of their users.


Courtesy of Notilo Plus

The real advantage of this platform is the possibility to generate and share inspection reports, quickly with advanced editing and image selection tools. The platform was made to be used by industry players, from Service Providers to large shipping companies like CMA-CGM, a close partner of Notilo Plus company. With a simple interface and extensive customization options, the platform aggregates various data into clear, easy-to-read reports.

IN THE FIELD

Using Seasam and Notilo Cloud brings a new vision towards the use of underwater data for hull optimization. Shipping companies, as well as ship owners in general, can get a clearer view on the status of their fleet's hulls, and plan maintenance and dry docks accordingly. As of today, any ROV operator or service provider can upload inspection data in Notilo Cloud, tag the various zones of the hull manually or via the Seasam ecosystem, and create automated reports on biofouling, hull damage or points of interests.

By giving a clear view of the hull, Notilo Cloud helps the maritime industry to get a step closer to the overall digitalization of ship assets. And digitalization opens the way for new opportunities for the ROV industry: Bureau Veritas, the French leader in testing, inspection and certification which is present in more than 140 countries and a 5.1 billion revenue in 2019 has successfully used the Seasam ecosystem for a proof-of-concept remote ship inspection.

This operation also was a world first in the certification field: The Bureau Veritas team, located in their office in Paris, was able to fully inspect the hull of a Corsica Linea ship located in the port of Marseille, France.

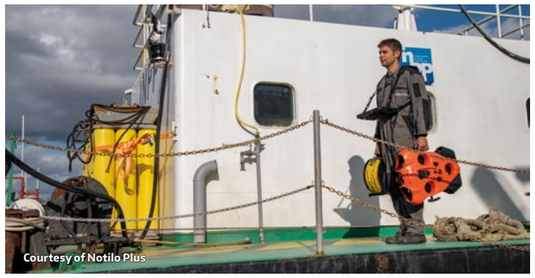
This inspection was successfully completed by livestreaming the drone's point of view in real time. In today's sanitary context, live streaming is finally getting to the point where it can be used to broadcast any underwater inspection live, anywhere. While this long-distance concept inspection was a first in this industry, it definitely will not be the last.

FINAL THOUGHTS

From a novel idea to a full ecosystem used by major industry players in only 3 years, the French company is shaking things up in the small world of industrial ROVs. By focusing on data exploitation and building around it, the start-up has opened a new market, ready to welcome other ROV companies.

Time will tell if digitalization and big data is the next logical step for ROVs manufacturers and operators across the globe.


Courtesy of Notilo Plus


Courtesy of Notilo Plus

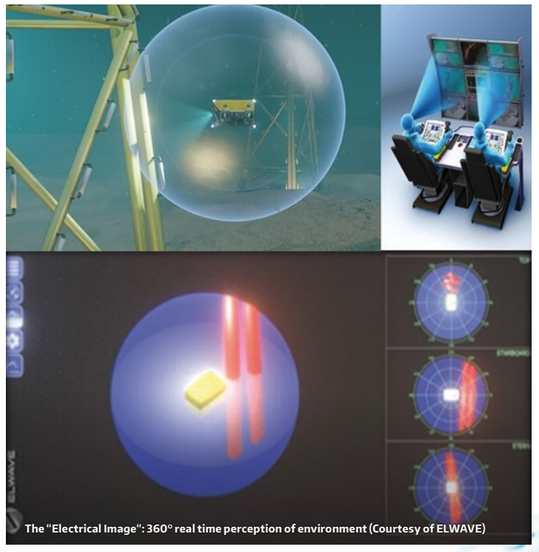
Courtesy of ELWAVE

ELWAVE: A SIXTH SENSE FOR UNDERWATER VEHICLES

ELWAVE, a deep tech company, is the first in the world to develop and market a unique underwater detection technology called the "electrical sense".

Submarine activities are developing rapidly worldwide. Thanks to offshore wind turbines, submarine telecommunications cables, and – in the field of defence – anti-submarine and mine warfare. Inspection and maintenance operations are carried out mainly with ROVs. To reduce costs and carbon footprint, the subsea industry is turning to Autonomous Underwater Vehicles (AUVs) and hybrid ROVs.

