ROV PLANET

23

ISSUE

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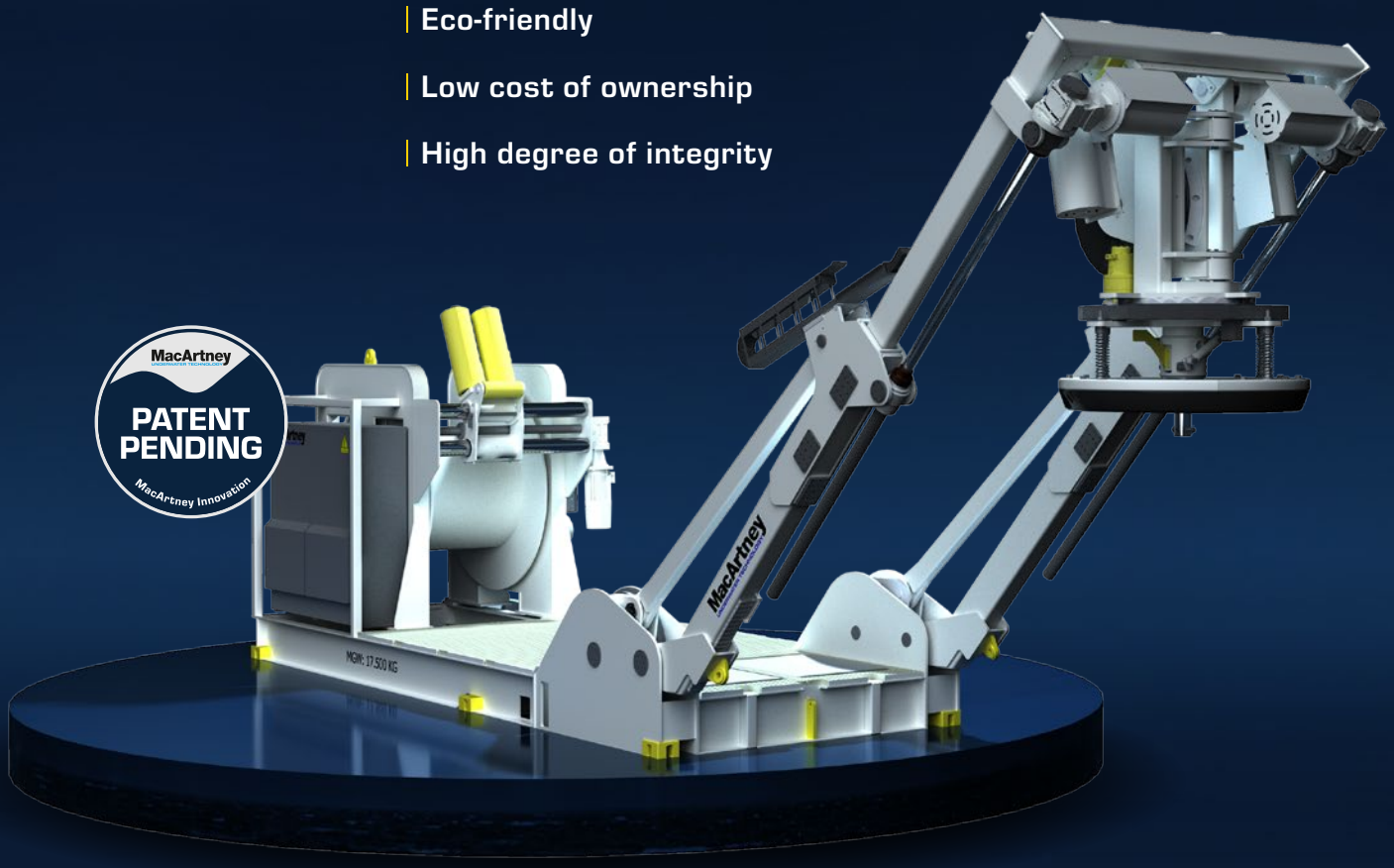

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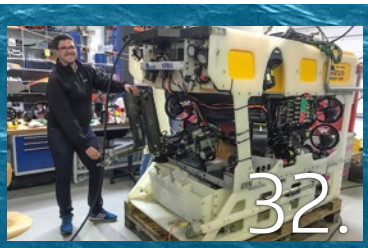

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WELCOME TO ROV PLANET

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

Dear Reader,

Usually I write the introduction around the contents of the issue I publish, but recently the world has changed profoundly. Almost all countries are now experiencing restrictions and lockdowns to keep the population safe and flatten the curve of the coronavirus infections. For us – ROV/AUV/Subsea professionals – who are working in different parts of the world this is even more of a risk. We are potentially exposed to the virus during our travels; flights and airports are hotspots for viruses with a high density of international passengers.

There is not much we can do except follow government and health officials' guidelines: washing your hands, avoiding touching your face, and observing social distancing. I sincerely hope our readers are following this advice and keeping well.

However, despite all these challenges businesses are still running and life does not stop. We must continue to keep working remotely from home when it is possible.

The issue again has some great articles starting with the ARGOS smart light intervention ROV from Forssea Robotics. We also have the BP subsea oilfield panel discussion at Underwater Intervention in New Orleans from earlier this year. There is also a defence theme as we cover the Talisker Whisky Atlantic Challenge, where we speak to a team of Royal Navy Submariners who completed the world's toughest rowing competition.

Furthermore, we have a thought-provoking article on subsea warfare and the future of automation. We also revisited our good friends at QSTAR in Barcelona, as well as in-depth interviews about new products: USBL from iXblue and Leak Detection from OTAQ.

Again, I wish you and your families good health in these turbulent times. Let us all get through this together and we'll see each other on the other side!

Best regards,
Richie Enzmann

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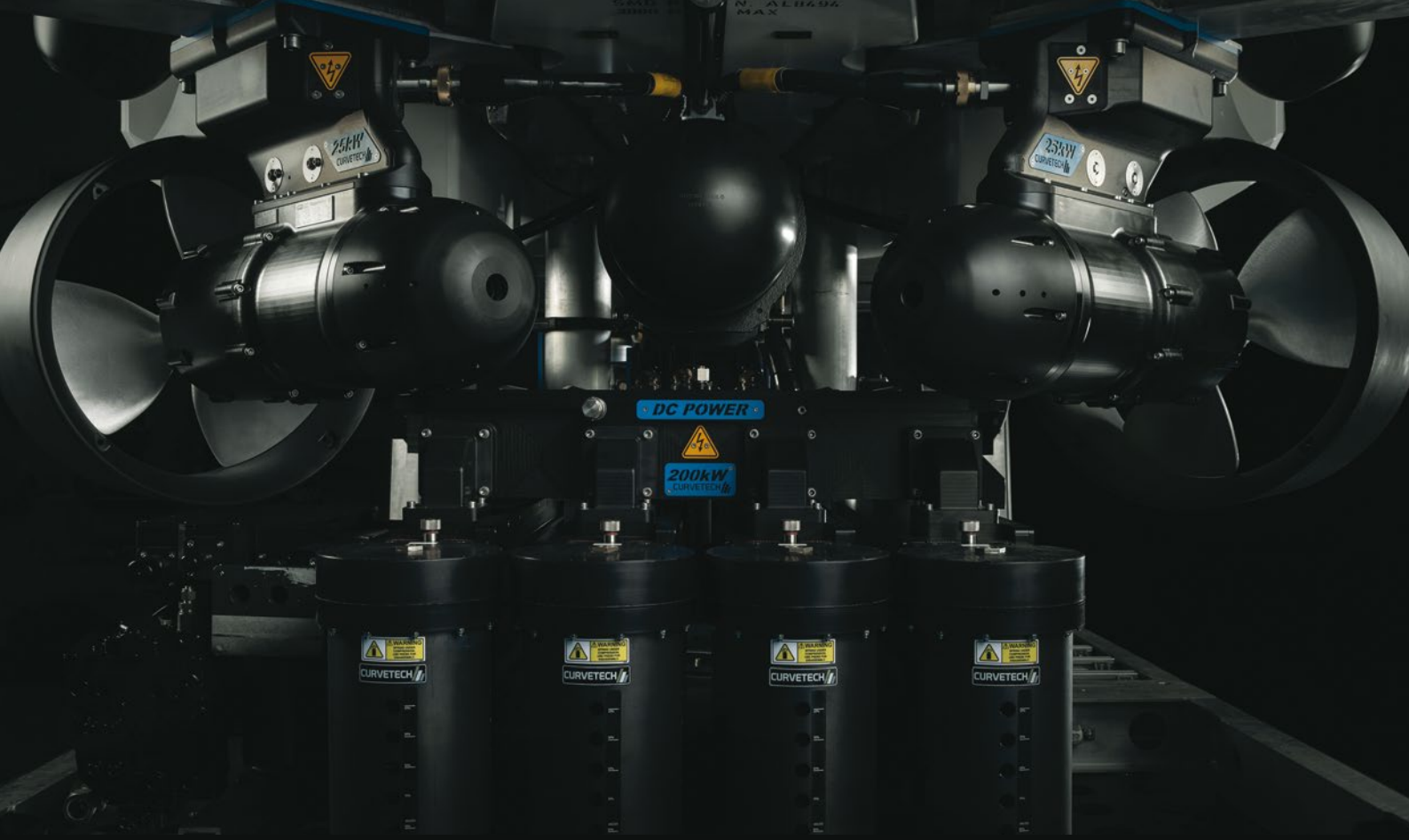
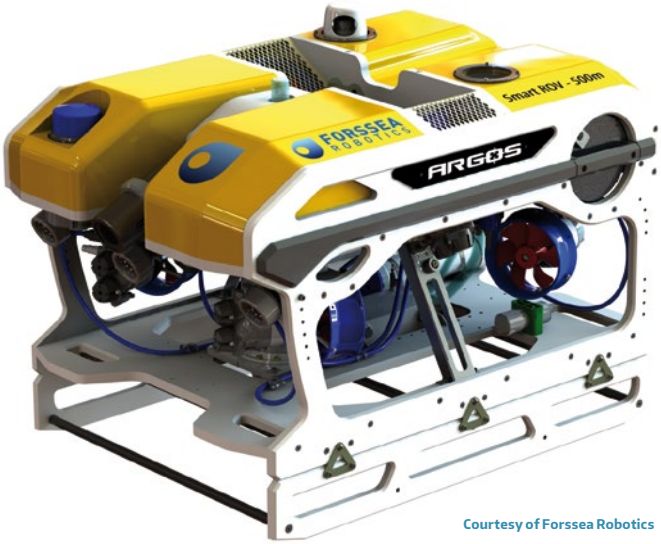
www.ROVPlanet.com



FORSSEA RELEASES

NEW SMART LIGHT INTERVENTION CLASS ROV

AND TARGETS USV MARKETS & REMOTE-CONTROLLED OPERATIONS



Courtesy of Forssea Robotics

France based Forssea Robotics have been developing state of the art underwater technologies for over 3 years now, and through its specialist Research and Development team have been working on a new project since the beginning of 2019.

With the evolving ROV market heading towards new horizons, Forssea Robotics have taken the opportunity to develop a new light intervention class Smart ROV called ARGOS. ARGOS is a development based on the same technology as the previously developed autonomous docking ROV, ATOLL. The two vehicles share the same autonomous technology advancements, but the ARGOS ROV has the added versatility to install full survey equipment and light intervention capabilities.

ARGOS is a state-of-the-art, electrically powered ROV system. It has been designed for a wide range of subsea tasks including structure and asset inspection, diver monitoring and support, maintenance, survey, and autonomous tracking. The ROV is compact in size and weighs only 190kg (including payload). The standard system is rated to a water depth of 500m. The ROV can also be customized with simple modifications to suit either 1,000m or 2,000m ratings. This gives clients a range of options to operate the system globally.

The Oil and Gas market was initially defined as the primary market for the ARGOS ROV. However, with some interested clients from across all sectors of the marine and subsea industries, ARGOS is now considered a game changer for ROV work within the renewables industry.

VERSATILE LIGHT INTERVENTION CLASS SMART ROV

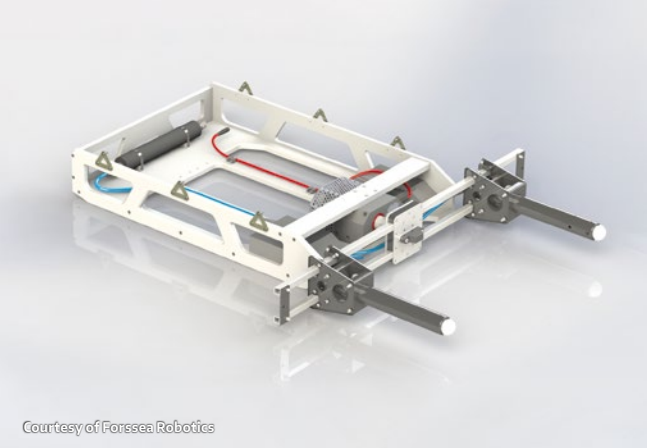
The ROV is supplied with a 320VDC power supply directly from the surface. This allows to use the ROV in a live boat configuration from a light surface vessel. The system can also be interfaced with an adapted size commercial Tether Management System (TMS) and Launch and Recovery System (LARS). The vehicle is capable of carrying a wide range of cameras and sensors such as sonars and altimeters.

ARGOS has also been designed to adopt various larger tooling and sensors by utilising custom built skids at the bottom of the ROV such as an electric 5-Function manipulator, Class 1- 4 torque tool, and cleaning tools.

ARGOS is propelled with 6 thrusters; four axials positioned in the vectored configuration and two verticals. All the thrusters' vertical positions can be adjusted manually before the dive. Axials thrusters' angles can also be adjusted to suit various subsea tasks or different environmental conditions. By designing the thrusters in this configuration, the ROV is able to operate in currents up to 2knts, speeds often found in shallow water.

In terms of subsea tooling and survey sensors the industry has seen a trend with manufacturers and suppliers opting

Courtesy of Forssea Robotics



Courtesy of Forssea Robotics

Courtesy of Forssea Robotics

to develop lighter and more compact tooling and sensors. This is an ideal scenario and is in line with Forssea Robotics' development roadmap.

With the development of electrical torque tools in the subsea market, this makes the ARGOS system perfectly adapted to carry such payloads and conduct light intervention work on structures that were once only capable through a work class ROV. Furthermore, by going electric the tooling does not have the same constraints as hydraulic equivalents; there is no need to carry heavy valve packs for the torque tool, and there is also no oil within the system to be affected by temperature. This makes tool accuracy better for operating valves.

