UT TWO

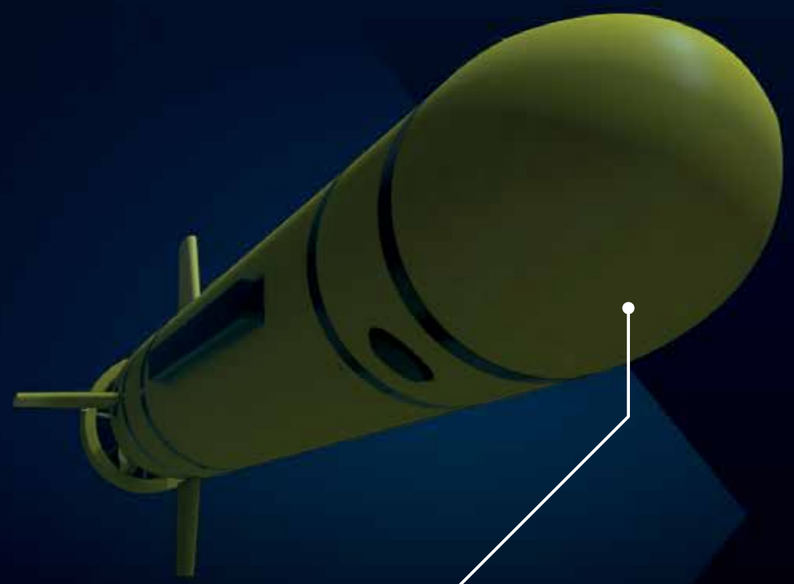
UNDERWATER TECHNOLOGY

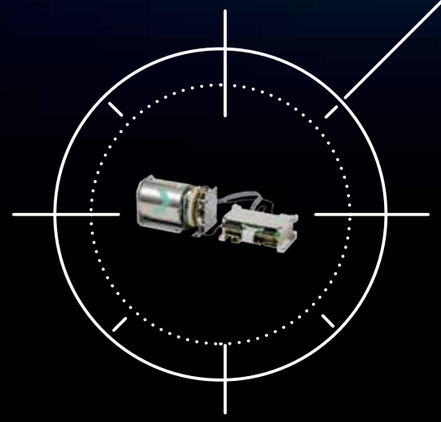
ISSUE 2 2023

SUT Society for Underwater Technology

MTS marine technology society

EMPOWERING AUTONOMOUS NAVIGATION





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R7, Exail's compact observation-class ROV

R7 COMPACT OBSERVATION-CLASS ROV

THE BALANCE OF POWER AND PORTABILITY

The Exail's R7 is a compact observation-class Remotely Operated Vehicle (ROV) combining the portability and ease of deployment of mini-ROVs with the performances, speed and payload carrying capacity of professional observation-class ROVs.

Fast, modular and easy to deploy in less than 30 minutes, the R7 is designed for a wide range of users including oceanographers, hydrographers, fish farmers and operators of submerged structures for all their underwater missions down to 300m, including inspection, observation, surveillance, maintenance and object recovery.

In the oil and gas industry and ship maintenance sectors, for example, the R7 is useful for inspecting the integrity of assets and UWILD operations. The compact yet powerful ROV is ideally suited for aquaculture applications such as inspecting nets, as well as anchorage points and cables, common to offshore windfarms too.

Civil engineers make time and mission cost savings by using the R7 to efficiently inspect and maintain dams, bridge foundations, sub-structures and sewers.

100% DIGITAL CONNECTED ARCHITECTURE FOR UNRIVALLED EASE OF USE AND IMAGE GATHERING

The R7 incorporates the latest developments in digital technology giving operators some of the highest quality images on the market, thanks to a full HD video chain going from the camera sensors to the display screens.

To facilitate navigation even in difficult visibility conditions, the R7's navigation camera is equipped with a very high sensitivity wide-angle video sensor. The camera is coupled with high performance LED lighting to provide an exceptional level of rendering- two 5000 lumen floodlights provide unrivalled light intensity to the camera, further increasing image quality.

The Full High Definition (FHD) 1080p observation camera with 4x optical zoom and vertical rotation movement +/-90° ensures that the R7 offers users optimum comfort and power during inspection.

The R7 can be fitted with up to four floodlights and four FHD cameras with the possibility of visualising and recording two video streams simultaneously, reducing mission time since two areas of interest can be studied in parallel. It only requires two people to carry and deploy the ROV, the CCU, PSU, umbilical and reel. Deployment and recovery are facilitated thanks to its ergonomic, compact design and integrated handles.

Switching payloads is quick and easy thanks to the ROV's plug-and-play connection, and its 100% digital architecture also makes it scalable to adapt to different customer missions

.

INTUITIVE HUMAN MACHINE INTERFACE

The R7 also stands out in terms of ergonomics: its highly intuitive Human Machine Interface and ease of use make it readily deployable at a moment's notice. The 15in touch-screen of the control unit and a second screen enabling the display of the cameras, USBL and sonar data sources simultaneously are high-luminosity and designed for use even in bright sunlight, giving the operator a high level of visual comfort. A USBL beacon and/or DVL are also available, tracking the ROV's position in real time.

R7 COMBINES POWER, STABILITY AND SERVICEABILITY

The R7's manoeuvrability and power facilitates the operator's task, even in harsh environments. Operators benefit from the ROV's exceptional dexterity in flight mode thanks to its innovative propulsion system, comprised of four horizontal vectorized thrusters and three vertical thrusters.

The latest generation Attitude and Heading Reference System (AHRS) coupled with the three vertical thrusters manage the attitude and provide the ROV with a high level of horizontal stability in all directions. This AHRS, integrated as standard, provides the R7 with advanced stability and control, enabling it to maintain the pitch & roll angles in dynamic mode.

COVER STORY: EXAIL R7

Automated heading, depth, altitude, and attitude functions give users advanced navigation capability.

UNRIVALLED IMAGE QUALITY EVEN IN LOW VISIBILITY

Operators use this new-generation ROV even in low visibility conditions. Using traditional cameras would be impossible in such conditions, but the R7's HD inspection camera performs remarkably, providing high-resolution data with superior positioning accuracy.

EASY & FAST MAINTENANCE

The R7 "open frame" design gives users and maintenance teams access to all the vehicle's sub-assemblies, including cameras, floodlights, thrusters, telemetry, and sensors. Exail manufactures the subassemblies in house and holds stocks of spare parts including thrusters, connectors, floodlights and cameras. The R7's HMI offers an auto diagnosis function of the whole ROV system.

A RANGE OF EASILY INTERCHANGEABLE PAYLOADS CATERING FOR DIFFERENT MISSION REQUIREMENTS

The vehicle can also be equipped with a choice of manipulator arms with up to five functions to easily handle or recover objects up to 2kg.

Payloads include an altimeter, a FHD wide-angle rear camera with additional floodlight, a FHD wide-angle rear navigation camera with additional floodlight, an Ultra-short baseline (USBL) system, a USBL beacon compatible with Exail's Gaps USBL, a rotating grabber arm, a motorised brush with NDT probes to measure thickness and cathodic protection, as well as a double frequency imaging sonar and navigation sonar.

PERSPECTIVES FOR FURTHER EXPLORATION AND INSPECTION CAPABILITIES

The R7 will soon integrate DVL, or
DVL+ USBL giving the operator greater capacity to control station keeping. An AUV functionality will also be available in the course of 2023 enabling the ROV to conduct autonomous missions with the capability to send images and data to the operator in real-time.

To overcome the common problems of turbidity and sun reflection are a common source of problems during shallow water missions, Exail will introduce a state-of-the art underwater imaging camera in 2023, incorporating image processing to obtain high quality video images in real time.

Exail's R7

FOUR WINCHES FOR MCM USV

MacArtney Underwater Technology has drawn on in-house expert knowledge and long, close cooperation with Textron Systems, to supply custom-built winches withstanding shock and vibration from exploding mines for the Common Unmanned Surface Vehicle (CUSV) used on the US Navy's Mine Countermeasures Unmanned Surface Vehicle (MCM USV).

Textron Systems placed its first order in 2015 for winches designed to comply with MIL standard 901D for shock and vibration.

They recently ordered four more after a one-year 'Winch Improvement Program', during which MacArtney improved design and performance in line with Textron Systems moving the CUSV system from prototype status to low-rate production.

DESIGNED FOR MCM

The CUSV system is a multi-mission unmanned surface vehicle with a large, configurable payload capacity. The system can be configured for sweeping, localisation and neutralising mines and other explosive devices without human interaction.

RUGGEDISED PROGRAM

The MacArtney winches on board Textron Systems' CUSV have to endure the shock of powerful explosions and violent vibrations. The winches have undergone a 'ruggedised programme' to enhance their performance and survivability, including the use of aluminium and special alloys to make them lightweight and corrosion resistant, increasing pull force/winch weight ratio and adding fuel capacity for the boats.

The CUSV can be used for a wide range of other defence and commercial applications due to its unique technology.

Subsea Test Tools

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100 mTRACK WINCHES

The 100th mTrack will soon be operating on the new research vessel *Kaharoa II* in New Zealand.

The research institute NIWA and Armon Shipyard have chosen a package consisting of Ibercisa trawl and oceanographic winches for the new Skipsteknisk ST-361 design, where mTrack is essential for several of the subsea operations.

Scantrol has been working with Ibercisa since 2009. Like Scantrol, Ibercisa also started in the fishing sector, but 30 years ago Ibercisa entered the oceanographic market. Since then, Ibercisa has become one of the market leaders in the sector and continues growing.

"Scantrol has a long experience with delivering control systems for research vessels, mostly for trawl winches," said Rolf Krogh Hjelmeland, VP for AHC and USVs at Scantrol. "The new winch provides a very flexible product that can be used for the oceanographic operations in order to improve data quality when collecting scientific data and during towing operations. It keeps the load stable at a certain depth and can follow the seabed profile.

"Traditionally AHC functionality has been too complex and expensive for smaller winches and vessels. One of the goals when developing mTrack was to make AHC available for smaller winches as well.

"The challenge with the new Kaharoa is that it needs to pack in a lot of equipment whilst minimising size and weight. Even if it is a quite small vessel, NIWA required the latest technology and functionality

onboard. To maximise marine science it is important to have the ability to continue operating, even in challenging and variable sea conditions in the southern Pacific Ocean.

Electric winches equipped with AHC will enable us to continue working in weather conditions where previously we had to stop or wait until conditions improved."

TOPSIDE WIRELESS MODEM

C-Kore Systems has launched its new Topside Wireless Modem which completes their line of test tools to now offer a complete solution for Umbilical Installation Monitoring.

The Topside Wireless Modem improves safety on back-deck operations by reducing the risk to offshore personnel while monitoring the deployment of umbilicals.

It provides a live dashboard of C-Kore test results, presenting the user with a consolidated view of the health of an umbilical before it is deployed subsea.

The results are accessed over Wi-Fi to allow access of the data in the onboard cabin, eliminating the need for offshore personnel to access the potentially hazardous umbilical area during installation.