Given the current state of sensor technology, all vehicles – including those in full autonomous mode- are confronted with shortcomings in terms of detection. Cameras are blind in dirty water, and sonars do not provide satisfactory "vision" in the immediate vicinity of infrastructures, the seabed, or cluttered areas.


The "Electrical Image": 360° real time perception of environment (Courtesy of ELWAVE)

A UNIQUE BIOMIMETIC TECHNOLOGY

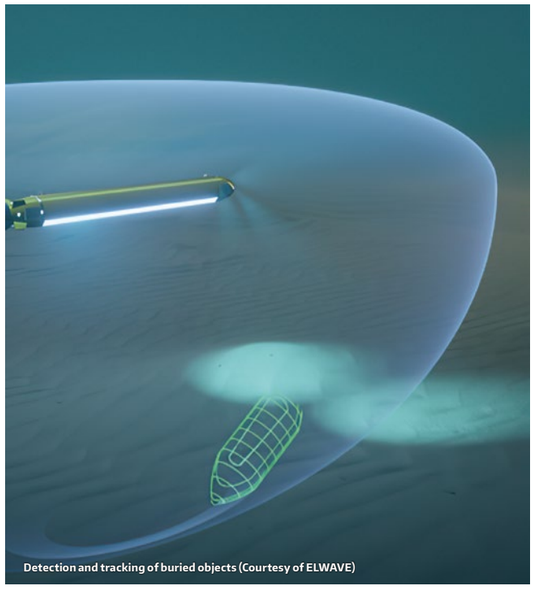
In response to these problems, French company ELWAVE has introduced "electrical sense". This technology utilises ten years of academic research in the bio-robotics laboratory of the Institute Mines-Telecom Atlantique, France.

Inspired by the mode of perception used by fish living in muddy and very congested tropical waters, the ELWAVE sensors installed on underwater vehicles generate a weak electromagnetic field and measure the disturbance created by the environment. Algorithmic and AI processing of these disturbances then makes it possible to create a 360° "electric image" in 3D and in real time. This can be done even in complex environments such as dirty water, highly constrained areas, or with objects to be detected buried in the sediment.

DIRECTLY INTEGRABLE OR DEDICATED SOLUTIONS.

ELWAVE offers two product lines for either navigation and detection in real time around 360° of the vehicle's vicinity, or the detection of buried objects in the first layers of seabed. Both have the ability to localise, shape, and characterise any object entering in the range of detection, inclusive of non-magnetic objects.

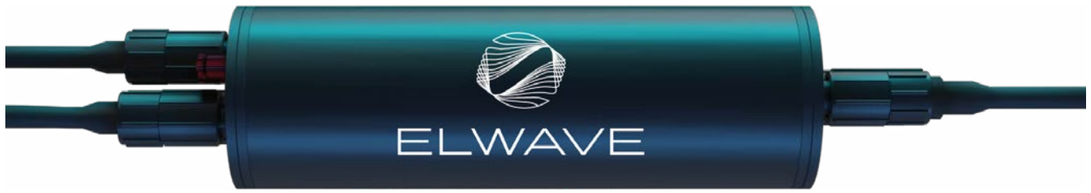
The ELWAVE sensors are made for compact size (40×15cm) and low energy consumption (less than 30w), to be directly integrated into ROVs and AUVs, both in operation or during manufacturing. ELWAVE also conducts upstream in situ demonstrations of its technology, as well as in complex engineering studies for the use of "electrical sense" in response to specific needs on all types of underwater vehicles.



Detection and tracking of buried objects (Courtesy of ELWAVE)

ELWAVE recently secured two million euros in funding to commercialise production by this year. With its patented "electric sense" technology, manufacturers and operators of underwater vehicles can access a unique real-time 360° detection sensor. ELWAVE represents a real "sixth sense" to improve safety and productivity of their operations.