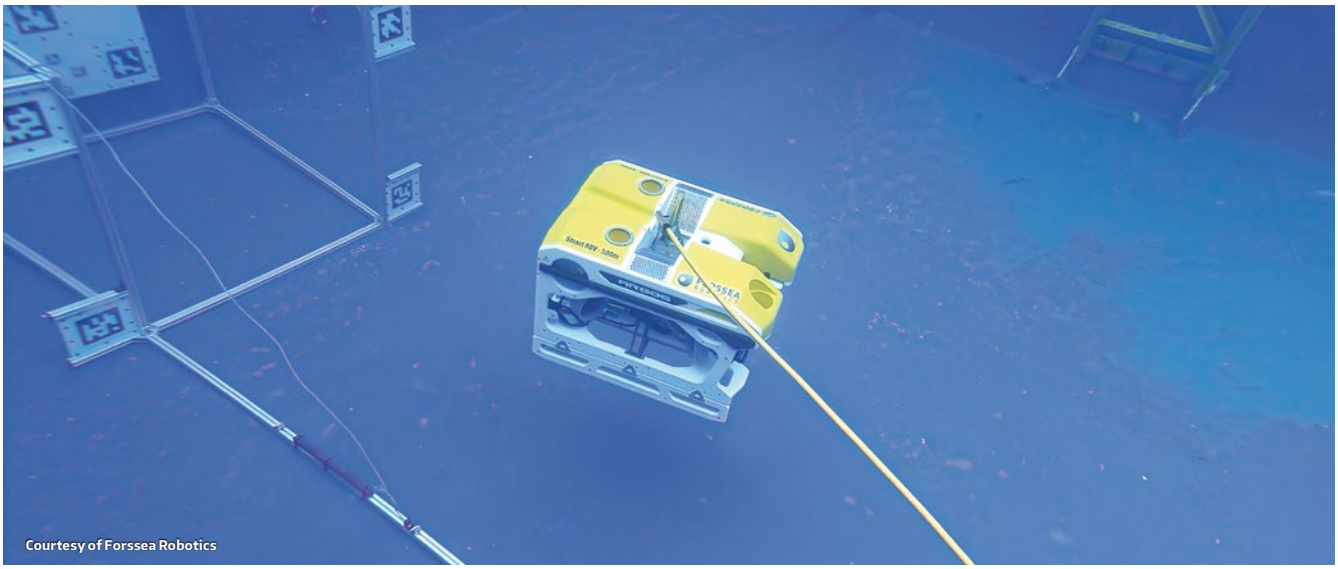
Within the last few years, we have seen that there are now various survey sensors that were once only capable of being installed on work class ROVs, such as high-grade pipe and cable trackers. This has allowed interfacing such equipment to a compact ROV the size of ARGOS: a win-win opportunity for the equipment and ROV suppliers. The universal underslung skid of ARGOS has been specifically designed to accommodate a wide range of tooling and sensors, making change-out of tooling offshore more optimised.

One such survey and inspection system is the Flooded Member Detection (FMD) tool from Subsea Technology & Rentals (STR). Forssea Robotics has an exclusive commercial partnership with for the rental supply of their V-LOC system. The STR SeaGamma FMD system has been designed as a modern inspection tool to reliably determine if a subsea structure has sustained water ingress as a result of corrosion, weld failure, or damage. The system is operational without the need to clean away marine growth build-up.

The STR FMD Rotator Skid utilises an actuator to rotate the survey frame, obviating the requirement for the host vehicle to return to the surface to change orientation of the frame.

PLUG & PLAY USV INTERFACING

One of the main benefits of the Surface Control System of ARGOS is that it is equipped with Transmission Control Protocol/Internet Protocol (TCP/IP), meaning the system is already set up for remote piloting. This removes the need for personnel to operate the ROV on site. Forssea Robotics have already performed pool trials of the TCP/IP control system by having the vehicle operated from their R&D base in Paris, and the ROV located in test pools in the south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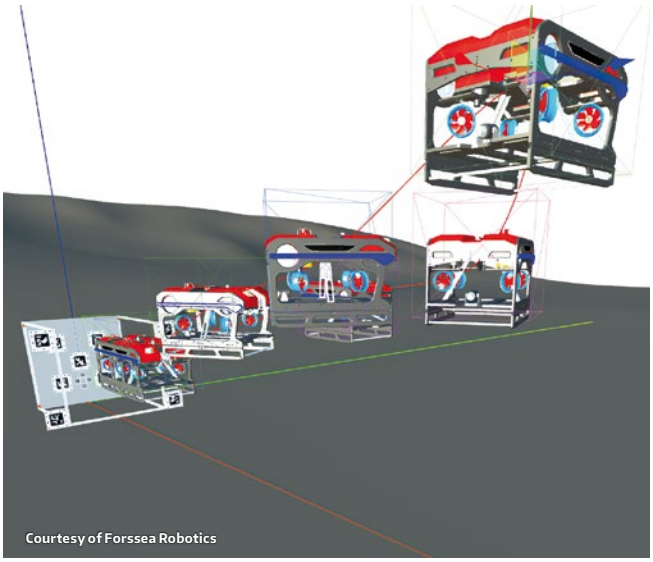
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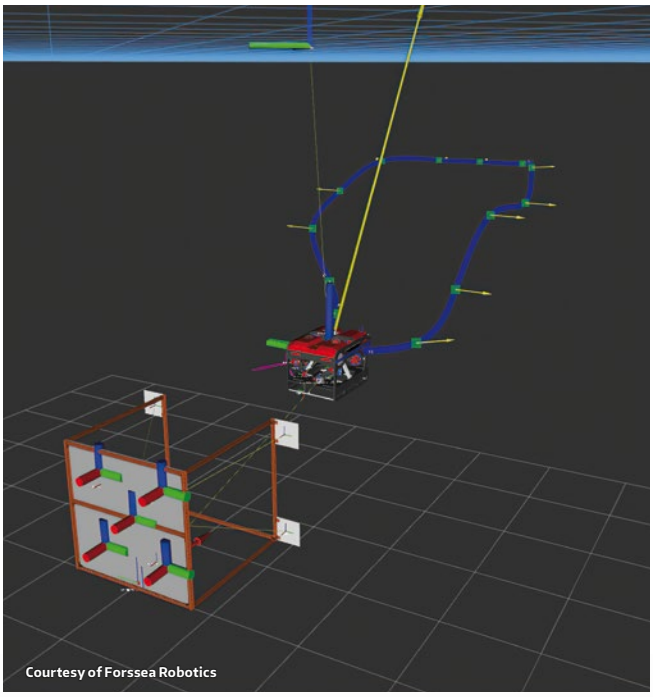

Courtesy of Forssea Robotics

of France. This is the company's major step towards full remote control of the ROV. The standard ROV system also incorporates a fully digital touch screen hand controller.

One of the other advantages of the TCP/IP control is being able to integrate ARGOS into an Unmanned Surface Vessel (USV). After discussions with providers this is a concept that operators will develop further, especially for wind farm inspection and survey campaigns. The ROV also comes with a network supervised and regulated 320VDC power supply. This allows the ROV to be used in a live boat configuration from light surface vessel. The system can also be interfaced with an adapted size commercial TMS and LARS.

The ARGOS ROV can perform tasks in supervised mode by having personnel control the ROV from an onshore control centre. Moreover, the entire ARGOS intelligence and software is embedded inside the vehicle, allowing it to react based on pre-programmed behaviour.

ADVANCED AUTONOMOUS FEATURES TO ALLOW MORE RELIABLE REMOTE CONTROL

In terms of autonomy, the Forssea Robotics specialist Robotics and Software team who were behind the same development of the ATOLL autonomous docking ROV have brought even more aspects of autonomy to ARGOS.

With the fast development of full resident systems approaching, the autonomous technology of ARGOS will be able to perform a full autonomous inspection or survey campaign and eventually in the future a fully autonomous intervention operation such as valve operations.

"However, we believe that the home for resident ROVs is not the seabed, but USVs (Unmanned Surface Vehicles)," says Gautier Dreyfus, CEO of Forssea. "The requirements are similar: long immersions cycles and all electric design to reduce maintenance, supervised piloting mode with low latency, and autonomous features to deal with communication loss and pre-programmed operations such as pipe survey or asset inspection."


Courtesy of Forssea Robotics


Courtesy of Forssea Robotics

The standard ARGOS version currently comes with "smart" piloting modes including latency management, auto-diagnosis features, dynamic positioning (based on visual, acoustic and/or INS/DVL sensors) and GO-TO features. Visual docking can be used to safely dock the ROV back inside its TMS, especially in challenging weather conditions.

In addition, Forssea is currently working on a new intuitive mission planning and supervision tool that will be sold as an option. This software platform is currently being trialled, with commercial release planned for early 2021.

The ARGOS ROV platform has been carefully designed to accommodate a range of client requirements: whether this be a basic observation ROV or a fully equipped autonomous system for advanced subsea operations.

"Service contractors need versatile hardware platforms with intuitive and evolving high-value software," says Gautier Dreyfus. "We want to offer this open platform with a long-term robotics service."

VISUAL LOCALISATION SYSTEM V-LOC

In addition to the development of the ARGOS vehicle over the past year the Forssea Robotics team have been focusing on the development of their Visual Positioning System (V-LOC) which is used for monitoring structures positioning, heading, and attitude: all done visually without the need for any ROV intervention or docking onto the structure. All that's required is open source QR code markers installed onto the host structure, and a Forssea Robotics Nav Cam mounted on the ROV to obtain full 6 degree of freedom absolute positioning of the structure. The Nav Cam is a fully integrated survey sensor that is available for any light or work class ROV.

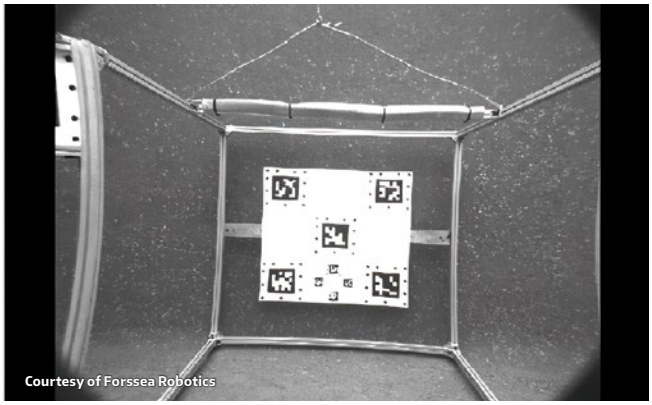
In the summer of 2019, STR acquired eight V-LOC systems to include as part of their client rental pool. More recently they have become the exclusive rentals distributor and commercial partner of the V-LOC system. By having STR as our partners for the rental supply of the V-LOC system, we are now in a prime position to support client operations globally.

In terms of projects last year, V-LOC has completed offshore trials in Egypt where a suction pile was installed and most recently it has completed operations for the Finlaggan SSIV installation in the North Sea.

Stephen Miller, Project and BD Manager at Forssea Robotics explains "We have seen interest from subsea service suppliers and survey contractors for the use of the V-LOC system for many applications.

"Initially we developed V-LOC for the key purpose for monitoring of structure positioning during installation. Now however, we are being asked if V-LOC can perform more complex tasks which would normally require a lot more survey equipment. Survey contractors are also being encouraged to propose alternative technologies as part of their tenders, so the V-LOC system fits in well with these proposals. Forssea Robotics and STR are currently in discussion with various clients in which they feel our technology can provide a niche solution."

Further versions of the V-LOC system will be coming to the market this summer which will have modified hardware in order to be operated on deck and land-based operations.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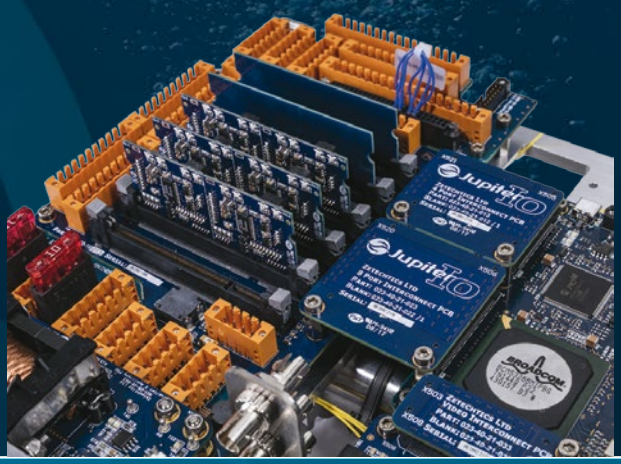

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THE BP "FUTURE SUBSEA OILFIELD"

PANEL DISCUSSION AT UNDERWATER INTERVENTION 2020

By: Bob Christ, SeaTrepid – Technical Chair for UI2020

BP hosted a very lively panel discussion on the future of the subsea oilfield. The event took place Wednesday February 5th in New Orleans at Underwater Intervention on the main exhibition floor adjacent to the exhibits. This year's event was a continuation of the 2019 two-day panel.

Moderator Mark Siegmund fleshing out the discussion (Courtesy of Bob Christ)

The discussion's focus set aside the higher-level needs of the operators (as they have not changed materially since last year's discussion) and drilled down to the specifics of service company achievements towards the operators' challenges laid down during the 2019 event. Formatting changes from the 2019 event place the panel into one extended discussion with a break mid-discussion.

Panelist included:

- Mark Siegmund, Moderator
- Martin Dove, BP
- Diana Grauer, TechnipFMC
- Todd Newell, Oceaneering
- Giovanni Massari, Saipem – Sonsub
- James Ives, XOcean
- Sean Halpin, Houston Mechatronics
- Philip Hoffman, NOAA

BP's Doug Hernandez lead with the safety moment followed by UI's Technical Chair, Bob Christ, with setting the stage for the discussion based upon a series of talking points:

1. This year's event sets aside the broader discussion of operator needs
2. We will drill down into the specifics of select service company initiatives towards achieving the objectives laid down in the 2019 event
3. Some select background statistics reflect the shift in worldwide energy generation and usage:
   a. The UK will ban new gasoline and hybrid car sales by 2035
   b. In 2019, fossil fuels fell to record low proportion of UK energy mix
   c. 20% of 2019 UK grid electricity was generated by offshore wind

BP's Martin Dove outlining his company's objectives for the future (Courtesy of Bob Christ)

4. Pricing pressures continue to drive service companies to rethink their menu of offerings in order to adapt to the changing overall market conditions
5. Offshore operators are requiring a rethinking of their business models from being an "Oil and Gas Company" model to becoming "Energy Company" in order to remain relevant in this changing worldwide energy production landscape

BP'S MARTIN DOVE OUTLINING HIS COMPANY'S OBJECTIVES FOR THE FUTURE

Moderator Mark Siegmund immediately led into the main discussion introducing the sole operator representative, BP's Martin Dove. A no-nonsense dive straight into the heart of the issues quickly ensured with Martin outlining BP's initiatives in a series of "Messages":

> MESSAGE 1: 100% of all BP subsea inspections will be conducted via unmanned systems from 2025
>
> MESSAGE 2: By 2025, BP will reduce the number of people working on IMR vessels by 50%
>
> MESSAGE 3: BP will increase the use of automation and remote controls offshore
>
> MESSAGE 4: BP's goal is the removal of people from offshore through usage of advanced technologies for conducting remote and/or autonomous operations
>
> MESSAGE 5: BP will use more AUV's and/or ROVs that are remotely controlled from onshore

Martin then challenged the service company representatives onstage and within the audience to discuss their initiatives to meet the upcoming evolution within the subsea oilfield. A stunned silence ensued within the audience and onstage panelist...