C-Kore Systems has a range of subsea testing tools used globally by operators and contractors on de-commissioning, fault-finding operations, and new installation campaigns. The tools are easy to deploy and are operated without the need for C-Kore personnel being present, providing rapid and accurate feedback.

This combination of simplicity, accuracy and reliability introduces significant operational savings to testing campaigns.

Greg Smith, C- Operations Director commented, "The Topside Wireless Modem is the last puzzle piece to offer a complete monitoring solution to our customers. It improves the safety on the back-deck. Offshore personnel no longer need to access the umbilical during installation to gather test results.

"All the data is sent wirelessly to the cabin. Not only is safety on the back-deck improved, but the vessel time needed to deploy umbilicals is also reduced. By automating the testing process, the installation does not need to be stopped to complete manual testing of the umbilical.

"Designing our tools to be simple to use also means no additional offshore personnel are required, reducing the POD needed.

"We give a complete online interactive training to our customers to ensure they are comfortable using our testing tools prior to the mobilisation".

● C-Kore's Subsea Testing tools have successfully completed a complex subsea electrical integrity campaign for a major oil operator in Nigeria, via VAYCO Oil Tools and their Nigerian partner, Cranium Engineering. C-Kore was selected as fast and accurate measurement was essential to minimise disruption during Turn Around Maintenance (TAM) on the FPSO and remove the need for any additional offshore personnel.

C-Kore's self-contained and automated subsea testing units are used on both asset integrity and installation operations to verify the health of subsea electrical systems. The Cable Monitor unit tests the insulation resistance and continuity of the electrical line while the Subsea TDR unit localises faults with an accuracy of around 20cm.

Sola Adekunle, CEO of Cranium Engineering commented, "Our customer was completely satisfied with the ease of use along while the quick results kept disruption to the FPSO maintenance operations to a minimum. Removing the need for additional offshore personnel simplified the whole operation."

DEEP CTD

Valeport's popular range of SWiFT profilers has been extended with the launch of a new addition for those requiring CTD measurements to depths of 6000m.

The new profiler provides survey-grade sensor technology coupled with the convenience of Bluetooth wireless technology, a rechargeable battery and an integral GNSS module to geo-locate each profile.

Using Valeport's high accuracy sensor technology to combine sensors for multiple profiles in a single drop, the SWiFT Deep CTD can operate to 6000m, delivering directly measured conductivity, temperature and depth.

In addition, the SWiFT Deep CTD will provide computed salinity, density and sound velocity, calculated using the UNESCO international standard algorithm and Chen and Millero equation.

Data can be quickly and easily downloaded wirelessly, and instantly shared in industry standard data formats.

Ease of use is at the heart of the SWiFT range and the new SWiFT Deep CTD not only makes any problematic battery changes a thing of the past and delivers fully automated data transfer with no user input required, it also features Valeport's signature SWiFT magnetic switch ring.

The switch ring is easy to operate even with cold hands, it simply turns through 90 degrees and reassuringly clicks into position. The end cap features user-friendly LED status indications for GNSS, battery and communications.

With an operational battery life of up to five days and the convenience of charge via USB, the SWiFT Deep CTD is designed to cope with the harshest conditions and intended for offshore, coastal, harbour and inland environmental and hydrographic survey use.

SWiFT Deep CTD

SEA PICKET


Sea Picket launch

ThayerMahan has developed technology to detect and report in real-time, the presence of whales. This is a venture to minimise the incidence of ships striking whales, and to advance marine life research.

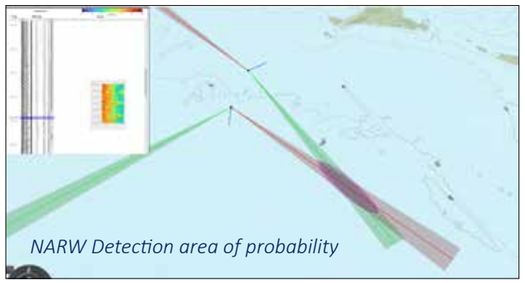
Through the integration of passive acoustic sonar, vessel Automatic Identification Systems and other sensors, the SeaPicket technology notifies captains in real time whether a whale is in the vicinity of the ship's course. SeaPicket is an energy-harvesting, autonomous, long-dwell platform that can serve as a vital tool for protecting the endangered North Atlantic right whale and all species of whale.

SeaPicket was developed to track whales for the highly regulated commercial offshore wind energy market. Wind farm developers are required during the permitting process to show how they will avoid harm to whales and other marine life during construction and operation of their developments. This technology leveraged concepts originally used to provide persistent surveillance services to the U.S. Navy.

The SeaPicket system uses passive acoustic arrays to detect whales, identify the species, and to determine if they are in or near an area that poses a danger to them. The system's passive sonar array, anchored in a safe location on the seabed, optimises detection range and enables an observer to locate and track a whale.

The moored device uses solar panels to power the system with green energy and transmits information about whales in real time. They can then use AI to find quiet whales in loud areas, and to predict where the whales might be going, thus helping to reduce vessel strikes.

The passive acoustic array on the seabed is tethered to a buoy. A signal light atop each buoy will flash either red or green to indicate whether a whale is nearby.


NARW Detection area of probability

"A series of SeaPicket sensors deployed along a maritime shipping route will provide the information needed – in real-time -- to help prevent vessel strikes," said Dr. Kevin Lopes, Director of Strategy and Marketing at ThayerMahan. "A route that is green-lighted would allow ships to pass at regular speed as opposed to slowing based on the theory that whales could be present according to historical migration patterns that we know are changing."

Wind farm developers are already looking to the SeaPicket system to meet their regulatory requirements for protecting whales. SeaPicket can detect whales across the broad expanse of an offshore wind lease area and alert Protected Species Observers when whales are nearby. This means a construction company can stop loud work to make sure endangered marine animals won't be hurt.

For decades, vessel strikes have been cited as the primary cause of whale injury and death. Recent reports this winter of dead whales washing ashore along the East Coast of the United States make the implementation of SeaPicket a priority for the commercial shipping industry and for any maritime enterprise with vessels transiting the area.

The National Oceanic and Atmospheric Administration relies on historical migration routes to establish Seasonal Migration Zones for ships to avoid or reduce speeds while transiting. NOAA acknowledges that climate change has affected patterns of prey fish, which in turn has led whales to deviate from these long-established migration zones.

These proposed regulations likely would further impede shipping and still lack real-time, verifiable data to warrant further restrictions.

MacArtney
UNDERWATER TECHNOLOGY

TrustLink
Metal Shell Connectors

MacArtney global solutions

Denmark | Norway | Sweden | United Kingdom | France
Italy | Germany | Netherlands | USA | Canada | Brazil
India | Singapore | China | Australia

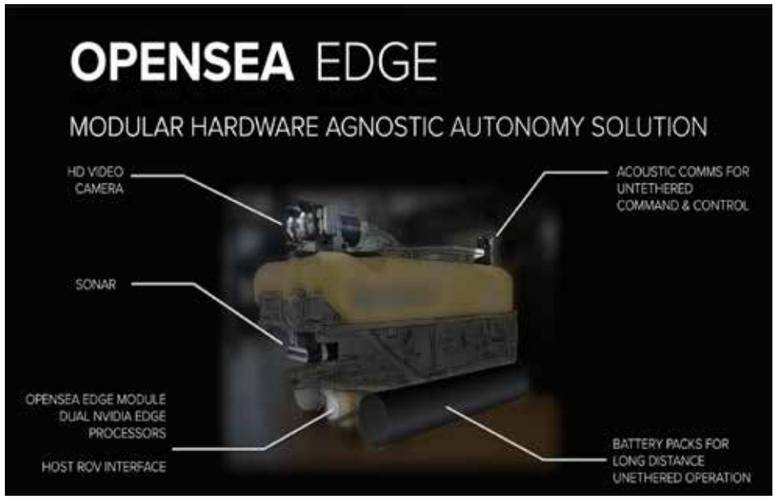
OPENSEA

OPENSEA EDGE IS A MODULAR EDGE COMPUTING MODULE WITH PERCEPTION SUPPORT FOR AUTONOMOUS UNDERWATER ROBOTS BASED ON GREENSEA'S OPENSEA OPEN ARCHITECTURE SOFTWARE PLATFORM

Marine robotic software solutions developer Greensea System has launched OPENSEA Edge, the latest product that promises to bring true autonomy to ocean robotics.

Greensea was founded with the vision to improve the working relationship between humans and machines in the marine environment. OPENSEA Edge delivers the technologies required to advance ocean robotics into the next generation.

Based on OPENSEA, OPENSEA Edge offers the next level of operator capability. While OPENSEA provides the software capabilities of navigation, control, autonomy, perception, and long-range communications, OPENSEA Edge provides a modular, hardware agnostic processing platform, that converts a traditional ROV into one with autonomy, AI, vehicle perception and tetherless, over-the-horizon, communication and control.



With edge processing, ROVs come alive. Data processing, navigation, and control on the vehicle allow for decision making on the edge.

This paves the way for redundancy, failure mitigation, and the platform required to integrate new levels of autonomy. OPENSEA Edge is a 'brain in a box'- a modular and vehicle-agnostic autonomy solution addressing the future requirements of manufacturers, service providers, and system integrators as the industry looks to a future of autonomous and unmanned operations.

"I founded Greensea to develop technology that would improve the working relationship between operators and vehicles. OPENSEA Edge is the embodiment of that effort. Leveraging more than a decade and a half of experience in open architecture robot software, OPENSEA Edge delivers an edge-processing solution for ocean vehicles with control, autonomy, perception, and sea-floor-to-over-the-horizon communications. With OPENSEA Edge, Greensea is leading the way towards subsea robot residency and extended reach", says Greensea founder and CEO Ben Kinnaman.

OPENSEA Edge utilises parallel NVIDIA processors to handle sonar and video perception feeds while providing autonomy, communications, and task management for the robot. This platform puts a tremendous amount of processing power at the edge, right on the robot, where it can work directly with sensor data and make decisions for the vehicle. OPENSEA's Safe C2 software package for low bandwidth and high latency communications links provides a seafloor to over-the-horizon communications solution for operators supervising the robot.

With the open architecture framework of OPENSEA and available processing space, developers can install their own autonomy and perception-handling software, including AI/ML libraries.

Originally developed and tested for military use, OPENSEA Edge has been deployed on untethered ROVs as well as seafloor-crawling robots in Mine Countermeasure and Explosive Ordnance Disposal applications.

OPENSEA Edge has been used to retrofit traditional commercial ROVs as well as the basis of new vehicle builds. With proven performance in military applications, Greensea is now offering OPENSEA Edge as a commercial product.

As the subsea industry looks forward to the future of cost-effective and persistent operations offshore, OPENSEA Edge will be the open architecture processing foundation the industry builds upon.