For more information about this new technology please visit: www.elwave.fr



Compact "plug and play" sensor system (Courtesy of ELWAVE)

Courtesy of Copenhagen Subsea

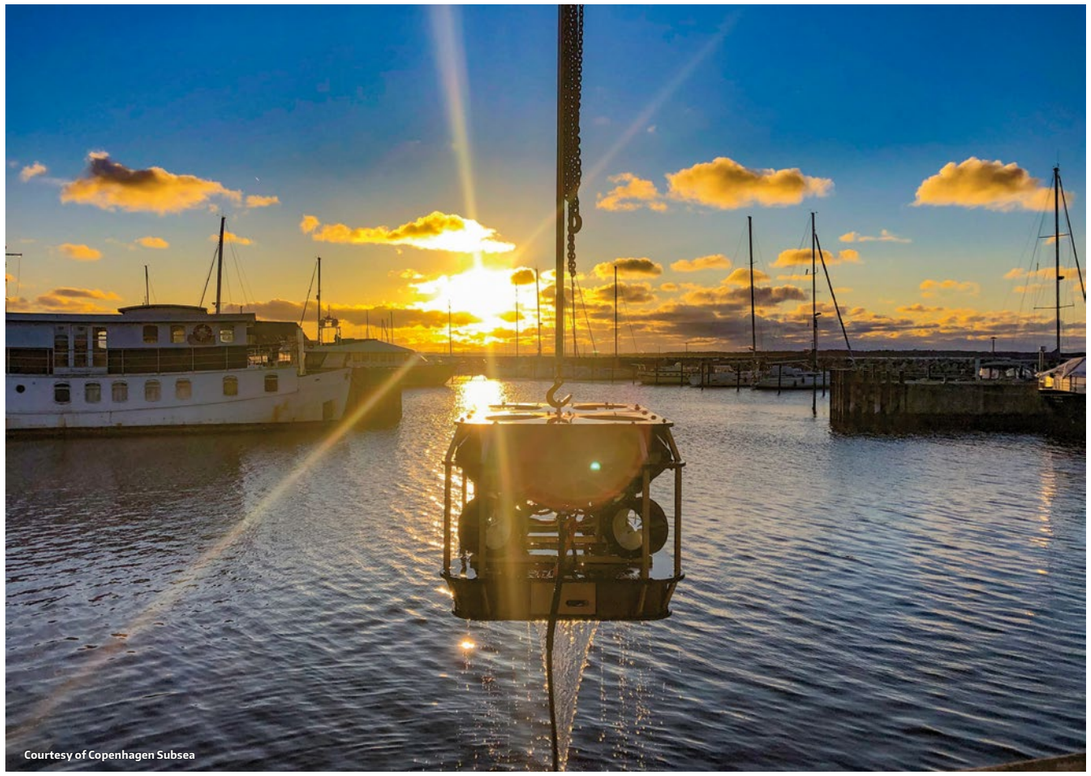
GORILLA ROV
STRENGTH TO DEAL WITH THE CURRENTS

Copenhagen Subsea has launched a new powerful Remotely Operated Vehicle (ROV), specifically developed for the tough conditions in the offshore industry. The ROV is based on Copenhagen Subsea's rim-driven thruster technology and is robust and reliable in challenging environments – qualities which inspired us to name it the Gorilla. Reliability has been first and foremost throughout the design and development of the Gorilla. By basing the ROV on industrial components, we ensure the utmost operational reliability, allowing our customers to execute their tasks on time, to budget and safely, with no need for divers in the water.

EASY TO OPERATE

The Gorilla is equipped as standard with an intelligent Dynamic Positioning (DP) system, enabling automatic control of position, depth, altitude, heading, pitch and roll. A lack of thrusters is a common problem in conventional ROV design, which makes it impossible to control the pitch and roll of the vehicle and thus hard for the operator to keep it stable during operations. Even weak currents can cause these ROVs to tilt and the operator to lose control of the vehicle, potentially leading even to the abandonment of the mission and recovery of the ROV.

Courtesy of Copenhagen Subsea


Courtesy of Copenhagen Subsea

By contrast, the Gorilla's state-of-the-art DP system makes it easy to operate the vehicle even in low visibility and strong currents. This is based on an advanced sensor system, which delivers input to the DP system to constantly adjust output of the ROV's eight thrusters in a fly-by-wire system to keep it stable in the water. The Gorilla can sense the seafloor from up to 70 meters above, enabling the DP system to keep it in the required position, even should the operator take hands off the controls.

This solves another common problem during launch of conventional ROVs, when the current can quickly push it away from the vessel, leaving the operator disoriented and without knowledge of its exact location or where to steer to reach its destination. This can often lead to an abandoned mission, necessitating a second attempt or wait for conditions to improve. Instead, the Gorilla will use its DP system to instantly adjust the output of its eight thrusters to maintain position relative to the seabed, meaning the operator can easily steer to the designated destination.