DR. DIANA GRAUER led off the service company portion with discussion of her section within TechnipFMC. Her mandate from top corporate management is to encourage new innovation through collaboration with smaller companies. Dr. Grauer's team forms a small business innovation incubator in order to foster rapid commercialization of possibly disruptive technologies that may face excessive hurdles with coming to market.

TODD NEWELL followed with Oceaneering's progress on its Freedom resident ROV system.

GIOVANNI MASSARI reported on Sonsub's leap forward on new software and hardware control systems.

In keeping with the rapidly evolving nature of autonomous vehicle development, XOcean's JAMES IVES reported on their progress with his company's unmanned surface vehicle development along with the IMO's progress towards standards for USV integration onto the high seas.

SEAN HALPIN returned to report on Houston Mechatronics' Machine Vision and Manipulation developments as integrated into Aquanaut, HMI's innovative subsea IMR vehicle.

For the 2020 event, BP invited participation from NOAA as the governmental entrant into the discussion. PHILIP HOFFMAN gave a poignant review of NOAA's unmanned vehicle initiatives rounding up the lecture series thus opening the floor for audience participation.

Mark Siegmund immediately drove into the panelist with the main messages laid down by Martin Dove:

a. How does your company's new technologies fit into BP's low carbon agendas?
b. What measures is your company implementing to reduce the number of people offshore by using onshore remote operating centers?
c. How are you transforming today's AUVs into vertical inspection machines capable of doing light interventions?
d. How is your company moving the advancement of AUVs and ROVs into the combi systems?
e. Please explain your initiatives on new subsea sensors, computers, or systems needed to advance technology that may not be available.
f. Discuss your company's work in progress, successes, challenges, and failures.

The theme arising from the service company responses were a consistent set of challenges experienced by both the onstage panelist along with the audience in general:

1. The industry-wide downturn from 2014 onward has consistently resulted in falling profits putting a squeeze on service company research and development budgets.
2. Governmental and Operator-sponsored funding initiatives are overly political blocking some of the more promising technologies from coming to market.
3. The offshore oil and gas industry is slow to adapt to new technologies due to the general risk-aversion of operator field-level program managers.
4. Some type of operator/service company shared-risk program needs to emerge in order to meet the needs of a rapidly-evolving technological environment.
5. The general trend of operator needs places even more pressure on service companies to cut into profitable revenue streams such as field service personnel day rates as well as high-value asset field usage.

UI Technical Chair Bob Christ awarding BP Panel event organizer Doug Hernandez the achievement award (Courtesy of Bob Christ)

6. There is a vast oversupply of field resources such as platform supply vessels, offshore heavy-lift assets and such with insufficient worldwide demand to assure sufficient equipment utilization. This is pressuring asset owners to re-task these items into other industries or to scrap their valuable inventory of equipment.

7. There will be further consolidation within the service company sector giving rise to opportunities for smaller/more nimble companies to arise from the turmoil.

BP's Marcelo Lardosa recapped the highlights of the discussion as a means of summary. The session was quite thoughtful and left more questions than answers. But the function of this forum is to foster the ongoing chatter that allows everyone a voice in the future of our industry. This was/is a worthwhile endeavor and we hope to continue this discussion at future events.

UI Technical Chair Bob Christ awarding BP Panel event organizer Doug Hernandez the achievement award

The general consensus from the session was the observed continued pressure on traditional service providers to change their mix of services towards further efficiencies and autonomy while observing the operator initiatives of personnel reductions, environmental safety concerns as well as shifting towards accommodation for renewables. However, all in attendance recognized the turmoil within the industry is providing ripe opportunities for the "Two Kids in a Garage" style disruptive technologies to emerge. The challenge to both forums remains the same – we all must rethink the way we do business in this rapidly changing technological landscape.

Subsequent to the conclusion of the BP Panel at UI, the world in general (and the offshore oilfield in particular) has been subjected to an unprecedented worldwide pandemic not seen in over 100 years. In the wake of this game-changing event, our close circle of panelist and organizers again conversed to discuss this event's effect upon our industry. Further, our feeling is this event will only accelerate the need for personnel removal from field locations and serve to distribute the command and control towards remote shore-based lock-down centers. We believe the entire O&G Industry will change the way it does business in the future due to COVID-19. We also believe that the "New Green Agenda" the world is attempting to meet, globally, will be replaced by the findings of the COVID-19 virus and how the O&G industry recovers. Although our reflections on the 2025 oil field of the future and Modernization and Technology projects are a good bellwether of things to come in the medium-term, for the short-term we need to figure out how the Majors will keep the smaller O&G companies and contractors in business throughout the next cycle of low oil prices. The global economic meltdown has slowed demand for oil and gas products flooding the market with supply thus plummeting the pricing. Without coordinated efforts of industry and government to stem insolvencies, our strategic supply of this necessary commodity will have limited to no consistent contractor support as the casualties of price wars accelerate the domino-tumbling of contractor bankruptcies.

As the 2020 Underwater Intervention was the last of the major industry forums before the onset of the COVID-19 pandemic, this discussion may require moving to a remote forum in order to keep the momentum going on evolving our industry to change with the times.

ABOUT THE AUTHOR

Bob Christ is CEO of SeaTrepid International – a US-based ROV service company servicing the Western Hemisphere's commercial and governmental sector. Bob is the returning 2020 UI Technical Chair, and Vice Chair of the MTS ROV Committee.

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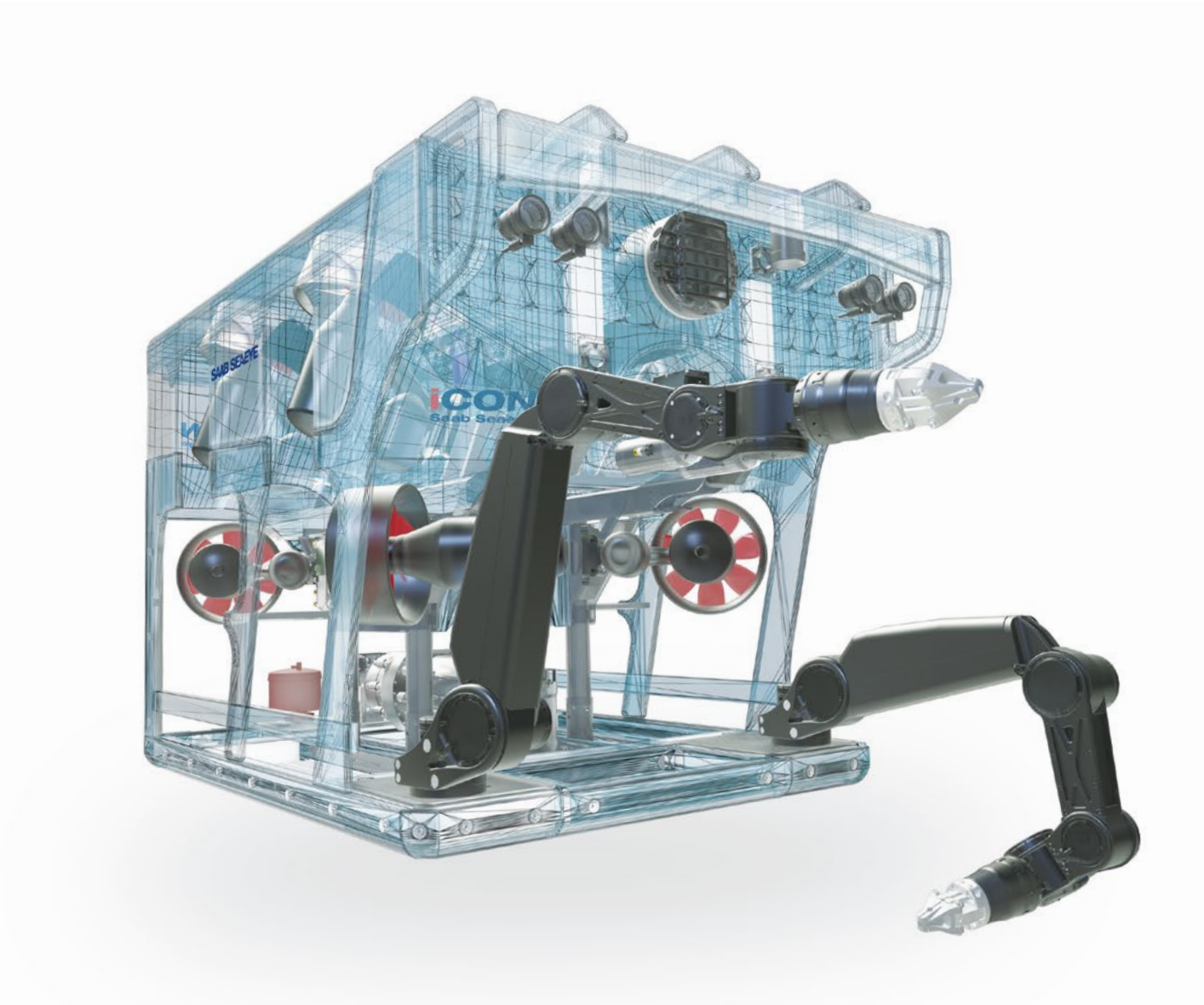

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FINISH OF THE 2019 TALISKER WHISKY ATLANTIC CHALLENGE

FROM LA GOMERA TO ANTIGUA.

A team of serving Royal Navy Submariners have completed the world's toughest rowing challenge. HMS Oardacious finished the Talisker Whisky Atlantic Challenge on Saturday 18 January, after a 4,828 km row from the Canary Islands to Antigua.

The team took 37 days, 6 hours and 40 minutes to complete the row, racing against 35 teams from around the world and reaching the finish line in sixth position, becoming the fastest serving military team in history to row across the Atlantic Ocean.

The four-man team has raised over £110,000 for charity to provide Mental Health and Wellbeing support to their serving, veterans and family community working with the Royal Navy and Royal Marines Charity (RNRMC) which operates to ensure a world in which sailors, marines, veterans and their families are valued and supported for life.

HMS Oardacious left San Sebastian de la Gomera on 12 December and rowed unsupported across the Atlantic Ocean. The team rowed for 2 hours and rested for 2 hours all day every day for the duration of their crossing. They faced waves over 40 feet high, salt sores, storms, sea sickness and blistering tropical sunshine.

The race is considered the world's toughest row and puts the competitors to the test, both mentally and physically. Each rower consumes an average of 10 litres of water and burns up to 10,000 calories per day. The crew lost on average 16 kg each when they first stepped on land.

Courtesy of Atlantic Campaigns


Courtesy of Atlantic Campaigns

The First Sea Lord, Admiral Tony Radakin congratulated the team on social media, saying completing the row was "an amazing achievement".

> **And they've done it!!** @hmsoardacious have crossed the finish line in Antigua after 37 days, 3 hours and 7 mins at sea. An amazing achievement, a huge sum raised for charity, and doubtless 4 very happy submariners and their families and friends tonight. Enjoy the celebrations!
>
> **First Sea Lord (@AdmTonyRadakin) January 18, 2020**

Expedition Leader, Lieutenant Mitchell-Heggs tells ROV planet:

"Thank you for your support! We were fortunate to have seen some of the Atlantic's most incredible sights, pods of dolphins and whales that curiously came right up to our boat, sea turtles, swordfish, yellowfin tuna as well as sea birds that would circle ominously round us for days on end. The night skies, sunsets and peaceful moments gave us some time to reflect whilst some of the storms and harsh conditions tested our resilience as individuals and as a team to get the job done. Our capsize over 1000 miles from land was a reality check that reminded us just how powerful the Ocean is and how our safety culture and ability to react under pressure was crucial.

It was such an incredible feeling completing our 3000-mile journey; the Atlantic threw everything at us but some real perseverance, drive and determination from my team saw us arrive safely into Antigua. Seeing our families waiting for us in the harbour with a welcome crowd of hundreds of people was the most incredible feeling and made the whole experience even more special. Our first steps on land were a bit wobbly as we'd been used to living on a tiny boat that's always rocking around but we quickly got used to it. It's been really nice having basic luxuries back: fresh food, a shower, a toilet (instead of a bucket) and of course a bed!

We couldn't have done this without the support of our support teams and sponsors, of which we are particularly grateful to ROV Planet for supporting this campaign. The question is what's next?"

To find out more about the team, challenge please visit www.hmsoardacious.com

To donate £5 to the charity text NAVY OAR to 70500 or visit the website for more information.


Courtesy of Atlantic Campaigns


Courtesy of Atlantic Campaigns

AUTOMATION, AUTONOMY, AND SUBSEA WARFARE

HAVE WE ALREADY OPENED PANDORA'S BOX?

By Maj. (retired) Konrad Mech, P.Eng.

Last year, I wrote an article titled Android vs Human Soldier: What Near-Future Warfare Will Look Like. As a former officer in the Royal Canadian Artillery who works in the tech space, I became concerned with the rapid convergence of technologies that may enable state actors to deploy android combat units in the near future. I compared the features of a notional android soldier with a human soldier, and posited some uncomfortable outcomes including maltreatment of prisoners of war, indiscriminate collateral injury or killing of non-combatants, and summary execution of identified leadership. A respected senior commander from the Canadian Army and a military lawyer provided input on military and international humanitarian law. I believe that many similar issues must be confronted in the maritime space.

Warfare is ugly. It is much worse when state actors violate established norms by performing atrocities against military members and the civic populace at large. During WWI, Germany outraged the world in 1915 by sinking the ocean liner RMS Lusitania, killing 1,198 non-combatants. The German high command restricted submarine warfare until 1917 when they adopted unrestricted submarine warfare, allowing attacks against tankers and merchant vessels, including neutral vessels, without warning. This action was a significant factor in the United States' decision to enter the war against Germany. Unrestricted submarine warfare occurred again in three theatres during the Second World War: during the Battle of the Atlantic (Germany against the western allies), in the Baltic (Russia and Germany against each other), and in the Pacific Theatre (Japan against USA). Today and tomorrow's new technologies – unchecked and unregulated – could embolden some powers to engage in similar behavior in future conflicts.