AH-1

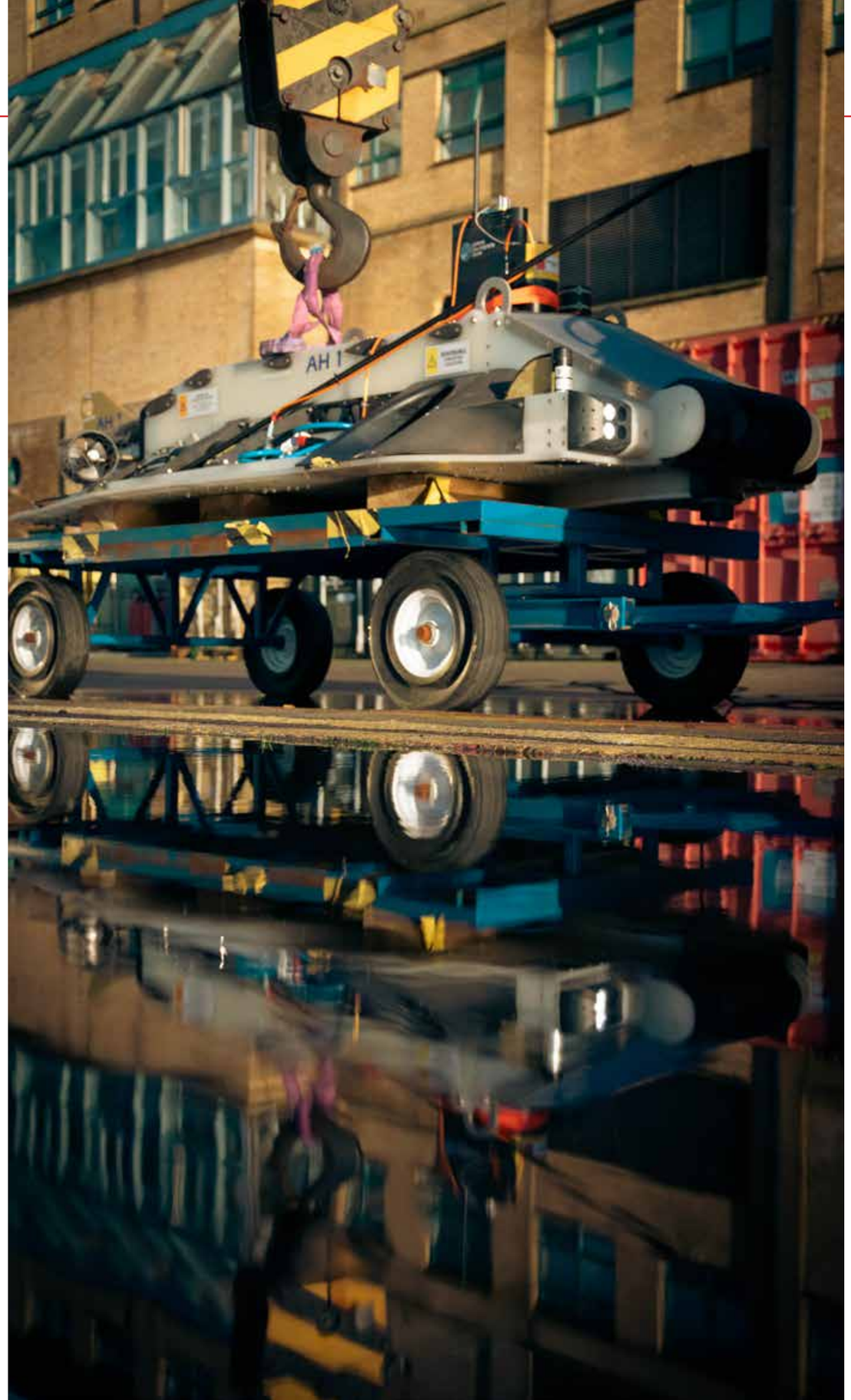
NOCS NEWEST VEHICLE

Later this year, engineers at the National Oceanography Centre in Southampton (NOC) will commence the first offshore testing of its new AH-1 hover-capable autonomous underwater vehicle. This follows a year of controlled dockside and deeper water testing. The group is already looking towards an AH-2 vehicle to build on the many lessons already learned so far on the development of AH-1.

NOC has experience in developing underwater vehicles and currently operates the two large AUVs the Autosub Long Range (ALR) and Autosub 5, and the whileat the other end of the scale, it has had input on the microAUV ecoSUB. This new vehicle, however, takes the design in a completely different direction. Almost literally.

"This is the first hover-capable vehicle we have developed' said principal systems engineer Terry Wood. " We began the initial work right at the very beginning of the pandemic and it grew from there. The project has received, and continues to receive, Innovate UK project funding and we are working with other, mainly commercial partners, who use AH-1 to trial new products and concepts, while we advance the vehicle itself.

"The new vehicle has a total of six thrusters- three vertical, two forward and a lateral thruster. This



arrangement affords the H1 vehicle, the ability to both hover in a stationary position and move vertically up and down the water column. It will allow the team to carry out scientific work such as surveying vertical canyons. In addition, we have definite plans to use it with other partners on green energy projects such as examining monopiles and other subsea infrastructure.

A key feature of the software architecture of AH-1 is it's frontseat/backseat architecture. This means we can easily add new systems to the vehicle which can use their own techniques and sensors to derive a navigational instructions for the vehicle, perhaps fusing AH-1's data set with a dataset. Provided these instructions are not adjudged to put the vehicle at risk, AH-1 will obey the backseat's requests. Without the backseat being present, or if it fails, navigation reverts to the vehicle itself; i.e. the frontseat.

"We concluded the first phase of development about 18 months ago. This culminated in combined testing with one of our partners a quarry in Somerset. This included our first demonstration of a camera system, operating as the backseat, controlling the vehicle
After that project, we were working with the defence partner using the sonar system to control the vehicle.

"We are now working on another related project where we have integrated an inertial measurement system into vehicle which gives us a much higher grade of navigation than we had on vehicle previous version. It means much better localization and we are in the process of just starting to test that and to enhance the back seat systems that we developed in previous projects.

"we have been able to call upon the work we carried out developing the larger auto sub vehicles, particularly in the navigation and control areas," Shivan Ramdhanie who started working on the project after the first phase."
"We can use the same set of manoeuvres but combine these with hover-capable movement. Instead of going straight towards something, it can now approach the target in 6 degrees of freedom."

"The actual Mission planning tools are virtually identical between all our vehicles. What we have had to do, however, is to look at the different behaviour to exploit the enhanced capabilities of the hovering vehicle. It will be a two-way process, borrowing items from our other vehicles, but arming them with new abilities developed during the evolution of this vehicle. "

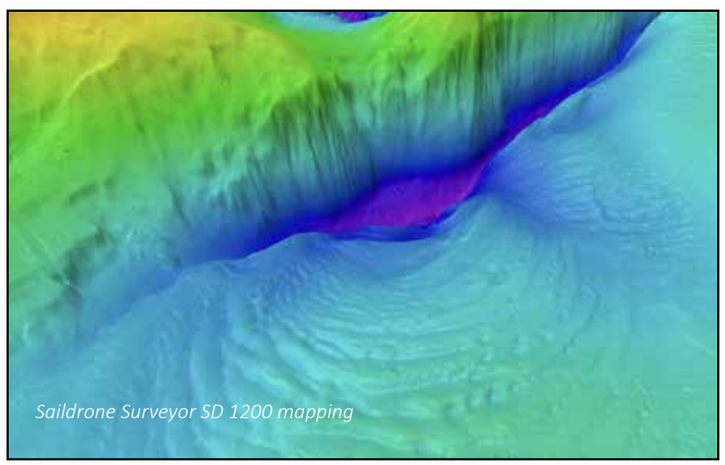
SAILDRONE COMPLETES WORLD-FIRST UNCREWED ALASKA OCEAN MAPPING MISSION

The Saildrone Surveyor, the world's largest uncrewed ocean mapping vehicle, has completed a months-long survey around Alaska's Aleutian Islands and off the coast of California as part of a multi-agency public-private partnership funded by the National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management (BOEM) to address ocean exploration gaps in remote areas with uncrewed surface vehicles (USVs).

The United States Exclusive Economic Zone (EEZ), stretching from the coast to 200 nautical miles from shore, is one of the largest in the world, but it is largely still unmapped, unobserved, and unexplored. In terms of area, Alaska is by far the least mapped region of the US EEZ.

Saildrone Surveyor SD 1200

Saildrone Surveyor SD 1200 departed Saildrone HQ in Alameda, CA, to sail across the North Pacific to the survey area in July 2022. Between August and October, it mapped 16,254 km^2 of unknown seafloor around the Aleutian Islands over 52 days. During the mission, the Surveyor also carried technology from the Monterey Bay Aquarium Research Institute (MBARI) to sample environmental DNA (eDNA). Outfitted with the Environmental Sample Processor (ESP)—a groundbreaking "lab in a can"—the Surveyor was able to collect important clues about marine biodiversity and ocean health from the genetic "fingerprints" left behind by marine life.


Saildrone Surveyor SD 1200 mapping

Severe weather is the norm in the Aleutian region, but the Surveyor continued to collect high-quality data even in 35-knot winds and wave swells over 5m(16 ft)—conditions that would have proved too challenging for most crewed survey vessels.

The data collected around the Aleutian Islands will be publicly available through NOAA's National Centers for Environmental Information once post-processing has been completed by the Center for Coastal and Ocean Mapping at the University of New Hampshire.

SD 1200 is the first of Saildrone's Surveyor class vehicles. An additional four Surveyor-class ocean mapping vehicles will be built by Austal USA in Mobile, AL, this year to meet increasing global demand.

NOAA's Arks

The NOAA Uncrewed Systems Operations Centre has selected nine projects that use private-sector operated uncrewed marine systems in an innovative partnership to collect data for NOAA missions. In total, $7.5 million will be allocated in fiscal year 2023.

These nine projects will leverage capabilities from the private sector, and help NOAA to advance the science that underpins the products we provide to the nation.