RELIABILITY AND STRENGTH

Like its namesake, the Gorilla is strong – our ROV can carry up to 70 kg and has an easy-to-understand payload interface with a power supply and separate Gigabit Ethernet connection, dedicated to the customer specific requirement.


Courtesy of Copenhagen Subsea

The electrical system of the Gorilla ROV is based on industrial hardware from the leading Japanese industrial electronics company OMRON. This means we use only industrial standard hardware components which are available commercially worldwide – unlike conventional ROV systems which are often based on proprietary electronic components developed inhouse. This is a critical differentiating factor in the reliability of the Gorilla: hardware developed and produced inhouse, in series of only 20-50 items, is simply not of sufficient scale to achieve the required level of endurance and reliability for offshore use. Industrial hardware components


Courtesy of Copenhagen Subsea

are cheaper, more reliable and easier to maintain as they are produced in series of hundreds of thousands and deployed worldwide across multiple industries. The Omron standard components are readily available off-the-shelf anywhere in the world and with significantly shorter delivery times for spare parts, compared to regular waits of 12 weeks or more for proprietary parts from conventional ROV manufacturers.

Customers will have access to all electric documentation in the form of wiring diagrams, meaning they can service and maintain the vehicle on their own, as well as a full component list so they can source all parts directly. It means an operating company can simply change the Gorilla's standard spare parts itself. These robust industrial components are generally larger, but this means they have the required dimensions to perform reliably in extreme offshore conditions with extended temperature range. These parts also have the capacity to handle overload currents during acceleration and deacceleration and fast shifts of rotational direction. These elements are crucial to keep an ROV stable in challenging offshore conditions.

In short, the Gorilla is tough and strong, works reliably in challenging conditions, is simple to maintain with easy access spare parts and is easily controlled thanks to Copenhagen Subsea's unique thruster technology. This unique com-


Courtesy of Copenhagen Subsea

bination, of exceptional reliability and robustness with maneuverability and power, makes the Gorilla ideally suited for completing any task in tough offshore conditions. On time, to budget and safely.

The Gorilla ROV has been thoroughly tested and the pictures are from the latest inspection task performed under the ice cover in a danish harbor. Copenhagen subsea are now seeking partners to get the Gorilla deployed in offshore conditions with a specific focus on offshore wind farms.

FORSSEA ROBOTICS OPENS WORKSHOP AND TESTING FACILITIES IN SÈTE HARBOR, FRANCE

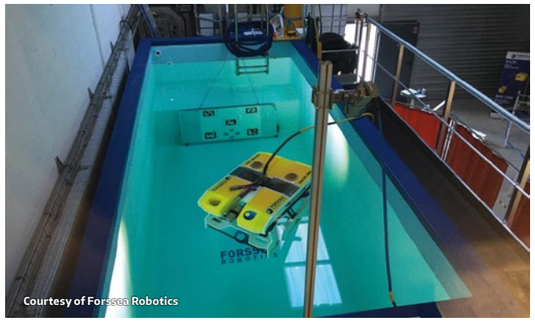
Forssea recently opened its new warehouse in Sète harbor, France which will act as a future maintenance base for French offshore wind farm projects in the Mediterranean Sea. Six engineers and technicians will be working in the new office, where an ROV remote control room is being prepared for upcoming surveys.

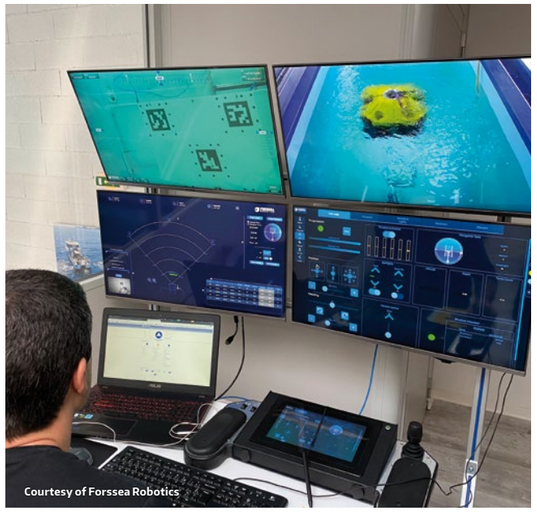
Last October, Forssea Robotics organised an open day, they welcomed several local marine players to introduce the company's plans for the underwater offshore wind sector, and to demonstrate their outstanding technology. The company is known for their innovation, using intelligent subsea cameras and markers for their underwater operations.