The world has been blessed with the absence of a major conflict since the end of the Second World War. But we are faced with the ascendancy and rapid militarization of the People's Liberation Army Navy (PLAN) in China and a resurgent Russia. Russia is already very active in the Arctic, and China has stated it has polar interests. China is also asserting territorial dominance in the South China Sea, including provocative maneuvers against other navies, and has focused on asserting naval dominance as far as Hawaii in the Pacific, for example the PLAN's seizing of a USN sea glider in disputed waters in the South China Sea. With the accelerating development of intelligent mines and torpedoes, swarm drones, hypersonic missiles, subsurface sensors, weapons guidance technology, inertial navigation, and strong focus on automation and autonomy, it's a good time to devote serious thought to these issues.

In today's subsea world, the seabed hosts fixed sensor arrays listening for acoustic signals, feeling for magnetic anomalies, and measuring changes in ocean chemistry. Navies are increasingly deploying gliders and unmanned vehicles as remote sensing platforms for intelligence, reconnaissance, and sentinel functions. Sensitive sensors are utilised for target location, target identification, target tracking, attack, and defense/counter-attack. Subsea vehicles can stay submerged in 'persistent' mode, recharging at subsea docking stations and transferring data via acoustic modems. Inter-operational assets like submarines, sensor networks, and surface assets secure ocean space and deny mobility. Trade journalists are writing pieces such as The World's Deadliest Torpedoes and The Future of Drone Warfare: The Rise of Maritime Drones. It is clear that advanced computing power, increasing battery efficiency, underwater communications technologies that enable neural networks of surface and subsea robots, and other technical advances are converging rapidly in potent new systems. This convergence creates potential for collateral harm to non-combatants and those 'hors de combat' (prisoners of war, those surrendering, etc), as well as significant environmental damage and degradation – unintended (or worse, intended!) outcomes in cases where human oversight and intervention are not designed into the system.

Unintended collateral consequences to innocent parties – killing them due to automation – is already a reality. Ukrainian International Airlines Flight 752 was downed by the Iranian Islamic Revolutionary Guard when a Russian surface-to-air missile system, the SA-15 Gauntlet, was set to 'weapons free'. Highly automated, the time from target (mis) identification to launch was less than 10 seconds. A Wikipedia entry on Gauntlet states: "The digital computers allowed for a higher degree of automation than any previous Soviet system of its type. Target threat classification is automatic, and the system can be operated with little operator input, if desired." Obviously caused by human error, Iran announced the arrest of several people over this incident. But what of truly autonomous systems, where there is no human in the decision loop at all? What party is to be brought to justice – the system manufacturer? The software coding team? The commander who deployed the system in theatre?

Militaries already face recruiting and retention challenges. Automation gives militaries significant benefits in terms of reduced manpower required to run complex naval systems like submarines and surface vessels. During World War II, a destroyer needed 350 crew to operate. Today, the US Navy's Littoral Combat Ship is designed to be manned by 40 personnel – 10% of the complement of a similar sized warship from WWII. This reduction in manning greatly eases the challenge of manning up for a conflict and reducing losses if a vessel is taken out during combat – an advantage that military planners will exploit. Autonomy offers the potential of reducing losses even further. Deploying vessels at and under the sea without any personnel is very attractive to military planners. However, there is a moral hazard component to this. If no humans are on board, remote operators may feel empowered to take greater risks. From the perspective of the attacker, a warship or submarine without human lives on board becomes an abstract weapon. Add autonomy to the mix and there may be a bias to increasingly violent action by attackers using autonomous weapons rather than de-escalation to reduce loss of life.

What harms could this type of moral hazard cause? Injury and death due to indiscriminate action by autonomous weapon systems and significant harm to the environment are real outcomes. During the Battle of the Atlantic in World War II, German U-boats sunk 6,000 ships totalling 21 million GRT – vessels with munitions sent to the bottom and fuel oil spilled in the ocean. The war caused considerable environmental damage, some lasting to this very day. Many lives were lost because convoy vessels were ordered not to stop and pick up survivors to minimise additional losses to the attacking submarines.

That was then. Many modern war vessels are powered with nuclear fuel. Six nations have operational nuclear submarines. The US and France have nuclear aircraft carriers. The number of Chinese nuclear subs cannot be known with certainty. Indiscriminate action against nuclear vessels could result in badly contaminated oceans.

In the event of violations, who would be held to account? Take this hypothetical case. The California Gray Whale population was gravely threatened at one time. It has now recovered well and continues to migrate between Alaska and Baja California each year. If there is a Pacific maritime conflict, it is probable that action would occur off the California coast. If nuclear attack submarines have a duel off the coast, with active sonar, intelligent torpedoes, torpedo countermeasures, and surface launched anti-sub mortars roiling the ocean, do we seriously believe either party would stop to consider collateral damage to migrating cetaceans? And after the event, would anyone be held to account?

Compared to the maritime battles of WWI and WWII, the potential for environmental damage and degradation are significant. Thousands of undetonated drones that missed their targets, toxic fuel from inbound missiles destroyed by Close In Weapon Systems (CIWS), the millions of depleted uranium rounds fired by those CIWS, and nuclear waste from nuclear sub duels would have long-lasting effects. Bikini Atoll is still hot from nuclear testing in the 1950s. And nobody will be fighting a 'green' war; the carbon footprint would be massive.

If war is the last act in the failure of diplomacy, then how to hold bad actors to account? Outcomes of war include long-duration stalemate (WWI trench warfare), disengagement without formal end to hostilities (Korean peninsula) a negotiated peace on terms (Franco-Prussian War 1870-71), or a sound defeat of one party with unconditional surrender (Japan 1945). While losers pay the price for war crimes, victors rarely do. General Curtis LeMay was the US Air Force General responsible for the firebombing campaigns of Japanese cities in the closing days of WWII. An estimated 100,000 civilians were killed in Tokyo alone. "Killing Japanese didn't bother me very much at that time... I suppose if I had lost the war, I would have been tried as a war criminal," he is widely quoted as saying.

Military personnel may empathise with this overly pragmatic viewpoint. In addition, so do many corporate executives in this domain. Many companies are actively involved in developing technologies and systems on behalf of their national government. But today's citizens don't think that way. Shareholders and the general public engage these companies to the extent that entire departments focus on Corporate Social Responsibility and ESG – Environmental, Social, and Governance.

Corporations are targeted by activist stakeholders. Google recently had a Silicon Valley staff mutiny when employees found out Google was working on AI projects for the US military. After over 3,000 employees protested, Google withdrew from participation on next-phase projects. Question: what if this outcome was engineered by foreign agents to hamstring the USA in order to maintain a lead in their own nation's pursuit of AI dominance?

The subsea domain is a fascinating and rewarding place for us to work in. Let's remember there are significant moral and ethical issues to ponder. There are difficult, ugly options: don't develop bad technology at all and face potential defeat by an adversary using bad tech; take the high road – develop tech, but strictly follow negotiated rules for its use, and possibly fall to bad actors who violate those rules; develop tech and follow a 'no first strike' doctrine to at least maintain tech parity; and lastly, actively seek to win the arms race by any and all means, ethics be damned.

Let's think carefully and deeply about where we take our industry. The choices we make as employees, leaders, corporations, nations and societies today determine our outcomes in the future.

Konrad Mech works in the Maritime industry. The opinions expressed in this article are solely those of the author.

JOTUN HULL SKATING SOLUTIONS:
A CLEAN BREAK FROM FOUL PRACTICES

We get beneath the surface with the Jotun HullSkater to find out how this proactive hull-cleaning device is saving money and helping to save the planet

It's becoming more and more apparent, even to shipping companies which have been slow in committing to ecologically responsible digital strategies, that slashing carbon emissions and cutting costs are not mutually exclusive principles but are actually two sides of the same coin.

If there is still any element of surprise in this, it's perhaps only that new approaches to even some of the less high-profile operational procedures at sea can have a markedly positive effect on reducing a fleet's carbon footprint while saving substantial sums of money. One such major breakthrough, heralded with some justification as a revolution in hull-cleaning technology, is the HullSkater, the outcome of a close and lengthy collaboration between two industry giants, KONGSBERG and Jotun.

Where cleaning the hulls of large vessels has habitually been an expensive and laboriously reactive process, requiring divers and/or subsea drones to painstakingly remove macro-algae and macro-fouling from a ship's sub-surface structure, the hull skating principle is proactive, keeping hulls consistently clear before bacterial organisms can properly take hold. The risk of fouling increases when vessel operations are disrupted by factors such as fluctuating cargo availability, changes in fouling pressure and the number of ship idling days, so the HullSkater is an especially attractive solution for shipowners whose fleets are involved in challenging, unpredictable day-to-day operations. However, its potential for lowering fuel consumption, lessening the environmental impact and enhancing the hull efficiency of any large vessel is boundless.

Courtesy of Kongsberg

THE JOTUN HULLSKATER AT WORK

As the key component of Jotun's Hull Skating Solutions (HSS) initiative, the Hullskater is designed to be a permanent component in a vessel's equipment inventory. It is installed while the ship is in dry dock, while Jotun's Sea-Quantum Skate antifouling coating – which is designed to deliver good protection while withstanding regular proactive cleaning by the HullSkater – is being applied to the hull. The HullSkater itself is a remotely operated, four-wheeled device capable of being deployed underwater at any angle, even upside-down. Each of its wheels contains a magnet core which affixes the HullSkater securely to the hull, and its array of sensors and powerful lights are complemented with four cameras. The three cameras mounted on the front can be configured to point downwards for hull inspection purposes or positioned as front-facing so that operators can use them to navigate the device over the hull.

When working in inspection mode, the HullSkater's proactive condition monitoring applies a sophisticated and accurate fouling risk algorithm, taking into account a range of data parameters including oceanographic elements such as sea temperature, salinity and nutrients as well as determinants relating to the vessel itself – e.g., speed, activity, length of time spent idle, and so on. The idling data algorithm will also consider the depth of water and distance to shore of the ship while idle. When engaged in subsequent hull cleaning activities, the HullSkater's motorised brush will clear away any light fouling before it has a chance to accumulate and thereby compromise the ship's operational efficiency and flexibility. Optimal hull performance is the result of a simple equation: preventing speed loss prevents the accrual of additional fuel costs.

CORNERSTONE TECHNOLOGIES

Kongsberg Maritime has been a cornerstone of the HullSkater project since 2015. As Jotun's strategic partner in this venture, KONGSBERG has been responsible for enabling and delivering the robotics, industrialisation and manufacturing processes while also ring-fencing the HullSkater with a comprehensive global service and support network, ensuring local representation for customers in all locations and providing proactive servicing via KONGSBERG's vessel-to-cloud data infrastructure. As well as taking care of the HullSkater's assembly and project management at a new facility in Horten, Norway, KONGSBERG's broad-based expertise has been brought to bear in developing the device's battery technology, its composite materials and its internal navigation, remote control and data management systems, including ultrasonic sensors, data collection and cloud-based storage, and secure communication between the device and vessel. The navigation system has been devised to keep the HullSkater well away from a ship's thrusters and propellers, and work is under way to enhance the device's autonomous capabilities, eventually producing a version which will operate without an umbilical cable attached.

The KONGSBERG Group's well-founded commitment to the UN's Sustainable Development Goals work plan made the company the most fitting choice to partner with Jotun for the project, which is also reinforced with the cross-functional input of other market-leading firms such as Semcon, DNV-GL, Telenor and shipping partners including Wallenius Wilhelmsen and Berge Bulk. Kongsberg Maritime's long-term drive towards smart, integrated, fuel-reducing and climate-friendly automation and navigation systems chimes closely with Jotun's pledge to produce high-performance global fouling protection which reduces emissions, energy consumption and waste; and the HullSkater can be seen as an embodiment of this combined aim.

CLEANER AND GREENER

The numbers stack up very favourably. Extensive testing for over two years on more than 30 vessels has revealed that it takes just two hours for a HullSkater to inspect a 10,000m2 hull, remotely operated by a Jotun Skate Operator with the onboard support of a Skate Operator Assistant. This short investment of time pays inarguable dividends: while the market average performance for bulk carriers shows an average speed loss of 5.9% over five years due to fouling-induced drag, vessels using Jotun HSS can expect a reduction of just 1%. The consequent improvement in fuel consumption can save a minimum of 13% (approximately $4,366,000) in fuel expenditure and lead to a reduction in CO2 emissions to air of more than 12.5% (around 22,700 tonnes) over the same five-year period. It is additionally estimated that if 25% of ships engaged in challenging operations were to convert to HSS by 2030, the CO2 emissions reduction would equate to a minimum of 10 million tonnes per year.

It hardly needs pointing out that the accompanying decrease in a vessel's environmental footprint is highly significant, as is the fact that the proactive cleaning methodology means that everything removed from a ship's hull comes from local waters, preventing the transfer of invasive species from one sea area to another. Proactive hull cleaning also enables vessels to spend an effectively limitless amount of time idle, if compelled by circumstance to do so, without fouling accumulating beneath the surface. As the HullSkater is permanently on duty, hull state verification inspections can be carried out round the clock; a valuable asset for shipowners and crews who can confidently present documentation to confirm the cleanliness of a vessel's hull at any time, for example if requested by port authorities before berthing.

"As a company, our dedication to the ongoing development of sustainable, fuel-saving and safety-enhancing technologies speaks for itself, and we fully embraced the Jotun HullSkater project as another innovative milestone in the crusade towards a global reduction of air and sea pollution," says Egil Haugsdal, President, Kongsberg Maritime. "Our partnership with Jotun has been symbiotic and mutually fruitful and will inevitably strengthen as more and more shipping companies adopt this novel and prudent way of keeping their vessels clean, efficient, profitable and environmentally responsible."

Courtesy of Kongsberg

Jotun HullSkater (Courtesy of Kongsberg)

The unique design of Gaps M7 has been kept in the M5 version but with shorter legs to reduce its overall height by about 12cm compared to the M7. (Courtesy of iXblue)

GAPS M5

A NEW COST-EFFECTIVE AND EXPORT-FREE USBL SYSTEM

FOR ULTRA-SHALLOW WATER TO MEDIUM WATER DEPTHS

iXblue, a major provider of advanced navigation, subsea positioning, and imagery solutions recently announced the launch of its new Gaps M5: a compact, export-free, and omnidirectional USBL (Ultrashort Baseline) system offering highly accurate location, positioning, and tracking of subsea assets. ROV Planet Editor Richie Enzmann spoke to Paul Urvoas – Product Manager at iXblue – who answered our questions and shed some light on the new Gaps M5 and its capabilities.