The projects were submitted through NOAA's internal request for proposals and the agency received 17 proposals totalling $36.4 million. They selected the following projects:

Observing Hurricanes Using Uncrewed Surface Vehicles
Region: East Coast, Gulf of Mexico and Caribbean
Funding: $2,500,000

Instrument Validation and Calibration on Uncrewed Surface Vehicles for Broad Meteorological and Oceanographic Observations
Region: West Coast
Funding: $482,019

Uncrewed Surface Vehicles Integrated within the Tropical Pacific Observing System
Region: Tropical Pacific
Funding: $521,716

Gulf of Maine Seafloor Mapping to Inform Wind Energy Planning, Habitat Characterization, and Fisheries Management
Region: Gulf of Maine
Funding: $1,119,162

Expansion of Planned Hydrographic Survey Projects with Uncrewed Marine Systems
Region: Alaska
Funding: $1,176,811

Autonomous Underwater Vehicle Services for Scallop Survey in Wind Energy Areas
Region: New England
Funding: $191,300

Surveying Coral Reef Benthic Habitat with Autonomous Underwater Vehicle Technology
Region: Hawai`i and Florida Keys
Funding: $128,597

Assessing Ecosystem Productivity in Support of Ecosystem-Based Fisheries Management in the Hawaiian Islands
Region: Hawai`i
Funding: $381,880

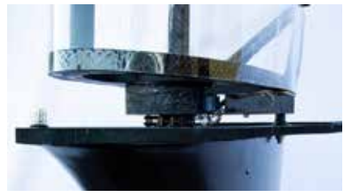
Operational Use of Uncrewed Marine Systems for Providing Observations at a National Data Buoy Center Buoy Location in a National Marine Sanctuary
Region: West Coast
Funding: $991,015

"Uncrewed systems are an increasingly important tool to support NOAA's mission of understanding and predicting changes in climate, weather, the ocean and coasts, and conserving and managing coastal and marine ecosystems and resources," said NOAA Corps Captain William Mowitt, director of the NOAA Uncrewed Systems Operations Center. "By partnering with the private sector, we can not only collect data more efficiently, but also support innovation and America's new blue economy."

SUBSEASAIL UPDATE

Back in 2019, UT2 ran an update of SubSeaSail's novel underwater vehicle. Since that short time, however, the design has gone through many iterations. Later this year, the company will launch its 8th generation vessel.

The design is driven by a huge wingsail. Fundamental to the design is its patented steering cam arrangement that passively positions the sail in the correct angle, automatically, irrespective of wind direction. This would otherwise have to executed using servo motors.



Cam arrangement

So what is new?

"On the face, the vessel looks very similar, however, there have been significant changes," said Managing partner Michael Jones. "The sail structure now has a moulded fibre glass frame. We worked with Kevlar and carbon fibre but with the mast being a good place to install an antenna, we found that some materials affected the propagation of signals."

The new vehicle will be able to draw from 4 solar panel arrays while the panels on the outside have been marinised to obviate problems with salt and corrosion.

"At the base of the vehicle is a torpedo-shaped structure which houses the power storage cells and the control system, 'server farm' we call Pamela, which is the vehicle's management system," said Jones. "When third parties wish to add equipment or sensors, the desired voltage is supplied from the batteries while the control cards are located in slots within this sealed body.

"Adding an acoustic sensor, for example, means simply securing it to the attachment point and letting it automatically communicate with the Pamela sensor hub. Importantly, the user doesn't have to send the equipment to us for integration – they can do it themselves and we will show them how to seal it. This is far more convenient for the client as they can change it out without returning the unit to our base."

LAYOUT

At the top of the mast is new a six- colour camera together with classifiers and a neural engine that can interpret patterns. This means that above water, it can look at images and recognise, say, a fishing vessel, cargo vessel or a naval vessel, and differentiate between them. Below water, it can listen to the noise signature and recognise the specific vessel, but equally, can be used to differentiate between sounds and movements of types of whales or other large sea creatures.

"While our vessel is 3m tall, the freeboard (the distance between the waterline and the deck) is only around 4in so the vessel does not push water away, as with ships, but slices through it.

"Looking at the acoustics, we realised that the biggest power consumers were devices discriminating against extraneous sound," said Jones. "Water impacting with the surface of the boat's hull –known as hull slapping – creates an acoustic noise. This is virtually non-existent in a vehicle with a submerged hull. By removing all that extra noise, the processing requirement drops down dramatically.

"Our vehicle is ultra-quiet with virtually no radar signature and was built from the ground up to be invisible as possible. This makes the vessel ideal for use in acoustic detection.

"The other major 'power hog' is the hydrophones. Being an ultralight vehicle, we originally decided to create a rigid array extending from the vehicle as a rod, underwater but since then, we have developed a semi-rigid array. This houses four transducers arranged in a shape where we can use the geometry to tell the direction something is coming from.

"Ship- shaped vessels are good for some applications but unsuited for others. They is not designed, for example, to conduct '*mow the lawn*'-type surveys but instead, suit more linear long-distance applications.

LIGHTNING

One potential hazard is lightning. This occurs in the oceans but the actual strikes are between 2 and 100 times more powerful than on land. This issue is well known to the marine insurance industry. A vessel's mast is often the tallest object in the ocean and if lightning hits it, typically vaporises the electronics.

"We use a lightning detector to tell us if lightning is in the area. Being a vehicle that works well underwater, we can submerge until the storm abated.

"Many vessels can submerge but this demands some forward movement.

yugi's forward movement to go straight down but we couldn't didn't want to do that so we basically wanted to have something that was patentable we have 550 patents now. And we've got five patent pending on top of that for step initially this is a vehicle we are creating a surface only vehicle and now we're in the process of developing the submerging vessel with control submersions.

SWARM

Many contend that small, agile vehicles work more efficiently in a swarm. This is a view supported by SubSeaSail who understandably would like their vehicles in every marine and oceanographic institution, possibly employing fleets of the vehicles. To get anywhere near that aspiration, however, company recognises the need to reduce vehicle costs as much as possible.

"The up-front cost of our vehicle considerably cheaper than the more sophisticated larger uncrewed alternatives," said Jones. "In our business plan, we will make them cheap enough to make swarming feasible. The cost is less but the total cost of ownership is much less.

"We don't need a harbour or A-frame. The whole vessel weighs only 70lbs so it can be literally picked up, placed in the water and retrieved in the same way. Transportation costs are also much smaller.

"We have designed the vehicle to do 80% of the jobs at 20% of the cost of other vessels. While this vehicle has a relatively small footprint, the design is completely scalable. If someone wants to use it going to the North Sea, this may not be the right vehicle but a larger version may be.

"Last year, we concentrated on testing the vehicle underwater but we want to make sure it is fully tested before we start manufacturing at scale. We have a list of 100 organisations in 19 countries have expressed interest. The development has benefited from three grants we've received from the Department of Energy and one from the National Science Foundation."

OCEAN AERO AUSV

Ocean Aero has reached Generation 3.3 in the development of its developed of its hybrid environmentally powered, 4m-long Autonomous Underwater and Surface Vehicle (AUSV).

The company originally offered three models: the Navigator, Discovery, and Scout, but has now rationalised them into a single vehicle called the Triton. This features the keynote retractable wingsail that allows the vehicle to submerge, avoid harsh surface conditions, evade detection and perform subsurface data collection tasks.

“The most obvious physical change is at the stern which now incorporates a twin conning tower houses the communication suites" said Jeff Williams, Business Development manager. "We have four different communication nodes: cellular, Wi-Fi, line of sight and video.

Left: Ocean Aero vehicles on the quayside

Vehicle submerged

Internally, the hull has been redesigned to make the system more modular. It contains a number of retrievable pressure vessels – an arrangement that provides greater integrity when the vehicle is submerged to, say, 100m.

“The vehicle is agnostic to payload," said Williams." Its versatile system architecture means that we can craft niche payloads for specific applications. When carrying out oceanographic work,we can accommodate numerous scientific sensors, bathymetry systems, side scan sonar, Sonardyne Solstice and SprintNav DVL. It can house a range of water sampling tools.

"In the defence phase, we have may types of payloads intelligence such as surveillance cameras LIDAR, pan and tilt units, zoom cameras, radar and remote sensing systems. We can take payloads designed by third parties and integrate into the platform but it's easier it's easier if we just get the equipment ourselves.

“The first point of propulsion is sailing. There are also two thrusters for thrust assist but when it dives, it just uses the thrusters These are driven by a pair of 2KW batteries housed in the main body.

"We went from 170W of solar power in the previous version, to 340W by putting solar power cells on the wing. We also converted a lot of our software in order to reduce the house load to about 40W This really expanded the payload since the capability.
Some models have an obstacle avoidance system on the platform. It it recognises a threat such as a fast approaching boat, or a vessel with guns, for example, it autonomously dives to avoid capture.

"We have sold a number to the United states Navy a number and to Saudi Arabia," said Kellie Keller, EVP, Growth, but we are mainly looking at the academic research community, and the Department of Homeland security. NOAA are using it for research projects," she said.

Triton vehicle

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HHI AND OCEAN AERO PARTNERSHIP

HII and Ocean Aero have initiated a strategic agreement to advance the combined capabilities of their respective unmanned maritime platforms and autonomy software solutions.

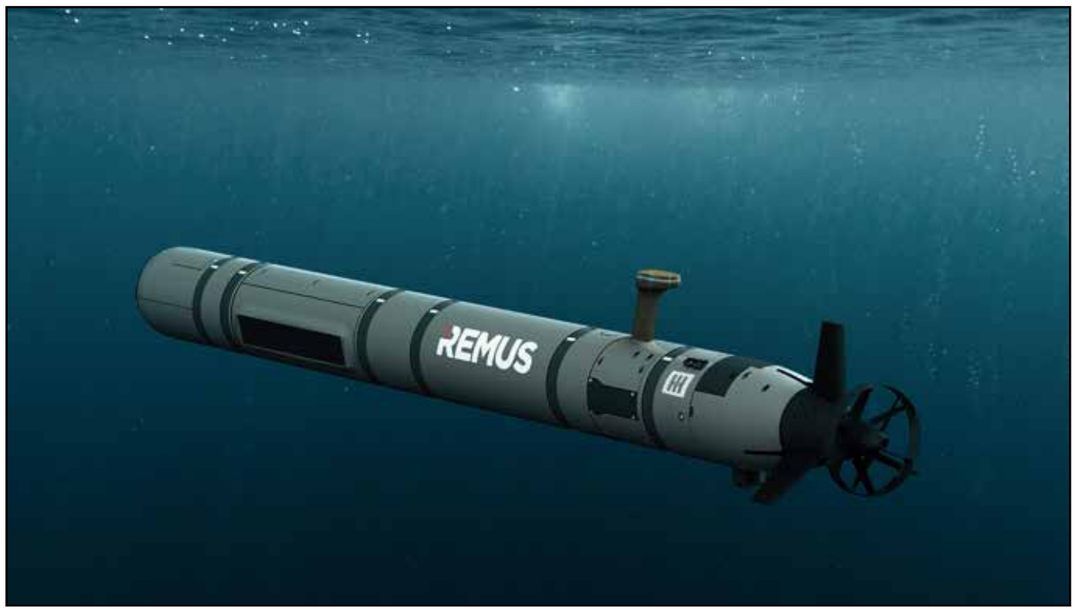
The unmanned solution providers recently commenced multiple, simultaneous efforts to enhance the operational reach and duration of the platforms, collaborative autonomy behaviours, shared sensor fusion and perception capabilities, and accelerated seabed-to-shore data transmission methods.

"We are pleased to partner with Ocean Aero to further expand the operational capabilities of the U.S. Armed Forces, partner nations and other maritime-focused commercial institutions," said Duane Fotheringham, president of the Unmanned Systems business group at HII's Mission Technologies division.

Kevin Decker, Ocean Aero chief executive officer, added: "This is the perfect time for us to partner with HII. With rising maritime challenges increasing worldwide, we need new capabilities to meet them."