The visitors had the chance to look around the facility that houses the 8m long x 3m deep test tank, where they perform underwater systems acceptance tests prior to deployment of their operations. An area will be dedicated to Forssea's underwater vision systems manufacturing and maintenance.

Both the ARGOS and ATOLL ROVs were on display in the testing tank, and the visitors were shown a demo of the capabilities of these vehicles.


Courtesy of Forssea Robotics

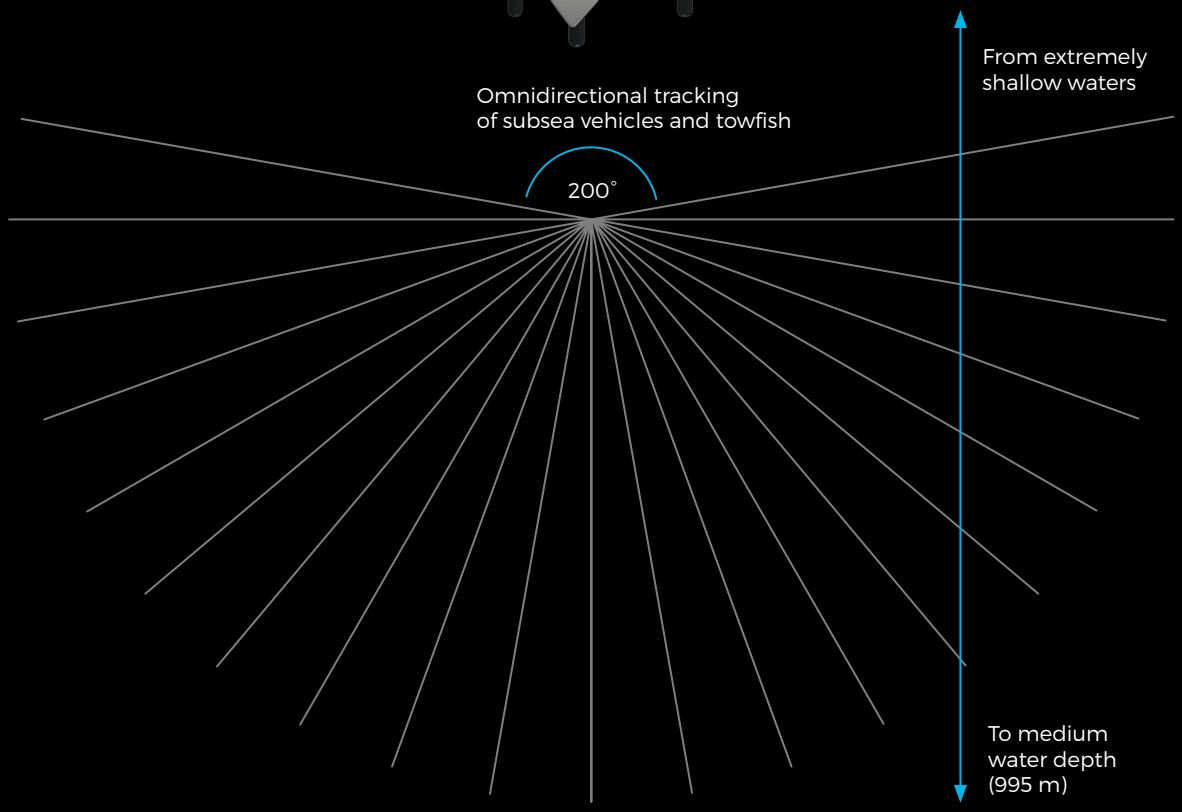

Courtesy of Forssea Robotics


Courtesy of Forssea Robotics


Courtesy of Forssea Robotics

Never lose track of your AUV.

NEW GAPS M5 USBL SYSTEM
Gaps M5 offers an export-free, pre-calibrated positioning and communication solution for the tracking of subsea vehicles and towfish. Its telemetry feature allows for AUV control & command, INS recalibration, as well as efficient data retrieval.



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