RICHIE ENZMANN: What is Gaps M5 exactly?

PAUL URVOAS: Gaps M5 is the latest addition to our USBL product range. Both Gaps M5 and Gaps M7 (previously known as Gaps) are USBL acoustic positioning systems that do not require any in-the-field calibration as they embed a motion sensor in their housing. Gaps M5 integrates a free-of-export Octans Nano AHRS based on iXblue FOG technology for stable heading roll and pitch compensation and a true North reference. Gaps M7 on the other hand, embeds a FOG-based Phins INS. This means that both Gaps M5 and Gaps M7 are calibration-free systems that do not need to be coupled with an external heading or attitude sensor, enabling very efficient operations.

Smaller and lighter, our new Gaps M5 is easy to install and ready-to-use. It offers an accuracy better than 0.5% of the slant range up to 995m. In practice, an ROV located 500m below the vessel will be positioned with an accuracy under 2.5m. Another big benefit of our Gaps M5 is that it is freely exportable and allows hassle-free shipment and operations.

RE: You say the new Gaps M5 is smaller and lighter; how does it compare to the Gaps M7?

PU: The unique design of Gaps M7 has been kept in the M5 version, but with shorter legs to reduce its overall height by about 12cm. The Gaps M5 also uses a different model of hydrophone. However, the acoustic aperture offered remains exactly the same. Apart from this, and the different embedded motion sensors, both Gaps are integrated, interfaced, configured, and used similarly. The 3D 4-hydrophone antenna still has different leg lengths to enhance horizontal tracking capabilities, and the acoustic design still offers maximum aperture with up to 200° omnidirectional coverage without the need to tilt the antenna. Both Gaps are extremely efficient in shallow water and horizontal tracking conditions especially when multiple vehicles must be simultaneously located at 360°. Gaps M7, on the other hand, remains the preferred solution for highly demanding applications as it offers an accuracy that can reach 0.06% of the slant range up to 4,000m, with ultimate horizontal tracking performance for shallow water applications.

The new Gaps M5 is suitable for any tracking operation under 1,000m. (Courtesy of iXblue)


Gaps M7 used by MAGE survey company during an hydrographic mission in the Sea of Okhotsk. (Courtesy of iXblue)

COMPARATIVE TABLE: GAPS M5 VS GAPS M7

	Gaps M5	Gaps M7*
Operating range – meters	995 m	4000 m typical
Accuracy – % of the slant distance (CEP50)	<0.5 %	0.06 %*
Embedded motion sensor	Octans Nano FOG-based AHRS	Phins FOG-based INS
Heading accuracy (degree secant latitude)	0.5 °	0.01 °
Dimensions (Height × Diameter)	520 mm × 296 mm	638 mm × 296 mm

* In vertical conditions. Including GPS error of 0.1 m. Sound velocity profile compensated.
Transponder transmit level=191 dB ref µPa @ 1 m. Slant range of 1000m

RE: Why did you decide to develop a new Gaps?

PU: Leveraging 15 years of developments and continued improvements to meet our customers' most demanding requirements, Gaps M7 has now become one of the highest performing USBL systems on the market, with established benefits such as its compact size, light weight, ease-of-use, and unrivaled horizontal tracking. But our Gaps M7 often offers a performance that is too high for less demanding applications. This is why we decided to expand our USBL range to cover the full spectrum of performance and accuracy required for vertical and horizontal tracking applications. With the new Gaps M5, we are now able to offer a cost-effective USBL system that is especially suited for subsea positioning needs of 1,000m or less.

RE: Which applications is the new Gaps M5 most suited for?

PU: Gaps M5 is suitable for any tracking operation under 1,000m, from diver – to multiple subsea assets – or inspection ROV-tracking. For imagery applications making use of a towed sonar a few hundred meters away from the mothership, Gaps M5 can also be a valuable asset. This is especially true when the sonar is equipped with its own INS as it will enhance the USBL positioning.

For reservoir dam IMR operations, where an ROV must be positioned below a distance of 100m with sub-metric accuracy, Gaps M5 will also be the best solution. Overall Gaps M5 will be the preferred solution for all very short range applications such as rivers, lakes, and dam environ-

Gaps M5 integrates a free-of-export Octans Nano AHRS based on iXblue FOG technology for stable heading roll and pitch compensation and a true North reference. (Courtesy of iXblue)

ments. Thanks to its compact size and embedded AHRS, it is easy to integrate and operate and can be used on small vessels with reduced crew onboard, or even deployed on instrumented buoys. Third-party friendly, Gaps M5 can also be used for dynamic positioning applications as an acoustic transceiver, using one single beacon in USBL mode or multiple beacons (3+) in LBL mode. Whatever the application, customers can rely on our teams to help them define the most suited acoustic and inertial positioning solution for their operations.

RE: Does Gaps M5 need to be recalibrated after repairs?

PU: "Because Gaps M5 embeds its own AHRS, its does not depend on the platform it is mounted on. And, thanks to its advanced design and mastering of all mechanical parts manufacturing tolerance, Gaps does not require any calibration. This remains true in the event of partial or total acoustic parts replacement. No recalibration is needed. This is why Gaps M5 is a true "calibration-free" system.

RE: Has the new Gaps M5 already raised interest within the industry?

PU: Yes, it has. As a matter of fact, a leading international subsea and offshore solutions provider has already contacted us to acquire many Gaps M5s this year. Another company specialising in mooring solutions has also recently shown interest in our Gaps M5... they have identified our USBL as being the only existing solution on the market suited to their needs in terms of budget, required performance and ease of use. And because our Gaps M5 can be easily interfaced with Dynamic Positioning (DP) systems, we've also been approached by many integrators for such applications.

RESEARCH DATA IN REAL TIME

SHORT MEASURING INTERVALS FOR SUBMERSIBLE ROBOTS

Dr. Nicolas Nowald, Research Associate, MARUM Marine Technology Working Group
Oliver Schultz, Application Engineer, Application Sales, Bender GmbH & Co. KG
Dipl.-Ing. Benjamin Greiff, Industrial Solutions, Market Segment Manager Harbours & Vessels, Bender GmbH & Co. KG

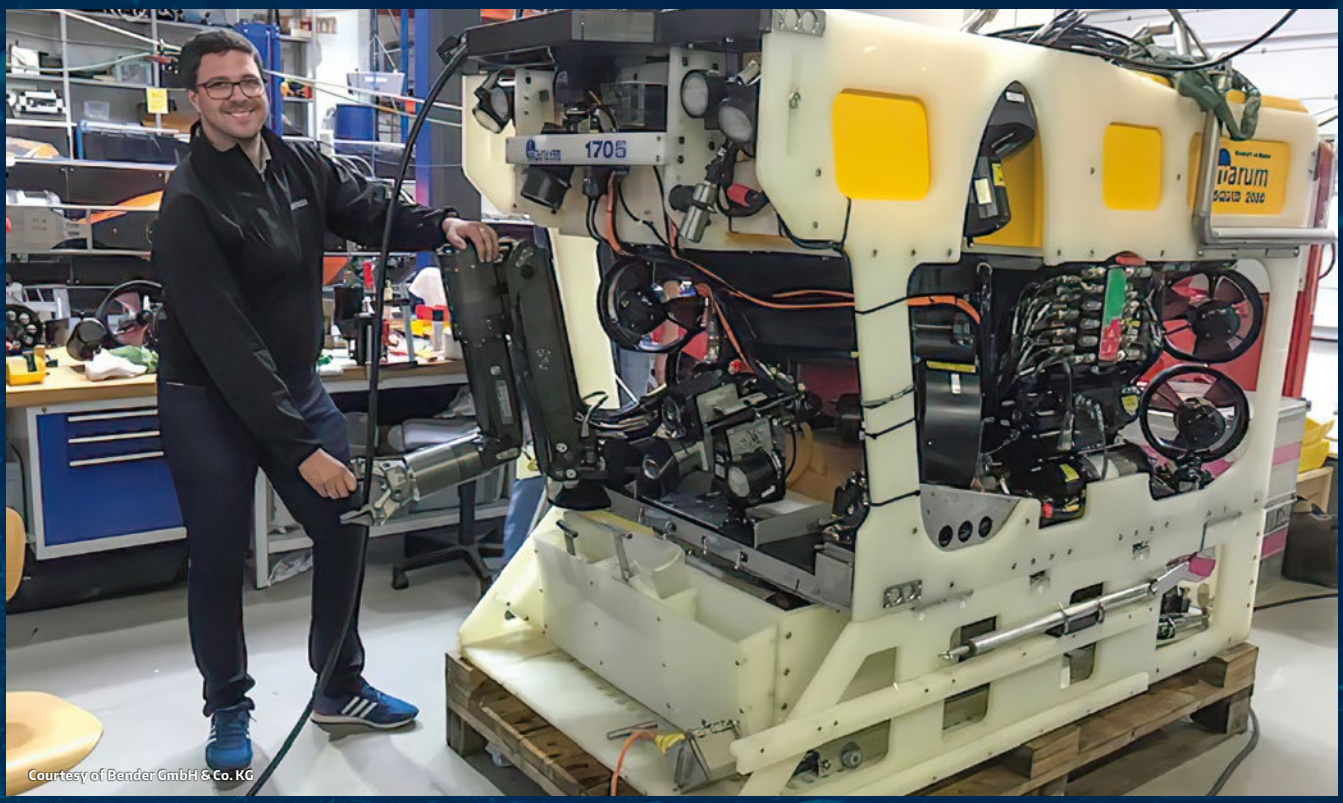
ROVs are used in marine research for underwater exploration. The high-tech devices need to withstand immense pressures and perform their work reliably even at depths of several 1,000 metres. A stable power supply is therefore vital for success.

Since 2012, the MARUM Centre for Marine Environmental Sciences has been the University of Bremen's first and only faculty carrying out research. Around 400 staff work there to improve understanding of the key processes in marine environments. With its research areas Ocean and Climate, Geosphere-Biosphere Interactions and Seafloor Dynamics, its scientists are involved in national and international research projects. The basic research it conducts has enormous potential because the ocean floor accounts for 71% of the Earth's solid surface and is located at depths of up to 11,000 metres below sea level. To understand interactions taking place at the seafloor/ocean confluence and to quantify their role in the Earth's geosystem, MARUM operates and develops a fleet of different submersible and measuring systems which are deployed at sea by research ships.

BUNDLED TECHNOLOGY IN THE NAME OF RESEARCH: THE ROV MARUM-SQUID

The MARUM-SQUID is a powerful, lightweight work class ROV with a maximum diving depth of 2,000 metres. All ROV systems such as the SQUID are connected to a ship via a supply cable and controlled remotely and supplied with power from onboard. The ROV is made of a plastic frame in which all the components needed for diving are installed. To prevent the vehicle from sinking like a stone, the frame has a large buoyancy block made of thousands of tiny air-filled glass balls offsetting the vehicle's weight. These give the ROV neutral buoyancy in water enabling it to freely manoeuvre underwater using its motors. The SQUID has three


Courtesy of Bender GmbH & Co. KG



Courtesy of Bender GmbH & Co. KG

cameras for acquiring scientific data, a sonar and two-line lasers for surveying objects on the seafloor. To acquire samples, there is a fully proportional manoeuvrable gripper with seven degrees of freedom. The ROV is equipped with sensor technology enabling the vehicle to be positioned above the seafloor with pinpoint accuracy as well as to manoeuvre it along specific routes. Powerful propulsion allows it to be operated in currents of up to three knots.

EXTENSIVE PLANNING FOR DEPLOYMENT AT SEA

Dr. Nicolas Nowald, a research associate in the MARUM marine technology working group, explains the make-up of a ROV team at MARUM: "Each team member must be able to pilot and monitor the ROV as well as perform their key skill, e.g. in electrics, hydraulics or IT. The ROV is operated by a pilot and co-pilot. The pilot "flies" the ROV while the co-pilot monitors all the systems and operates the manipulator. A third team member monitors the winch on deck and unwinds the supply cable during the dive".

IDEAL ONBOARD VOLTAGE

A transformer system supplies power to the ROV. The primary side is provided by the ship's system. On the secondary side, 3 kV is generated to keep the voltage loss in the supply cable low (3 x 4 mm² conductor + PE). To keep the transformer's size and weight to a minimum, frequency is increased beforehand to 800 Hz. A voltage filter levels out voltage peaks. Current is then fed through an electrical slip ring on the winch into the 2,200 m-long supply cable on the ROV with a diameter of 19 mm. The ROV's hydraulics and drive motors are supplied with DC 500 V and the cameras, sensor technology and lighting with 24 V. The smaller the cross-section of the supply cable the lower the flow pressure underwater, the cable weight and, ultimately, the overall weight of the ROV system.

IMPROVED INSULATION MONITORING FOR THE MARUM-SQUID

ROV insulation monitoring in the MARUM-SQUID was initially performed by a Bender type IRDH375 ISOMETER® insulation monitoring device and the AGH520S coupling device with measuring intervals of 6 to 12 seconds. However, it quickly became apparent during operations that the intervals were too long for the research applications. Bender was contacted to explore options for faster insulation fault detection. The original insulation monitoring device was therefore replaced by a type iso685W-S ISOMETER® with the FP200W display and control unit. With an on-site adapted profile, Bender technicians were able to reduce the interval to 3 seconds. Hedda Precht Dipl. Oceanographer, freelancer at the Bender company, added: "In operations, the new ISOMETER® gives MARUM researchers the major advantage of real-time monitoring via Ethernet in addition to shorter measurement times. Previously, insulation values could be read only from the IRDH375 installed into the 3 kV transformer system. This was impracticable during dives because the transformer is located far away from the ROV's actual control panels. Following replacement, insulation values can now be easily monitored by one of the navigation computers".