HII and Ocean Aero are involved in several unmanned maritime systems initiatives and exercises across the globe. Ocean Aero recently completed Digital Horizon, the U.S. Fifth Fleet Maritime Domain Awareness exercise in the Arabian Gulf, where HII's REMUS vehicles (MK18 Mod 1 and MK18 Mod 2) have been deployed continuously since 2013.

The HII-Ocean Aero team is already planning to demonstrate their combined capabilities and exercises for U.S. and international partners.



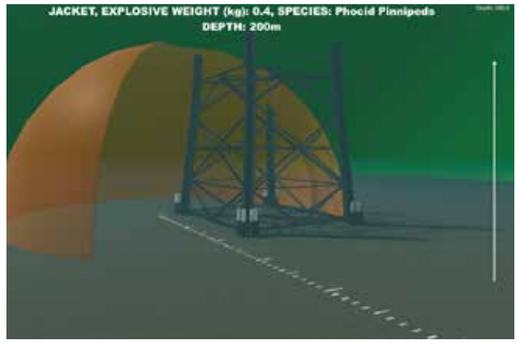
HHI's REMUS

SustainaVerse™ Afternoon Workshop

Using Digital Technologies to Visualize Operations and Identify Uncertainties in order to make better Commercial and ESG Decisions

1300-1700 hours, Tuesday, 16th May 2023
Lloyds Lab, The Lloyds Building, 1 Lime Street, London EC3M 7HA

The Second Energy Upheaval
We are in a second energy upheaval! The first occurred when the maritime sector changed, simultaneously, from sail to steam and wood to iron. The London market in the form of Lloyds responded to this. Today, in a very similar frenzy, this time to achieve 'Net Zero', the technologies may be very different, but insurance and investment market-need, and human nature remain very much the same. There is no less need for thorough understanding of endeavour in order to classify and therefore price the patterns of risk, but, today, operation is far removed from the commercial instruments that makes it possible, and few in the insurance, indemnifying and investment markets have practical, in-depth knowledge of the people involved and their practices. How to tackle this?



Focus of Practical Workshop
Two, short presentations covering electricity generation scenarios and ESG will be followed by a hands-on exercise using collaborative VR, followed by examples of where Visualization and Simulation has informed academic research, operations and spatial planning.

Who should attend?
Underwriters, P&I Clubs, Sustainable, Responsible Impact+ Investors+, Brokers, Lawyers, Technology Providers, Operators and Owners. Members of the Society for Underwater Technology (SUT) and Members and Associates of the International Salvage Union (ISU)

To register to attend this free event, please go to the SUT's Events Page: https://sut.org/events or contact Karen Seath, Lead Blue Economic Ecosystem at the D'Arcy Thompson Simulator Centre, direct: karen.seath@darcythompson.net

A Collaborative, Digital Response
The D'Arcy Thompson Simulator Centre as a provider of sustainability assurance, the London City Branch of the SUT as a learned society, Beazley as underwriters, the Waves Group as warranty surveyors working in maritime and oil and gas, and IQ3 Connect, providers of a collaborative VR platform, are holding an event at Lloyds Lab to explore how A CANVAS (Abstraction, Calculation, Analysis, modelliNg, Visualization, Animation and Simulation) can help ensure that test design is complete, and residual risk adequately identified.

WORLD SEAGRASS DAY

HydroSurv has won funding from Innovate UK to continue working with the University of Plymouth to enhance its technique of using Uncrewed Surface Vessels (USVs) to map seagrass coverage on the seabed.

Building on previous collaborations with the University and Valeport, the project aims to generate a comprehensive picture of seagrass meadows as well as to characterise the environment in which they are growing, enabling ecosystem health to be determined from the same survey campaign.

The project will see HydroSurv's low impact, fully electric USV data acquisition platform developed further to deliver comprehensive, seagrass monitoring using an Acoustic Ground Discrimination System (AGDS) coupled with video and environmental data collection from new hull-mounted and underwater sensor arrays.

These include two specialist cameras and a laser range finder, which is deployed to a constant altitude using an intelligently controlled cast winch on the HydroSurv REAV-28 USV.

A macro lens camera on the underwater skid will be lowered into sediment for close-up, hi-resolution photographs. Using an algorithm to ascertain grain size from the images, the type of ground in which the seagrass is growing can be determined. This enables stakeholders to monitor critical environmental parameters of seagrass habitats and to quantify meadow biomass and carbon sequestration potential, in turn informing better understanding of these habitats and their restoration.

The vessel's sensor payload will also measure sound velocity, turbidity and chlorophyll levels, while machine learning algorithms, developed by the University, will objectively classify the seagrass beds using acoustic envelopes.

Processed data will be provided to coastal practitioners and scientists using an enhanced cloud-based data hosting and visualisation application developed by HydroSurv. This will enable them to create an enhanced picture of seagrass coverage, density and canopy height alongside improved environmental measurements and ground truthing video files, making actionable seagrass data wholly accessible.

The six-month project will culminate in a system demonstration involving key UK natural capital stakeholders actively involved in seagrass conservation projects and strategy, including DEFRA (co-funder), Natural England and the Environment Agency.

Dr Tim Scott, Associate Professor at the University of Plymouth said: "Collecting and processing ground truth images of seagrass habitats is currently an essential, but costly and time-consuming, activity. This project will dramatically improve our ability to monitor these critical ecosystems effectively and economically, facilitating the collection of regular and spatially comprehensive datasets that would not be possible without leveraging marine autonomy and advanced data analysis techniques."

HydroSurv Uncrewed Surface Vessels (USVs)

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OPENOCEAN

About four years ago, OpenOcean started to develop and produce a small autonomous data gathering surface vehicle. The company is now beginning to manufacture these in greater numbers. This will afford the company, the ability to expand it's services to a global audience rather than being focused in Canada.

"Capturing ocean data is important," said Chief Technology Officer Dr Fritz Stahr. "It can protect at-risk whale species, allow ships to voyage more fuel-efficient routes, crack down on illegal fishing and enable the better understanding of impacts of climate change"

The main product is called the *Data Explorer*, an advanced uncrewed vessel. A number of solar panels on the surface provide the power to drive the motor. The vehicle measures around 4m in length and is a metre wide. It draws about 0.5m of water under the keel.

“The 600W motor has an output of 3hp although there is a 6hp version available," said Stahr. "Inside, there are banks of lithium ion batteries which represent is the main energy reserve. These give a power output is 10.5 kWh, although it is possible to also install batteries in the space in the bow often occupied by scientific equipment.

"Harvesting energy from the sun, our boats can travel nonstop for months, without producing any greenhouse gas emissions, noise pollution or risk of oil spills."

One of the characteristic features of the design is the novel and patented roll bar the stern. It rises around 1.5m above the deck. This ensures that if the boat gets turned upside down by wave action, it rotates itself again to the right side up due to roll bar’s buoyancy. This means that the propeller awlays remains under the water, generating thrust.

On the top of the roll bar is a 360deg camera. This may also be accompanied by thermal imaging infrared cameras. The vehicle also has AIS radio and broadcast/receive communications.

"The vessel contains a weather station which provides data on wind speed and air temperature, relative humidity," said Stahr. "This is complemented by sensors on the bottom of the boat to give additional information on water temperature and water depth.

"It is common to also add acoustic systems as well as an ADCP for measuring ocean currents. Some users also incorporate oceanographic sensors on the bottom of the hull to measure salinity, chlorophyll fluorescence and tubidity.

"The *Data Explorer* is used by a a range of clients from Non profit companies to Navies and Academic bodies to Fisheries looking at a variety of activities in and on the ocean.

“We have been considering adding a 7m boat to our range. This will carry more solar panels and sensors and batteries but potentially a chemically driven fuel cell diesel generators. We don't expect that it will be particularly faster, maybe around 6kts, but it will have a longer duration.

"Many people we speak with consider that instead of a fast boat moving quickly between areas of interest, a better use of resources might mean a smaller inexpensive vessel at each of these areas. These would provide a much greater understanding of the area.

"We can capture information from anywhere on the ocean and have instant access to it. Illegal fishing accounts for 20% of all wild fish caught, earning poachers $30 billion a year. Our USVs can patrol the ocean, safeguard Marine Protected Areas and facilitate the capture of illegally operating vessels.

"700 million litres of oil enters the ocean every year through boat spills, leaks and intentional discharges. Our vehicles can monitor for oil spills, detect intentional dumping and aid in the clean up effort." said Stahr.

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OTTER

Ashtead Technology has signed a multi-year rental agreement with Maritime Robotics for the Otter Unmanned Surface Vehicles (USVs) for high-quality maritime data acquisition.

The Otter is the smallest member of Maritime Robotic’s USV family with a footprint of only 200 x 108 x 81.5 cm and a weight of 55 kg.

The Otter's robust catamaran design and the tightly integrated survey sensors makes this system a particularly cost-effective, turn-key solution for carrying out bathymetric surveys in sheltered waters.

FOOVER

Underwater Contracting (UCO), owners of the world's largest fleet of Saab's Seaeye Falcons, has expanded to 27 vehicles as it has won one of the largest contracts in the global aquaculture sector.

Seaeye Falcon is capable of handling UCO's hugely successful FOOVER mortality recovery system.

The agreement will see the Falcon fleet working 365 days a year over multi-year contract terms and providing a range of services in Europe, North America and Australia.

Specialists in aquaculture, UCO, has successfully deployed Seaeye Falcon underwater vehicles since 2018, for animal welfare and installation integrity across aquaculture sites across three continents.

In that time, they have productively utilised the power and intelligence of the Falcon system when designing and developing industry-leading technologies, including their FOOVER Mortality Recovery system, NETFIX Net Repair system and G-LANCE Cage Cleaning system.

They chose the Seaeye Falcon as the world's top selling underwater robotic vehicle in its class and for its versatility, being able to be utilised not only in aquaculture, but in the offshore energy and maritime sectors as well.

● Scientists at the Washington Department of Fish and Wildlife (WDFW) have acquired a second Saab Seaeye Falcon underwater robot. The Seaeye Falcon is used to con-duct surveys of marine fish and

Foover

invertebrates in Washington's Puget Sound, where some rockfish populations were fished to levels that threatened extinction.