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NEW DRONE

MAKES A BUZZ AND A SPLASH

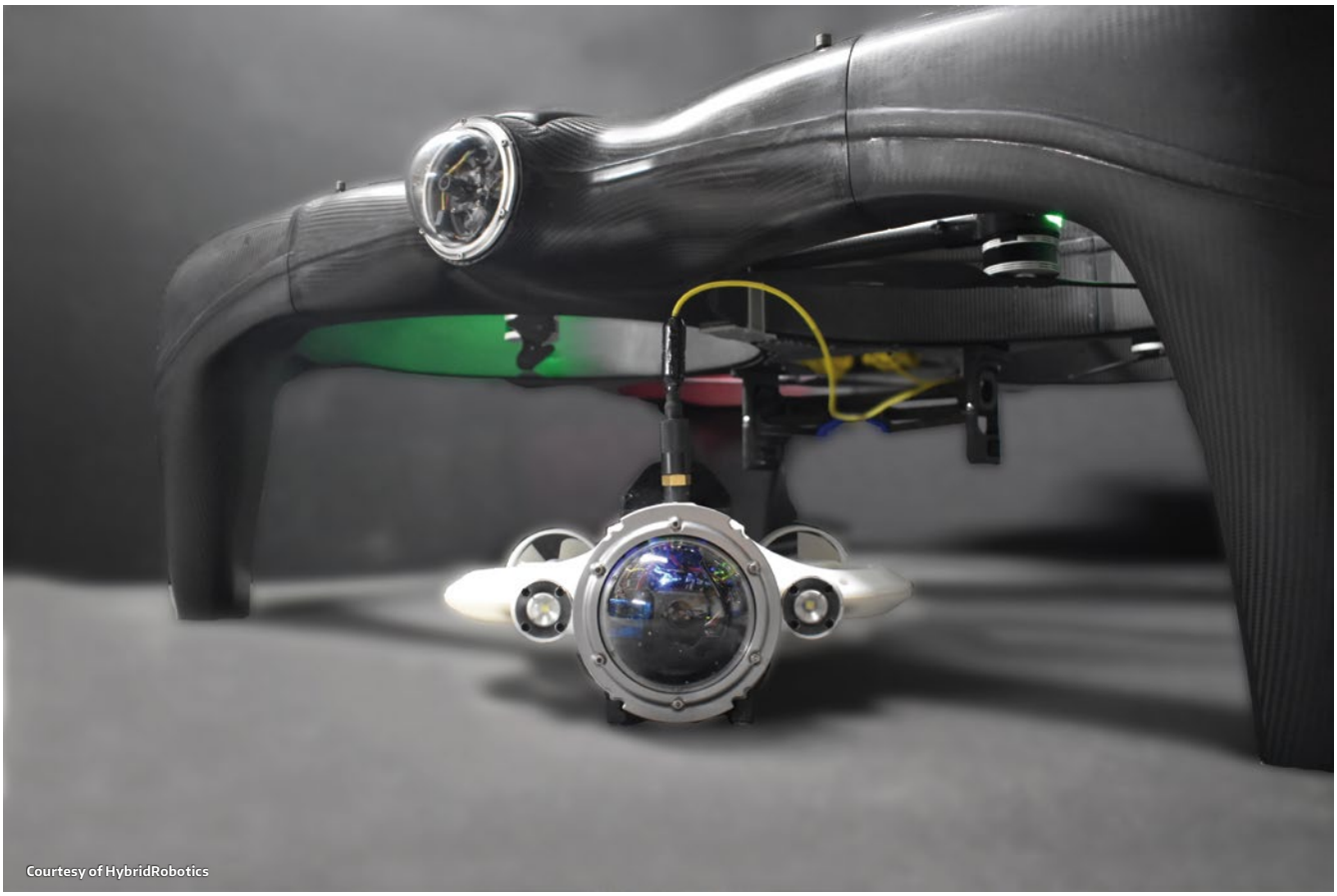
Courtesy of HybridRobotics

Capt. Marc Deglinnocenti (oldarmada@gmail.com)

A new type of aerial drone was unveiled at Underwater Intervention 2020 in New Orleans, USA. It's the Trifecta of new technologies. It flies through the air like an Unmanned Air System (UAS), lands on water, and will soon be able to propel itself as an Unmanned Surface Vehicle (USV). But wait, it does even more than that. It can then send a Remotely Operated Vehicle (ROV) beneath the waves controlled and powered via a tether! This achievement will drastically reduce the time needed to place the new HybridRobotics model Catalina UAS on station. It flies at 48.28 kph (30 mph) which is a great deal faster than even the larger size USVs. It can do quite a few things once it's deployed too.

After the Catalina lands on waves up to 1.52 meters (5 ft) high, it can then deploy its custom-made light weight 4.12 kg (9.1 lbs) ROV, the Cavalla, to a depth of 100.6 meters (330 ft). Yes, it can support other brands of ROVs too, but ROV weight is a concern. The author recommends the small Sofar Ocean, Trident ROV which weighs 3.4 kg (7.5 lbs) if you really need to use an alternative ROV. It's also small, light, and surprisingly aerodynamic. The HybridRobotics ROV is just fine though.

The ROV Cavalla can support a sonar, a gripper, and various water quality sensors. It has a built-in accelerometer, a gyroscope for enhanced stability, two LED lights at 1500 lumens each, magnetometer for compass bearings, and GPS along with a tilting camera. The Cavella battery life right now is rated at 1 hour, but I had a chat with their Co-Founder and Director of Research and Design Aaron Bottke about that. I recommended the installation of shape conforming solar panels to increase both the Catalina flight time and the Cavalla dive time. Aaron Bottke informed me that they already have a company working on such a solar panel bid now. I then recommended the addition of navigation lights, and I was told that they are currently being manufactured. I then recommended underwater thrusters on the Catalina itself. Mr. Bottke said that their UAV will have thrusters as a must, but they are still working on the design. I then pointed him toward a Small Water Area Twin Hull (SWATH) design. This will allow for surface propulsion while vastly increasing the stability of the Catalina on the water surface. This will also have a direct impact on helping to solve the Light Detection and Ranging (LiDar) performance issues


Courtesy of HybridRobotics

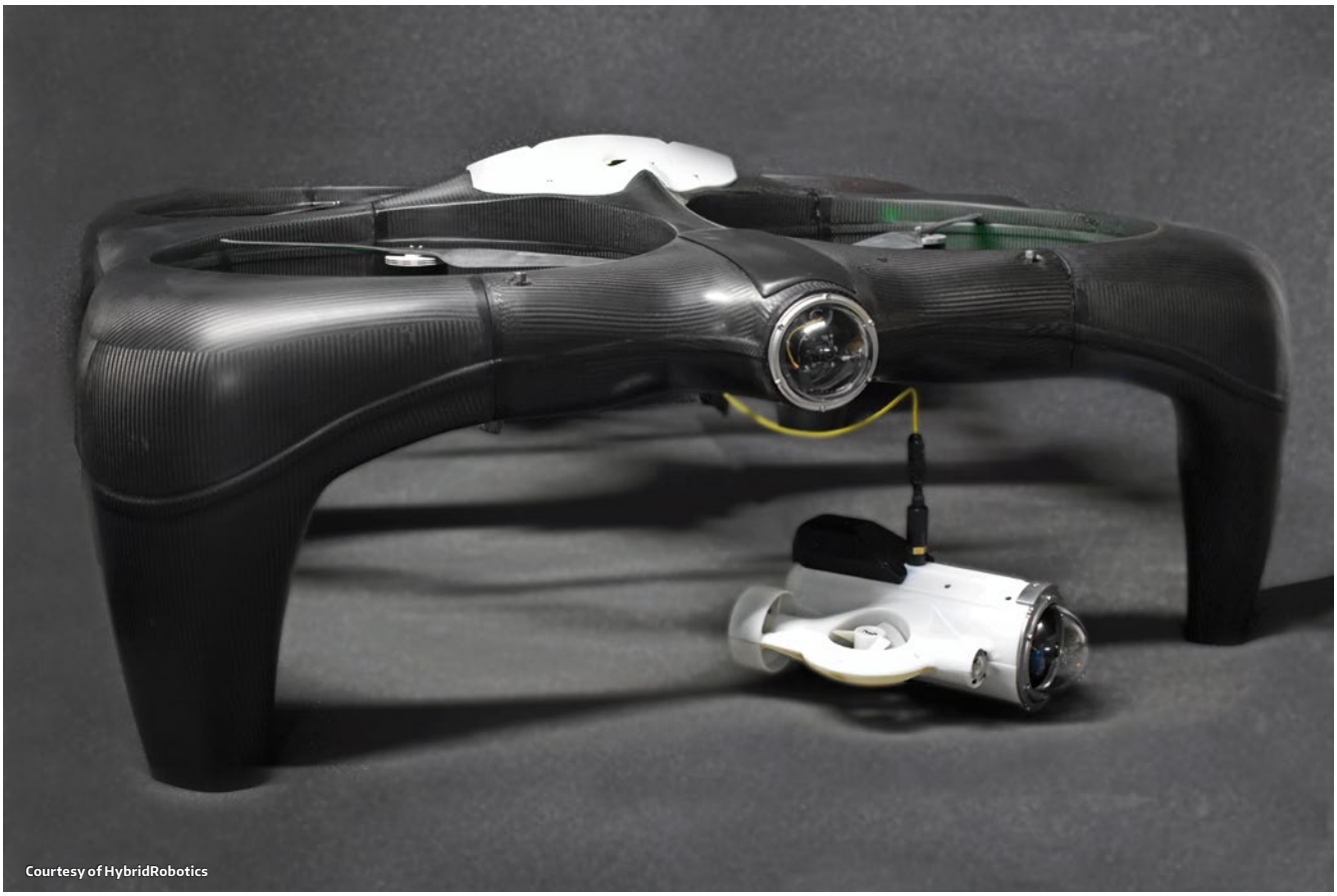

Courtesy of Marc Deglinnocenti

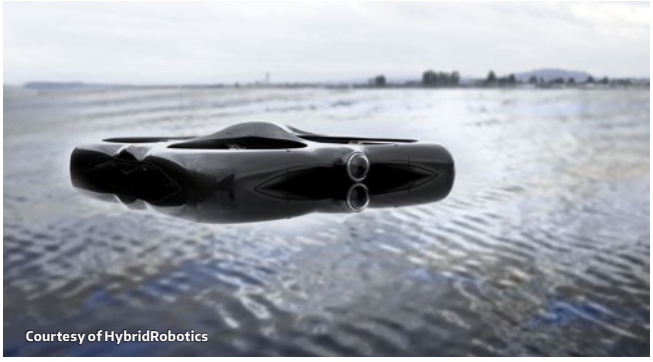

Courtesy of Marc Deglinnocenti

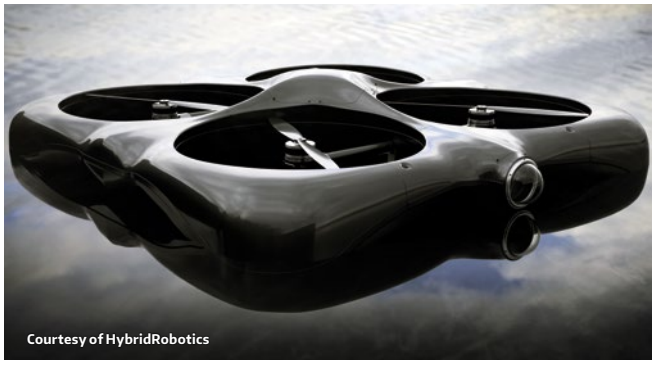
should it be installed on the Catalina. Poor and intermittent LiDar performance is something that monohull UAV engineers have been struggling with for quite some time now. It's due to the integrated laser rolling up and down with the rolling UAV instead of staying parallel to the water surface. Mr. Bottke took the idea to heart with great enthusiasm. Another recommendation was tendered to him by me that is currently being researched, but that research will remain confidential for the time being. What's not confidential is the fact that 19 patents of this unique design are pending with the U.S. Patent Office. These are all very impressive accomplishments along with some exciting future goals, but the Catalina still made quite the impression on the convention goers in its current configuration.

This is a physically large drone that people are not used to seeing especially with an ROV nestled under it. It measures 1.46 x 1.35 x .58 meters (57.6 in x 53.4 in x 23 in) and will soon be even taller if the SWATH pontoons and thrusters are installed. The four, dual bladed ducts provide a remarkable and redundant lifting power of 77.11 kg (170 lbs) in addition to its own weight. Both the Catalina and its ROV weight is currently totaled at less than 25 kg (55 lbs)! They have managed to keep the weight down so that the Catalina can fly for 15 minutes at 48.28 kph (30 mph) for a range of 12 km (7.5 miles) reduced to 11.26 km (7 miles) when factoring in maneuvering time. That 11.26 km (7 miles) range can easily be doubled with the installation of the solar panels. Additional batteries can also increase the range, but the additional battery weight can also become a limiting factor. Equipment weight is always a critical factor with aerial drones, but this UAS is already equipped with much as is.

The Catalina has its own tilting camera, accelerometer, gyroscope, magnetometer, GPS, and soon to be navigation lights, thrusters, and aerodynamic solar panels. Options


Courtesy of HybridRobotics


Courtesy of HybridRobotics


Courtesy of HybridRobotics

like LiDar are only restricted by the human imagination and their weight. So, why go with a UAV that is so weight restricted? Why not just spend a little more time getting on station with more capabilities at hand? The answer is a simple one, and it takes the form of emergency responses. If there is a fuel spill, its exact location can be found a lot easier and faster from the air. Its ROV can then immediately be deployed to find a pipeline leak or assess current speed and direction information in real time. This can be a huge time saving advantage and a great potential reduction of environmental damage. An aerial drone can also quickly spot algae blooms and other water discoloration discrepancies. Fast reporting and communication of environmental threats is one of Catalina's main assets.

The UAS Catalina has a two-tiered communication system. The frequency to control the aerial drone is a 900 megahertz one which easily reaches its 11.26 km (7 miles) range. All the other sensor data is retrieved in real time via a 2.4 GHz stream. A single pilot can operate everything from a single base station. It even has a semi-autonomous capability with preprogrammed mission profiles possible. It's easily transported and rapidly deployable due to its tough yet light weight carbon fiber construction.

Because of its size and weight, the recommended HybridRobotics safety procedures should be followed at all times. With four sets of twin propellers (8) measuring 56 cm x 17 cm each (22 in x 6.6 in) each, this is not your average toy UAS. Having said that, the Catalina's menacing size and sounds are mostly unfounded. Since it operates primarily over open waters, it's far less dangerous to people, property, and aircraft than its smaller and more numerous aerial drone cousins. This hybrid semi-autonomous multipurpose vehicle has great potential and just might be the wave of the future as it maneuvers over, on, and under the waves of our oceans today.

OLIS ROBOTICS PARTNERS WITH ALERON SUBSEA TO DELIVER MACHINE LEARNING AND TELEOPERATION SOLUTIONS TO THE ROV MANIPULATOR CONTROLLER MARKET

Partnership accelerates commercial traction to retrofit existing ROV systems with advanced software products as an operating expense cost saving product with minimal capital expenditure.

Olis Robotics, a leader in next generation robotic autonomy solutions announced a new agreement with Aleron Subsea, a part of the Aleron Group, a leader in ROV System design and build for sale and rental. Aleron will lead sales, distribution, and support of Olis Robotics machine-learning ROV manipulator controllers.