The surveys are used primarily to monitor the recovery of rockfish listed under the United States Endangered Species Act, but also provide information on the unique geological

Rockfish measurements

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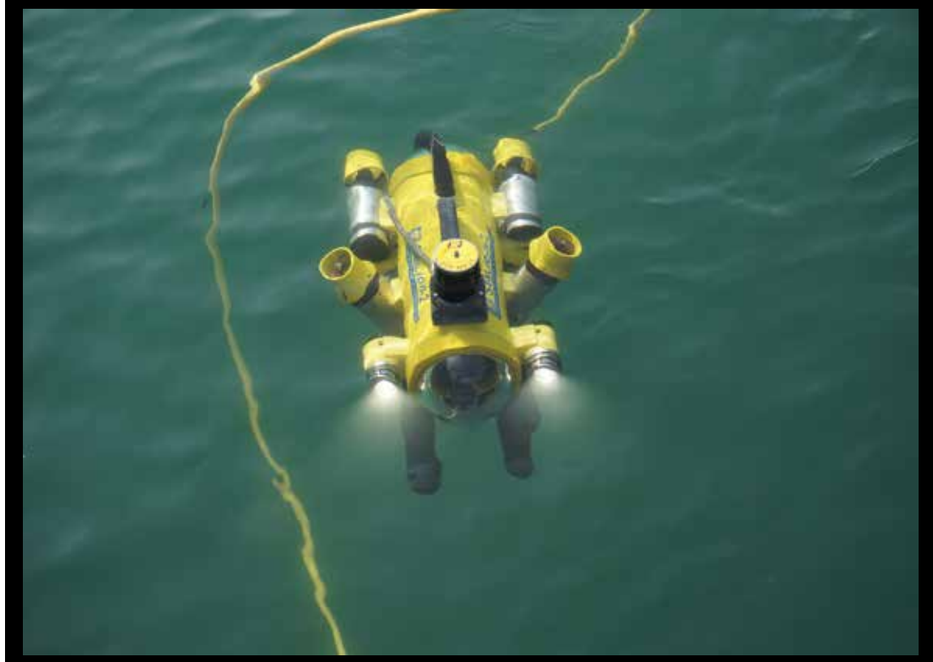

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features in Puget Sound. The WDFW has also used their Falcon to survey the habitat surrounding U.S. Navy bases in Puget Sound to meet Federal permitting requirements, locate and recover lost equipment and conduct special studies of sea urchins and sea cucumbers.

The new Seaeye Falcon is a 300m rated system and equipped with a high-definition fibre-optic video system capable of collecting higher resolution imagery than WDFW's original Falcon, which has seen over 4000hrs of use since 2007.

"The HD imagery collected with the new vehicle will greatly improve our ability to detect small and cryptic rockfishes, leading to more precise estimates of abundance, and will be used to train machine-learning algorithms being developed to partially automate the video review process, which is expected to substantially improve survey and post-processing efficiency," explains research scientist Robert Pacunski.

Specialised equipment fitted to the Falcon includes a pair of parallel lasers and a stereo camera for assessing individual fish size and the density of fish in a measured field of view.

An Imagenex multi-frequencing gyro-stabilised sonar is used to identify target habitats and avoid uncharted obstacles (for example, derelict fishing gear, sub-surface electrical and telecommunications cables).

Depending on survey needs, the vehicle can be fitted with a conductivity-temperature-depth meter to collect data in re-al-time for examining linkages between physiochemical water quality parameters and fish distribution/ abundance.

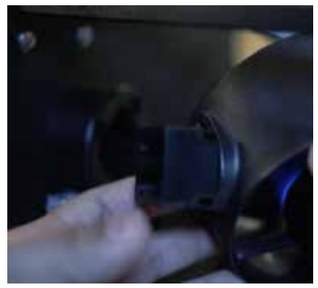
Saab Seaeye Falcon

OUTLAND 3000

Outland Technology has recently launched its latest underwater vehicle, the ROV-3000 which resides at the top end of the range. It can be operated in water depths up to 2000ft (600m) and includes auto depth, auto heading and auto pitch as standard. It builds on feedback gathered over the years, but retains the keynote simplicity which is a characteristic of its predecessor vehicles.

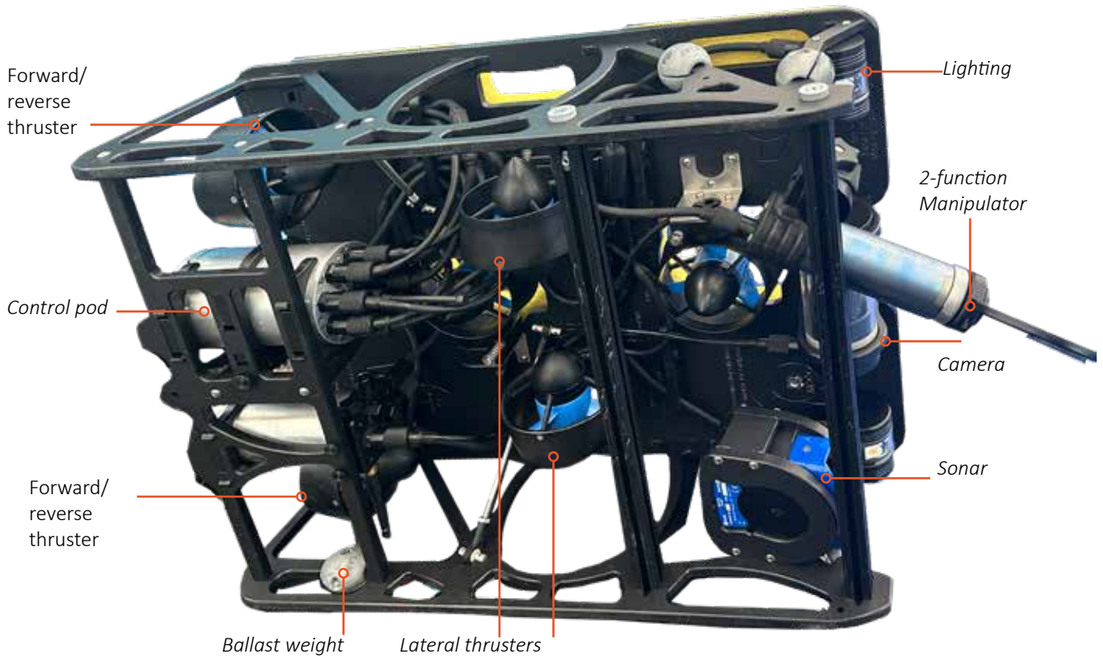
“If something breaks, it is always vitally important to get it back up and running quickly, especially if the support boat is in the middle of nowhere," said Sean Mayfield, Sales Manager at Outland. "Many vehicles on the market are becoming increasingly compact and complex but this sophistication occasionally comes at the cost of operational expediency.

"Equipment failure rates have improved considerably since the early days of vehicle development,



Thrusters can be removed in a simple quick-disconnect action

Above: The ROV3000
Below: Underneath view showing the simple layout.



but equally, there is often a lot more equipment on the vehicle to go wrong. We see an important design feature as the ease of swapping out components at the site for repair or replacement, and more particularly, minimising time it takes.

"We have developed a quick push-button disconnect system that makes it very easy to detach items such as thrusters from the ROV frame. Think of the system used to remove the steering wheel of a Formula One racing car at the end of each race.

“One of the first requests we had when developing this simplified arrangement was from the nuclear power industry. The engineers needed to remove devices from the vehicle while wearing protective gloves, and so we developed a solution that was as tool-less as possible.

“We have switched from metal to a polypropylene plastic frame which obviates corrosion problems. The frame is still very strong but is now also neutrally buoyant. This is useful when having to transport heavy equipment. We have also developed a payload skid that can be quickly attached to the frame base in a matter of minutes.

"Another feature of the vehicle is an improvement in the thrusters. Older vehicles used to incorporate high voltage thrusters possibly up to 300 volts DC."

The high voltage power coming into the ROV from the umbilical went through the control bottle and on to each individual thruster. That meant the possibility of multiple areas of failure for high voltage leakage to seawater. This has changed with the use of low voltage systems. The power comes in and converts to low voltage before it goes to the thrusters.

The new vehicle has better station keeping with the optional Waterlinked DVL. The control systems have been significantly improved, particularly the circuit board efficiency and layout. A feature of the Outland ROV design

The camera can revolve to move up and down. Laser pointer can add a scale

Briefcase-sized control box

is the way they the thrusters are arranged," said Mayfield. "They are positioned in an orthogonal rather than a vector arrangement, which we believe, is much simpler and more power efficient.

"Unlike our smaller vehicles, however, the ROV3000 has two vertical thrusters. This gives us the opportunity to do some pitch compensation. This may be necessary, for example when picking up a heavy object with the manipulator arm.

"The vehicle has an optional two function manipulator arm which offers an open close and wrist rotation action. The company says that they try to accommodate commonly available equipment

"The ROV can be manoeuvred by a new topside control box This briefcase-sized console takes up less space and is ideal for use in a small boat."

DEFENDERS

Greensea Systems, recently demonstrated untethered autonomy for ROVs.

Using a commercially available Defender ROV from VideoRay, outfitted with batteries, acoustic modem, and the new OPENSEA Edge system, Greensea has successfully proven untethered operation of an ROV at sea.

OPENSEA Edge puts a tremendous amount of processing power at the edge, right on the robot, where it can work directly with sensors to process that data onboard, eliminating the need for a topside computer via the tether. This dual, parallel NVIDIA edge platform runs Greensea's open architecture software, OPENSEA, and handles the sonar and video perception feeds while providing autonomy, navigation, communications, and task management for the robot.

Once the need to send all of the data, all of the time to a topside computer was no longer necessary, data could reside on the vehicle, sending only the most crucial pieces of information for a human operator to supervise. Reducing the amount and frequency of data being transmitted means that a lower bandwidth/higher latency communication method, such as acoustic modems, could be used.

VideoRay Defender

VideoRay Defender

During recent operations conducted at sea, Greensea was able to demonstrate that a VideoRay Defender outfitted with OPENSEA Edge was able to search, classify, map, and inspect during a mock EOD mission while being untethered. Operators supervised the autonomous ROV through Greensea's EOD Workspace user interface for defense applications.

Greensea also used itsproven Safe C2 (standoff command and control) technology to provide seafloor to over-the-horizon communications. This enabled the supervision of the ROV over very low bandwidth and very high latency-sparse data connections by an operator using a tablet.

"Eliminating the tether, surface ship, and onsite operator from ROV operations presents the opportunity for the industry to realize a new era of working in the ocean", said Ben Kinnaman, Greensea's CEO. "In this concept, our reach into the ocean is infinite and presence persistent. This demonstration shows that it is possible, affordable, and enabling."

AQUAPIX

Kraken Robotics has announced a $1.5 million in orders from a US defence customer for its AquaPix synthetic aperture sonars (SAS). These 6000m rated systems will be integrated to the customer's Autonomous Underwater Vehicles (AUVs). Delivery is expected in 2023.

Demand for Kraken's SAS products has increased significantly and for 2023 and the company expects to deliver approximately three times the volume as compared to previous years. The company says that this is a combination of
• An uptick in demand driven by customer desire for stronger intelligence about subsea infrastructure in both shallow and deep-water installations
• Increasing adoption of SAS over traditional side scan sonar
• The modularity and versatility of our SAS having a track record of successful integrations on over 20 different underwater platforms

They say that the increased range, resolution, and therefore higher useable Area Coverage Rate of SAS over traditional Side Scan Sonar systems significantly expand the capabilities of naval, scientific, and commercial applications.

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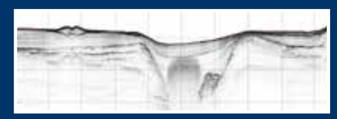

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OCEAN MODULES

Ocean Modules has successfully delivered a V8 M500 system to the Finnish Border Guard. The boarder guard bought their first Ocean Modules V8 Sii ROV systems, back in 2012. Now, ten years later, they are in the process of upgrading their ROV fleet to the latest version of the V8 M500 model as well as attending in Ocean Modules' ROV system training courses.

The V8 M500 offers a variety of possibilities, of which the Finnish Boarder Guard is keen to make use of, for instance by adding Survey Management Software SPOT.ON and a number of high technology sensors, such as a Kongsberg's Mesotech 360deg rotating sonar as well as a Blueview multibeam sonar.

On the V8 M500 ROV, the potential of these sonars are being utilized fully, since they can be aimed at any direction (rather than only in the forward mounted direction) while the ROV keeps moving – an effect made possible by the 6 deg of freedom concept.

ROS

At the recent Subsea Expo in Aberdeen, Subsea Commercial Services, distributor of Remote Ocean Systems (ROS) announced its latest offerings

Left: Flood lights

ROS has developed an AC powered 4000m-rated floodlight. It is the third iteration with an output of and 7000 lumen.

Another recent product is the Accu-positioner, a compact underwater pan and tilt. These units take a load of up to 5kg.

The unit gives computer-controlled positional feedback of 0.1 deg (6 arc minutes) and has absolute positioning, meaning that if it loses power and the supply returns, the device already knows the orientation.

It can continuously rotate Using a stepper motor system at a speed of between 0.4 and 24deg / sec or move between user-defined limits.

The oil filled version has a depth rating of 6000m, or 70m for the air filled unit. The aluminium unit stands 9.5 in (241 mm) and has a width of 7.4 in (188 mm). The body diameter is 3.9 in (99 mm). It weighs 6.6 lb (3.0 kg) in air or when oil filled, 7.7 lb (3.5 kg)

Accu-positioner

ROS has also developed a range of underwater SeaStar LED lights. Rated to 6000m, they are small and compact and have an output of 10 000 lumens

The new lights are also field serviceable. Twisting a band strap around the housing will release the bezel. This allows the user to remove the lens, LED array, and reveal all the internal electronics. The lights are supplied with a full field service kit which allows the unit to be repaire3d without it having to be returned to shore. This does not require Yo specialist training.

These are two versions: flood and spot. The basic difference is the beam angle.

A spotlight (top) has the LEDs set into a channel which gives a narrow concentrated beam angle of maybe 40-50deg.

Floodlights (bottom), however, would be to illuminate an area for general visualisation.

These have a typical beam angle maybe twice that of a floodlight - maybe 100 to 120deg. The light output of a wider beam angle is less concentrated.

In the flood, the LED diodes are not as set back into the housing as much as the spot which gives it a much wider flare.

LEDs. Top: Spot and bottom: Flood.

SIDUS

SIDUS' new SS560 is one of the smallest Mini Colour Cameras on he market. It unites an image-rich, high-clarity colour camera with integrated, variable intensity, built-in, adjustable white HB LED.

"It is about two inches in length and a little over half an inch wide rated for 6000m," said Larry Hagstrom Business Area Manager Sidus Solutions. It comes with its own light built into it. About 60 lumens on that light good for close quarters type investigations.

Typical applications include investigating into a small spaces such as pipe investigation. There is a military specification for IED investigation

Sidus has also released the Dark Crystal 50, a high definition IP camera rated up to about 6000m in depth. It produces A1080 picture 30 frames per second. It has a fully dimmable LED ring light about 2500 lumens. And it's our newest flagship light.

"They are just coming off the production line right now," said Hagstrom. " We had to redesign the electronics board because of the chip shortage after COVID. Chips became available but we had to redesign all of our electronics around the new chip. That held us back maybe six months. "

Dark Crystal

ARCTIC RAYS

Arctic Rays have recently launched its Thresher high-resolution IP camera with up to 4K resolution at 30fps, an ultra-wide angle lens with low-distortion, 8x digital zoom, HTTP API control, on-board recording and remote download. It is Onvif profile S compliant and rated for up to 1000m depths.

The Thresher

It comes in two versions- containing a Dome port for applications requiring a wide field of view or with a flat port for low distortion.

"The flat port also allows us to have integrated scaling lasers," said Comms Director Stephanie Herndon. It has been designed for a small vehicle without much available space.

"It has an aluminium housing with Delrin bezel; acrylic (flat) or BK7 glass (dome) viewport. This means that the flat port version with lasers weighs 470g in air or 170 g in seawater. The Dome port weighs 480g in air or 180 g in seawater.

Arctic Ray has also launched the Yellow Fin a

Yellow Fin

lighting/imaging solution developed largely for installation on larger scale AUVs. This machine vision system captures 4K still images as well as 4K/FHD/HD video. The integrated dual-mode lighting offers strobe and torch lighting, while the onboard CPU and SSD storage make this a perfect standalone system.

"We designed he Yellow Fin for photogrammetry and seafloor mapping types of applications," said Stephanie Herndon. "The lighting array has an integrated strobe and torch functions. For video the lights will shine continuously while for stills, the lights will go into strobe mode.

"We use a our different, dedicated set of electronics for each. Our strobes can generate 10 times more light the new continuous light with a fraction of the powerful stop for example a torchlight like this could do 10,000 lumens with 100W. A strobe will do 30,000 lumens With 14 W.

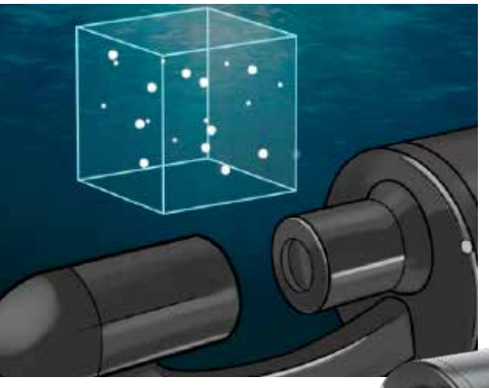
"In battery powered systems, energy efficiency is everything."

HOLOGRAPHIC SAMPLING

A good method of understanding the health of a sea or ocean body is to determine the number and variety of materials suspended within the water matrix. Taking repeated measurements shows the rate of change and how organisms behave, grow or diminish over time, especially in relation to environmental factors, human influence and overall climate change.

Historically, the most common technique has been to analyse water samples, typically containing sand, phytoplankton, marine snow, zooplankton and a range of complicated flocculations, as a laboratory exercise.

Sequoia Scientific (Sequoia), is the global leader of *in-situ* particle measurements in water. In addition to their products developed around laser diffraction, light emitting diodes, (LEDs) and acoustics, they also offer a holographic particle imaging sensor, known as the LISST-Holo2.



“An important aspect of aquatic sampling is that it is best carried out in its actual physical environment,” said Jim Decker, Manager of Sales and Marketing. "When this happens, the sample remains unchanged and still in its natural state, limiting outside induced mixing, settling and the overall disruption of particles; removing sampling bias."

The drive to develop more complete *in-situ* particle imaging methods resulted in the LISST-Holo2.
"This tool works by scanning particles in the water across a 50mm gap," said Decker. "If this image were captured using an optical camera, its characteristically narrow depth of field would mean that practically, only a small volume of water could be studied in each sample.

“To overcome this, we looked to an entirely different imaging technology- holography. This has an extremely high total depth of field, allowing particles to be examined in much higher resolution to reveal features as small as a few microns in some cases.”

The LISST-Holo2 has neither a lens nor does it form an actual photographic image. In the design, laser light crosses the gap between the sender and receiver. When this laser light hits any particle that gets in the path of the beam, it is scattered. This interferes with the unscattered beam creating an interference pattern.

"The interference pattern resembles the ripples on the surface of the water when a stone is thrown," says Thomas Leeuw, Research Associate at Sequoia. ”A CCD camera records this pattern at a rate up to 25 Hz. Our software then converts this scattering pattern back into the particle that created it.”

"Importantly and unlike microscopic photography, all the images are in focus. It can resolve particle sizes in the range between 25µm and 2500µm although it is possible to resolve features on a particle, down to 5-10µm. For comparison, the largest object that can be resolved with the naked eye is nearer 50µm."

Because holography uses micro-second laser pulses the images are frozen, even when the LISST-Holo2 moves through the water. Importantly, in addition to imaging particles it is also possible to measure the particle size distribution (PSD) as equivalent spheres.

"With few moving parts, the LISST HOLO 2 is extremely robust, small and particularity versatile" said Leeuw.. It can be easily mounted on a mooring as well as autonomous and remote underwater vehicles. It can be left for weeks at a time underwater without the need of a person to collect the sample.

"For sampling, it can be easily attached to a range of offshore devices such as fixed moorings, unmanned underwater vehicles and remote monitoring stations. The measurements can be taken at depths down to 600m and this fits in with the company’s philosophy of being able to take measurements anywhere in the water column."

Sequoia’s suite of products, including the LISST-Holo2, is distributed in the United Kingdom and Ireland by Planet Ocean.

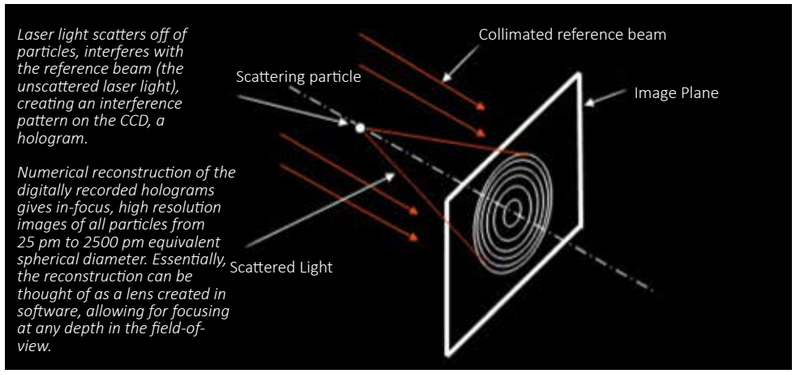
So what is coming next? If there is a LISST-Holo2 today, what will the next product be or what enhancements might improve the existing product?

“For most all aquatic sensors major steps are being taken with respect to software which allows better processing of existing datasets," said Leeuw, "and while it’s too early to say anything firm, Artificial intelligence (AI) software is starting to unlock the problem of how to extract rich data from these massive amounts of collected records. Possibly AI software can look through millions of particle vignettes and classify them into not only phytoplankton and natural organisms, but also micro-plastics, oil droplets and more; doing so in an automated process.

Some researchers have already developed classification methods, and we are likely to see major improvements for the marine science sector in the next years.”