The Olis Master Controller is providing value for ROV Inspection, Repair, and Maintenance (IRM) global market operators. The controller's intuitive interface, ease of integration, and straightforward training make the product a requirement for new ROVs and ROV upgrade and sustainment kits. The Olis Master Controller is available at a price point far below the cost of replacing legacy controllers.

"We're leveraging technology we developed for NASA and missions to the moon to help revolutionize the subsea industry and deliver intuitive controls and machine learning pilot assistive features that keep crew and equipment safe, along with saving time and money for offshore energy operations," remarked Olis Robotics CEO Don Pickering. "We're seeing increased interest in our solution in these uncertain times for the oil industry."

Olis' controllers are drop-in replacements to control legacy manipulators while providing advanced features that increase the precision of ROV operations. Olis Robotics' controllers help extend the life of expensive manipulator assets while also setting a platform for future autonomous operations. Aleron will lead sales of Olis Master Controller products for its retrofit and rental business.

Aleron will also incorporate the Olis Master Controller with the manipulators used on Aleron's innovative MultiROV product. The MultiROv is a flexible solution for remote subsea operations that can be configured to meet changing operational requirements in a cost-effective way. Combining Olis' autonomous software technology with Aleron's modular MultiROV gives subsea operation customers a solution for future IRM operation requirements.

"Aleron is excited about working with Olis Robotics and their new Olis Master Controller. The next generation master controller offers many features not currently available. Olis' software makes using the manipulator quicker, easier and safer. The touch screen and vibrating pendant offer visual and touch feedback when the manipulator has reached limits, saving expensive damage or downtime," says David Currie, Aleron Subsea General Manager. "In these very cost sensitive days the features will help pay for themselves. Aleron plans to use the Olis Master Controller on Aleron's MultiROV product."

Olis Robotics launched sales of the OMC in the third quarter of 2019. Additional capabilities using the one touch machine training and task automation technologies will be available in Q4 2020. The new capabilities delivered by Olis Robotics will open up a considerable number of new task applications with automation efficiencies that have never been available in the subsea manipulator market.

Courtesy of Olis Robotics

INSPIRING THE NEXT GENERATION OF SUBSEA TALENT

The STEM challenge, led and organised by Subsea UK and supported by the Smallpeice Trust, saw 60 teams of secondary school students compete in regional heats to earn their place in the final. The winners from each regional heat; St Damian's RC Science College, Manchester; St Mary's Catholic School, Port of Blyth; Northgate High School, Norwich; Hyndland Secondary School, Glasgow; Millburn Academy, Inverness and Bristol Free School, travelled to P&J Live in Aberdeen to take part in the final.

The subsea challenge saw the teams design and programme ROVs using Lego Mindstorms EV3 kit, an integrated platform that enables the development of programmable robots using Lego building blocks. An intelligent brick computer operates the system, including modular sensors and motors, with Lego Technic sections to construct the automated systems.

During the regional competitions, teams were asked to design and build an ROV which would survey a marine habitat to determine the accumulated levels of plastic. In the final, teams had to design and build an ROV with additional capability to retrieve the plastic. The teams then had to test their design and present their findings to a panel of judges, which included representatives from Subsea UK and industry sponsors, BP and TechnipFMC. Judges assessed the teams throughout the day and points were awarded for teamwork, design and manoeuvrability of their model, marketing material and the final delivery of their sales and marketing pitch.

Now in its third year, the STEM Challenge has been developed to encourage pupils to study STEM subjects and consider a career in the UK's £7.8bn subsea sector. This year's challenge was sponsored by SMD, Fugro, Teledyne Marine, Helix Energy Solutions, Saab Seaeye, OPITO, Flowline Specialists, DOF Subsea, Subsea 7, TechnipFMC, BP and supported by LoganAir. Pupils also had the chance to interact with displays presented by the sponsors.


Photo: Ross Johnston/Newsline Media (Courtesy of Subsea UK)

Photo: Ross Johnston/Newsline Media (Courtesy of Subsea UK)

Trish Banks, operations manager at Subsea UK, said: "We set the annual STEM Challenge as inspiration for pupils to learn more about the career possibilities which exist in engineering and the subsea industry. Witnessing the ingenuity, ambition and enthusiasm shown by all pupils taking part in this year's STEM challenge has been tremendous, and I want to congratulate the team from Northgate High School on their winning design.

"This year we chose the topical theme of removing plastics from the sea as we want the next generation to understand the breadth of challenges which subsea engineering can tackle. I want to thank everyone who has taken part in this year's challenge and our sponsors who have helped make the 2020 STEM Challenge such a huge success."

Maddison Fleming (14), a pupil on the winning team from Northgate High School, said: "The STEM challenge has been a really exciting experience and it made me realise that I can do more than I thought possible. It was a really fun challenge, and everybody has been absolutely amazing, from the organisers to the sponsors. I am incredibly proud to be a part of Northgate High School."

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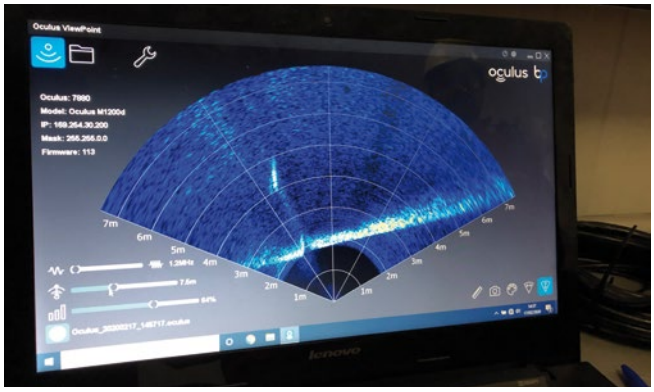
HARBOUR INSPECTION AND ROV PILOT TRAINING

IN BARCELONA WITH QSTAR

We recently returned to Barcelona to catch up with our old friends at QSTAR, and to see how their new ROV training centre has shaped up while the Canary Islands ROV Training facilities still undergoing with other ROV Courses.

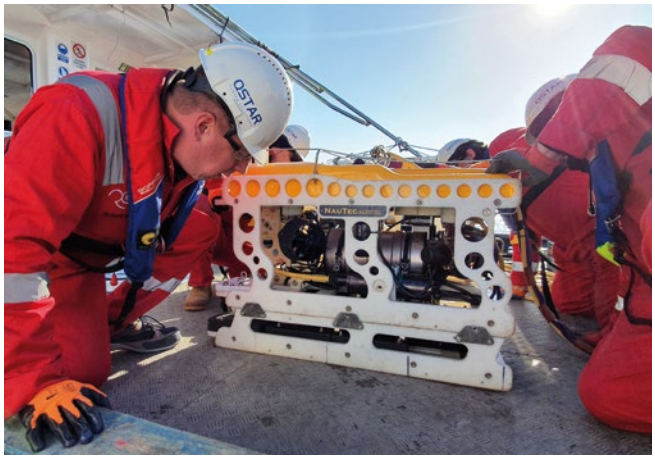


Barcelona has a lot to offer in terms of culture and nightlife, but it is also an excellent hub for flight connections to the rest of the world. Upon our arrival we introduced ourselves to the new trainees: Dennis, Yuri, and Kornel. Two of these guys were already in the offshore industry with a lot of experience but were retraining themselves. Dennis – from Belgium – is an offshore crane operator, and Yuri from Estonia is a seismic technician. Kornel from Poland is a recent university graduate who was very interested in marine robotics.

We arrived during the final week of the 7-week training course: the practical section. This was right after a huge storm (Gloria) had hit Barcelona. It had damaged the large concrete slabs of the harbour at Port Forum and came straight from the Atlantic into the Mediterranean: very unusual for this part of the world. So, we set up our observation class ROVs and began with the inspection of the harbour wall on our first day. This became a real-life practical exercise.

For the harbour wall inspection, we used a VideoRay Pro4, equipped with a BluePrint Subsea Oculus M1200d multibeam sonar. The VideoRay Pro4 is a versatile little vehicle which is extremely easy to use, and the controls are very intuitive. After launching it into the water we paid out about 20-30m of tether and operated it from the ROV Control Room at the harbour quay that had recently been commissioned by QSTAR.

The task was the inspection of the harbour wall, with particular focus on the cracks and the gaps between the concrete slabs caused by the storm. This was clearly visible from the Oculus multibeam sonar.

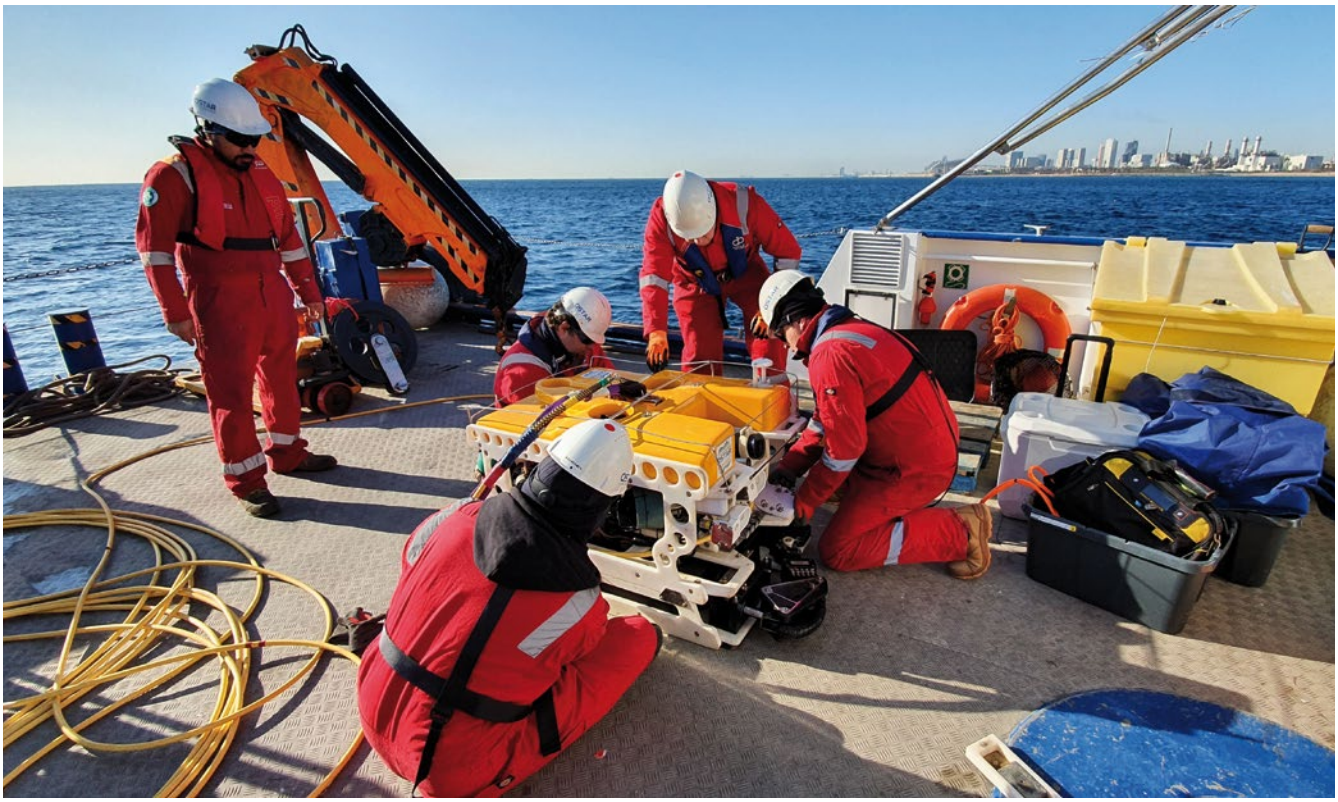


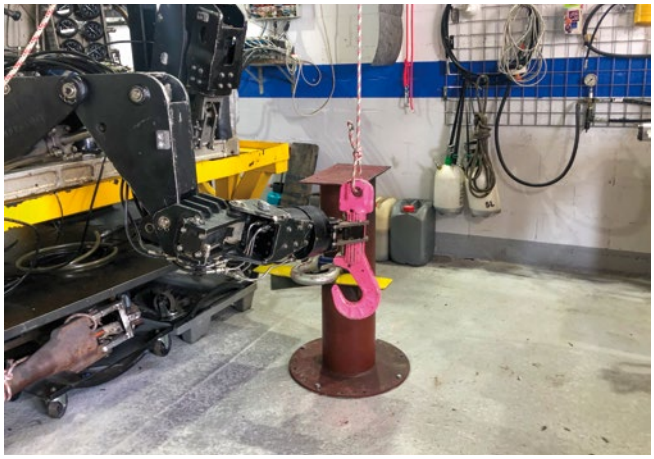
This sonar is easy to use and was useful for navigating around the harbour. Their small form factor – weighing less than 400g in water – and dual frequency capabilities make them ideally suited for deployment on micro-sized platforms. The Oculus M1200d operates at both 1.2MHz and 2.1MHz (with a 130° and 60° field of view respectively) making it ideal for specialised inspection tasks where image quality is critical.

Over the following days we went out to sea to practice ROV operations in the open water from QSTAR's workboat. We practiced pre- and post-dive checks before and after the launch and recovery of the Ageotec Perseo Class II ROV; this became routine in our operations. This included the usual camera, lights, thrusters, etc.

Anchor chain inspection tasks followed with each trainee getting plenty of time on the controls as pilots and co-pilots of the vehicle. We were also put on the handling of the tether on deck and rotated between all of these tasks. The following day the installation of the hydraulic manipulator skid to the light intervention vehicle gave us the opportunity to do manipulation operations such as Search & Recovery tasks, recovering objects from the seafloor and putting them into a basket underwater.

We also had a chance to test out the use of the RUD ROV-HOOK by operating it with a Work Class ROV and manipulators, set up with a Control Room in the QSTAR workshops. The new RUD ROV-HOOK provides efficient lifting solutions for demanding marine and offshore applications.





Its innovative safety mechanism makes it practically impossible to accidentally open the hook. At the same time, the additional version – with up to 25 tonnes of WLL – opens up completely new applications. It has a twin trigger mechanism. The hook only opens when both locking mechanisms are pressed simultaneously, providing ultimate safety.

The RUD ROV-HOOK also eliminates the risk of snagging and accidental rigging. The outer profile is smooth with no protruding hook nose and one particularity of this hook's mechanism is that it features an outwards opening safety latch. The safety latch intermeshes with the hook nose preventing soft slings to eventually slip through. The hook automatically closes and locks the safety latch when the ROV releases the triggers.

The hook can be operated by just one ROV arm in combination with all commonly used manips, even the grabber, by hand topside. It can also be approached at inclined angles up to 30° from the ideal gripping position perpendicular to hook flat side.

Overall, we can conclude that the special features of the RUD ROV-HOOK make operations much easier compared to traditional designs when using guide wires. The open and closing mechanism of the hook is easy to use even for trainee pilots, thus making manipulation operations shorter through increased efficiency.

This was another productive week with QSTAR, and we learned a lot. We can hardly wait for the COVID-19 pandemic to be over to return to Barcelona for another round of ROV training with the QSTAR team. Meanwhile QSTAR will soon launch an e-Learning online ROV Training Campus, so international students can achieve the required theory knowledge prior to attending the QSTAR training facilities in the future.

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INTERVIEW

OTAQ GROUP'S OCEANSENSE ENSURES NO LEAKS

We have been hearing a lot about the expansion and growth of OTAQ Group recently. Initially, the company focused on technologies used in aquaculture. Then with the acquisition of Link Subsea Ltd – the manufacturer of wet mate connectors – and the acquisition of MarineSENSE Ltd – the manufacturers of the OceanSENSE leak detection systems – the company extended its portfolio of products and created its new Offshore division based in Aberdeen. Richie Enzmann talks to Harry Rotsch, Technical Director of OTAQ and inventor of the OceanSENSE System and Chris Hyde, CCO of OTAQ to hear about their very ambitious plans, building on Harry's expertise and background in physics and engineering, and becoming a major player in both offshore energy and in aquaculture.

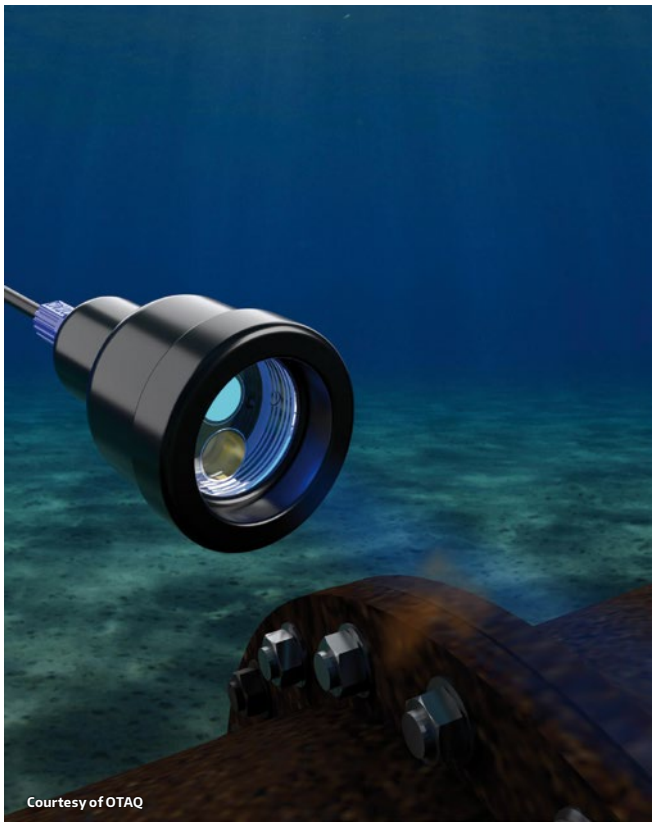

Harry Rotsch (Courtesy of OTAQ)

RICHIE ENZMANN: Harry, please tell us more about your background and expertise. How did you end up in Aberdeen and what are you bringing to the table for OTAQ?

HARRY ROTSCH: I'm from Germany originally. I studied applied physics at the University of Zwickau in Germany and then upon the completion of my studies in 1999, I secured a PhD placement at the Robert Gordon University (RGU) in Aberdeen focusing on laser spectroscopy and underwater sensors. I have been working with that type of technology in fluorescence for about 25 years, so I have a good knowledge of the field and about all the different kinds of sensors available and the ways of measuring things.
Eventually, I decided to stay, because I liked the underwater technology focus of Aberdeen and what it had to offer. Early on in my studies I was fascinated by the very interesting and difficult challenges of the offshore industry and underwater world!

RE: Please tell us how the concept for OceanSENSE came about?

HR: During my PhD I was working on underwater sensors. I was working on a whole range of different sensors and one of the main projects was environmental monitoring... that was partly for tracers and mostly for chlorophylls and algae in the water.


Courtesy of OTAQ

Courtesy of OTAQ

Courtesy of OTAQ

A few years later I heard that people were looking for detecting leaks. At that time leak detection systems were all very big, and they were either depending on the black light systems – where you have the UV light and try to figure out some stunt of a camera that had the disadvantages of having to switch off ROV lights – and the other option – which is closer to our system – was the dye had to flow pretty much through the sensor to tell that there is a leak.
All the things I have done in university with lasers were similar, and with the development of technology the lasers became more powerful and the detectors became smaller. So, I thought this could be an application which could help people to detect leaks and dyes at distance. And then I started the company.

RE: When did you start the company?

HR: In 2007 I started off, and the first offshore jobs went ahead in mid-2009. Then very quickly we had repeat business, which is always a good thing to have. Another difference between other systems and ours is that we are quite specific when it comes to what we are detecting... in a way you could increase the sensitivity a lot, but that would mean that you would pick up false readings.
But we are very specific. For example, a lot of the dyes: we can differentiate between a dye and some algae on the platform leg, where other systems they might go off as soon as they get close to some algae.

RE: If I understand it correctly, this is a visual detection system. You don't have any chemical sensors as such?

HR: That's correct. It's pure optics. We have a very high sensitivity photo multiplier. The same detectors are used in real scientific equipment in CERN, and they're using the same equipment of photo multipliers as ours, as they are so good and efficient. But some are now small enough that we could use for our system.

RE: Throughout the years have you made the equipment smaller? What was the process of development?

HR: The system from 2009 is still very similar to the system that we have now. There have been small improvements on the electronics and the software, but the principle is the same. There was thought of making the system more sensitive.... When we looked at how people were using the system, in the majority of cases they don't even use the highest existing sensitivity; on recorded data we can always see what sensitivity levels the users are using, and that's why we decided that making the system more sensitive was not necessary. The downside of making it more sensitive is that you are more likely to start picking up false readings.

RE: What's the range of the systems?

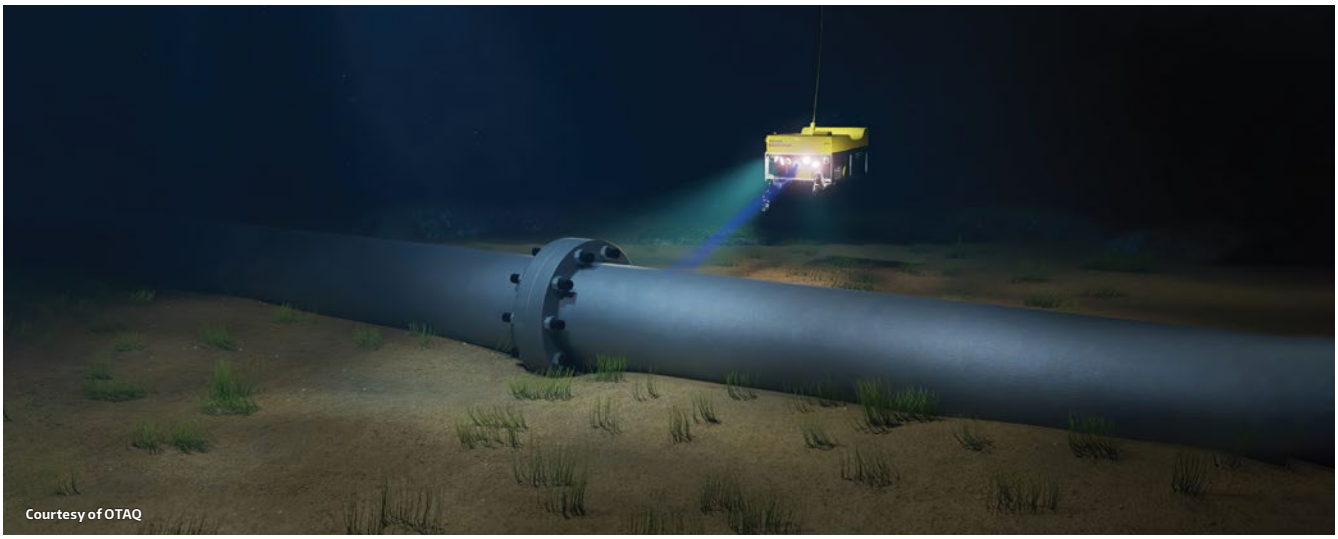
HR: That depends on the size of the leak and what it is actually leaking from. We have done some trials on really difficult to detect leaks. We have also done trials offshore of positive confirmation of the leaks at 7m upstream, but that was a small leak with a really difficult fluid to detect.
The usual kind of fluids people use offshore we can detect 15m upstream, and if the current is going towards OceanSENSE even further. One of the very first detection campaigns we did, we went offshore with the leak detector in a very big area underwater; there were a lot of structures and the client expected it would take us two days for the job. But in reality, within two hours from the ROV getting in the water we had identified and found the leak.
That was so far away that we couldn't even see the structure yet but yet we could detect the leak; the system is sensitive enough that you follow the highest concentration until you can pinpoint it exactly.

RE: Then you can use a smaller observation class ROV; you don't need a larger work class unit.

HR: Yes, that's correct. We even had campaigns that went out on a VideoRay. And that was my main focus – to have the system compact but still powerful enough to be able to detect even small leaks.

RE: Do you sell the product as an equipment package or as a service with technicians included? What is the operating business model?

HR: In the last 4-5 years we have not sent anybody out with it, because it is so standard now that people have used it in their training programs and then they get a qualification if they have used our system offshore. For anybody who hasn't used it, we are providing a 10-minute training session for them – we have put a lot of effort in making the software user friendly – and generally every ROV operator is happy to use it.


Courtesy of OTAQ

The system can be connected onto the ROV and then we also send out a laptop for the topside control room, but optionally the software can be also installed separately to a computer in the control room.

RE: What are the main applications for OceanSENSE? Would the main applications be pipeline leak detections for all kinds of hydrocarbons?

HR: It can be used for the detection of hydrocarbons, but the majority of our leak detection jobs are for hydraulic lines. But besides the leak detection, we have been approached by a drilling client 7 years ago, to detect the mix of some dye with cement.
When they do the cementing for putting the first conductor in, and they want to know when the cement has come up to the seabed or the seawater spacer. We said yes it should do and did some trials with our client. That showed to be a really successful approach as well. So, leak detection and cement detection are the main applications. We are in the process of finding some other applications in and outside the offshore industry as well.

RE: With the no leak policies of some operators, this is a very useful application to make sure all hydraulic lines are safe, and no leaks are present.

HR: Specifically, in the North Sea there is a lot of aging infrastructure. It is important to figure out if you got leaks and figure out where they are so it can be fixed quickly.

RE: Is it quite regular to have leaks or do they happen rarely?

HR: In the last 10 years the system has done 50,000 offshore days. We got over 100 systems on rental in Aberdeen and international, and we have a very quick turnaround. We had people calling up in the morning in Aberdeen that they wanted a system in Peterhead by lunchtime and we could accommodate that.

RE: I guess when it is needed then it is usually urgent. Do you have a distribution network or a supplier?

HR: In Aberdeen it is obviously us. We are covering the North Sea and the UK. Internationally it is the Unique Group... We have signed an exclusive distribution agreement with them to represent the OTAQ group's OceanSENSE and DragonFish solutions in the Middle East, Asia Pacific, and Americas.

RICHIE ENZMANN: This is more of a question for Chris – how is MarineSENSE being set up within OTAQ Group?

CHRIS HYDE: At this stage the companies that we have bought are MarineSENSE (Harry's company), and Link Subsea, a company based in Ulverston which produces moulded connectors and penetrators. They have both been rebranded as OTAQ companies, and we are looking at further acquisitions in different marine technology areas in offshore energy, renewables, and aquaculture.
So far all of our acquisitions have been rebranded as parts of the OTAQ Group. The group headquarters are in Lancaster, but Aberdeen is our sales and service centre, and is the customer facing part of our business.

RE: Finally, it sounds like OceanSENSE is pretty much the standard tool for leak detection now. So, what's next? Can this be developed any further? What's the future for the OceanSENSE product line?

CH: As well as the OceanSENSE ROV version that we have been discussing, we have the self-contained OceanSENSE Diver held version and have recently identified some new applications for that product which look very interesting. We are also working closely with some of the AUV manufacturers to develop an OceanSENSE leak detection solution which meets the very challenging needs of that application. We are very pleased to have Harry working on several, long-term R&D projects that are for future products across the group.

RE: It seems like there are exciting times ahead for the OTAQ Group, and the familiar faces working for them from Aberdeen's wider subsea community. We wish them good luck in their endeavour to become a key subsea equipment solutions provider!

EVENTS CALENDAR

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

JUNE 2020

IOSTIA BLUETECH EXPO
Washington, DC, USA (10-11 June 2020)

AUGUST 2020

OCEANS 2020
Singapore (11-14 August 2020)

DEEPSEA MINING SUMMIT
London, UK (18-19 August 2020)

SEPTEMBER 2020

ONS 2020
Stavanger, Norway (31 Augustus – 3 September 2020)

MCEDD
London, UK (7-9 September 2020)

WINDENERGY
Hamburg, Germany (22-25 September 2020)

OCTOBER 2020

OCEANS 2020
Biloxi, MI, USA (19-22 October 2020)

EURONAVAL 2020
Paris, France (20-23 October 2020)

OFFSHORE ENERGY
Amsterdam, The Netherlands (27-28 October 2020)

NOVEMBER 2020

MARITIME AUTONOMY & TECHNOLOGY SHOWCASE (MATS)
Southampton, UK (10-12 November 2020)

ADIPEC
Abu Dhabi (12-15 November 2020)

OSEA2020
Singapore (24-26 November 2020)

UNMANNED MARITIME SYSTEMS TECHNOLOGY (UMS)
London, UK (25-26 November 2020)

DECEMBER 2020

OCEANOLOGY INTERNATIONAL
London, UK (1-3 December 2020)

UNDERSEA DEFENCE TECHNOLOGY (UDT)
Rotterdam, The Netherlands (8-10 December 2020)

FEBRUARY 2021

OCEANOLOGY INTERNATIONAL AMERICAS
San Diego, CA, USA (15-17 February 2021)

SUBSEA EXPO
Aberdeen, Scotland, UK (23-25 February 2021)

MARCH 2020

OCEAN BUSINESS
Southampton, UK (13-15 April 2021)

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