“Future technology developments by Sequoia which impact existing product enhancements and the creation of brand-new products is partially dictated by our continual success winning United States grant funded efforts which pair Sequoia’s in-house engineering and science staff with academia, in a pursuit to fill gaps identified by the scientific community”

Currently Sequoia is completing 3 separate grant funded projects and has more planned on the horizon.



Laser light scatters off of particles, interferes with the reference beam (the unscattered laser light), creating an interference pattern on the CCD, a hologram.

Numerical reconstruction of the digitally recorded holograms gives in-focus, high resolution images of all particles from 25 pm to 2500 pm equivalent spherical diameter. Essentially, the reconstruction can be thought of as a lens created in software, allowing for focusing at any depth in the field-of-view.

MICROPLASTICS

In a recent paper, Daniele Calore and Nicola Fraticelli of Hydra Solutions noted that millions of tons of microplastics (MPs) are released yearly in the marine environment, especially in closed seas. Considering their small sizes, the amount of them per cubic meter of sea water is significant.

Current analysis methods use a 200–300µm manta net where the samples are treated with hydrogen peroxide to remove the biological debris, the particles are hand-picked using laboratory tweezers and the particles are then counted, weighed, dried and classified according to their shape and colour using a microscope and Fourier transform infrared (FTIR) spectroscopy to identify the type of polymers.

The procedures are very time-consuming and the data available poor.

They go on to suggest using a small ASV with a LISST-Holo2 attached to the hull to detect the MPs in the first 30-40 cm layer below the sea surface.

They concluded that the system is not yet able to provide information concerning the material of the detected particles, however, it is able to immediately provide (typically less than 24 hours) raw results concerning MP concentration and this information is very useful for the implementation of an "early warning system", especially for the fish farms in coastal areas and for similar activities.

Calore, D.; Fraticelli, N.
State of the Art Offshore In Situ Monitoring of Microplastic. Microplastics 2022, 1, 640–650. https://doi.org/10.3390/microplastics1040044

C-TECNICS

At the recent Subsea Expo show in Aberdeen, C-Tecnics displayed its small CT3031 it is inspection grade camera. This is a compact high definition colour camera.

"The camera is 58 millimetres wide but only 165mm long, " said Magnus Lindberg of Deepsea Solutions, which has an exclusive supply agreement with C-Tecnics for the Norwegian ROV market.

"What is interesting about this model is that it has a removable bezel. Surrounding the lens are LEDs with a 2100 lumen output of light output to further enhance the image in poorly lit environments. These are built into the front in a pair of half-moon groove arrangements within the Titanium body. This means that the LED lights do not affect the lens.

"The 1/3in CMOS sensor provides exceptional picture quality with the highest level of resolution. The camera provides a full 1080p HD resolution and incorporates a 10x optical zoom.

"The camera has been designed to be as compact as possible while still providing the highest quality of picture for all subsea viewing applications.

CT3031 inspection grade camera.

"The key to the design is that it is very modular. If a client who wants a wider field of view, we can swap out the bezel with a new lens so it is a very modular camera.

CT3027 wide angle camera

"It is a very high end camera in a very small package," continued Lindberg. "When you look at competitive similar output cameras in the industry, they are almost twice the size and longer and much higher cost than the CT3031. We feel that it is a game changer as it allows the output of big work class cameras on a small observation class vehicle without compromising on specifications.

C-Tecnics have also released the CT3027. This wide angle camera has 170 deg field of view. It means that when a metre away from the target, the view on the screen extends for 6.5m.

"This can be really useful," said Lindberg. "Attaching it to the front of the vehicle means it is possible to see the manipulators on either side. When pilots are driving a large work class vehicle, they can see if the unbilical ever sneaks in past the manipulator. It provides a full overview which means it is not necessary to use a pen and tilt.

"Normally when an image is stretched in a fisheye/Wide angle camera, it is an unnatural image to operate vehicles on as items will appear slightly warped. To fix this, we have stretched the vertical part of the image as well as the horizontal field of view

"We have had several clients that have asked for these wide-angle cameras but the problem is that many the industry are fabricated from aluminium. The ports sometimes corrode. That is why we use Titanium as standard.

"Another very useful property of these cameras is that it is possible to swap between black and white and colour. Many ROV pilots tend to like black and white and it's a much nicer picture to drive on. They can see lots of details that don't seem to be available in colour unless the viewer is close up.

"Clients, on the other hand, like colour because it makes more sense to them. This camera gives the best of both worlds."

VOYIS FOR REMUS

HII has selected Voyis Imaging Systems as the standard camera option for all REMUS UUVs.

Voyis has developed the Recon UUV module, consisting of a highly advanced 4K stills camera and extremely efficient, high output external light bar, that enhances all REMUS platforms imaging capabilities in any operational situation. The Recon camera module offers extremely crisp stills imagery with on-the-sensor data processing for real-time, highly optimised datasets that improve in mission autonomy and analysis capabilities. These enhancements include improving image quality using image undistortion, true colour correction, and image light levelling for consistent, actionable datasets available in-mission.

With Voyis cameras, navies are capable of completing the identification stage of MCM (mine countermeasure) operations, and improve target localization for neutralisation/recovery completely submerged using REMUS platforms, improving operational covertness and efficiency. The high resolution imagery captured with

Voyis' Recon module

Voyis' Recon module provide increased confidence in subsea missions, ensuring REMUS customers receive safe, reliable and efficient operations.

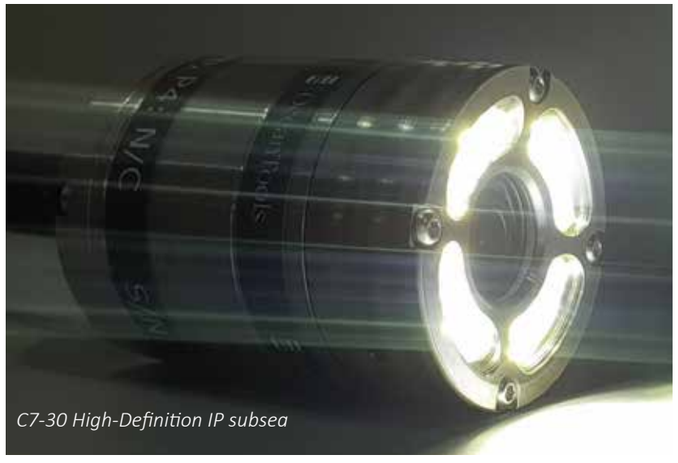
MULTIPURPOSE IP CAMERA

OceanTools has released the C7-30 High-Definition IP subsea camera.

Another market first for OceanTools, the C7-30 is a multipurpose IP camera with an integral high-intensity controllable light ring to illuminate the underwater environment and provide clear video footage at depths down to 6000m.

The compact C 7 30 subsea observation camera offers an impressive 2 MP HD over IP video output with a Wide Dynamic Range providing superb video quality under all lighting conditions.

The integral light ring has 12 LEDs that can provide a light output of up to 2250 lumens the intensity of which can be varied by analogue voltage control, power cycling or serial RS 485 control.



C7-30 High-Definition IP subsea

360DEG IMAGING

In recent years, legislation governing the use of airborne drones has limited their popular use in aerial photography. In addition to photographing the front or sides of a structure, the drone could fly above it capturing images in 360 deg.

In some cases, this creative demand has been subsequently met with the use of commercial 360 deg cameras. These typically feature a pair of back-to-back dome lenses, each able to independently record an image with a little over a 180 degrees viewing angle.

These image pairs can then be stitched together to provide a 360 deg representation.

These cameras can be positioned on the end of a selfie stick often anything between one and three metres long. These can sweep the camera over a given area. Post-processing software can subsequently remove this stick to make it look as though a drone was flying around freely above the user, taking stills or video footage.

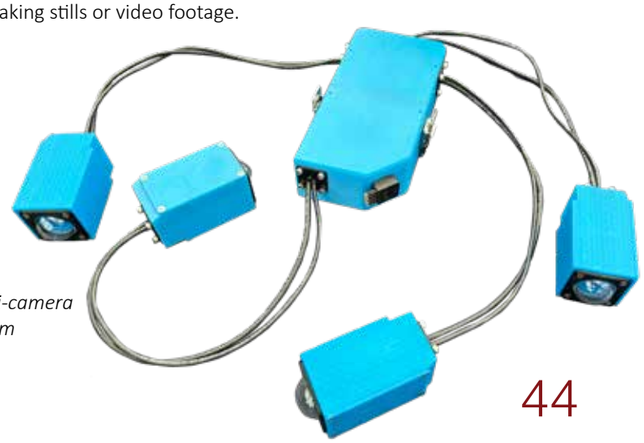
One company Blue Ring, is looking to bring the 360deg visualisation to underwater operations in a much bigger way.

"If we put a typical 360 deg camera on the top of an ROV, a large proportion of the image it would simply capture the top of the ROV," said Sapp. "What we would need to do is to effectively turn the entire ROV into the camera body so that we can see on all sides. That would really enhance situational awareness."

This has required a much more sophisticated multi view imaging system consisting of 4 or 8 individual cameras. The images they produce can be stitched together with software to produced a seamless 360deg image.

This can show the pilot what is happening all around the vehicle and is very useful for expedition and observation. The software can even be programmed with image enhancement and automatic target recognition. Oceanographers looking at the image do not even see the ROV being used to take the images.

”The camera we are building is great for tele-operations in that it has very low latency through hardware acceleration happening on the camera board, and having that low level access allows us to improve the color correction for underwater environments, and create plug-n-play templates for EOD technicians”.



Multi-camera system

PORTS
While there are rarely space issues for larger workclass ROVs, this is untrue with smaller observation vehicles. Specifically, there is greater competition for the samaller number of available power and control ports.

Blue Ring has incorporated an arrangement in which the four or eight cameras can be tied back into their control box, using only one port.

"It is also relatively important where the cameras are positioned," said Sapp. "We have been working with a VideoRay Defender, and have customised the upper floatation body specifically to install the cameras.

"There's also a skid as part of the mission set, and this allows the camera sensors to be turned in different directions. This is very useful for inspection, because very often, the pilots don't know what's going on below and behind all the sides and the positions of the cameras can be determined in-situ”

"One characteristic limitation of a spherical 360deg 2D or 360 3D image is that it is often difficult to display on single two-dimensional screen."

It is true that many ROV control systems have more than one video screen which partially offsets the issue, but what the 360deg camera array does lend itself into is to employ VR headsets. With these, the user's head can be used to control the direction of the vision. When coupled with a hand-controlled device, it is possible to interact more intuitively.

"At present, there's some physical constraints that need to be worked out but we're at the point with VR headsets now, as we were with large bulky mobile cell phones 20 years ago or so," said Sapp." We fully expect that in 5-10 years, it will be very similar to reading glasses."

NeRF

Another interesting visualisation methodology that is receiving a lot of traction is the area of Neural Radiance Fields or (NeRFs)

Neural Radiance Fields (NeRFs, introduced by Barron *et al*. from Google) is a new technique in computer vision and graphics that allows the creation of highly detailed and realistic 3D models of objects and scenes using deep learning.

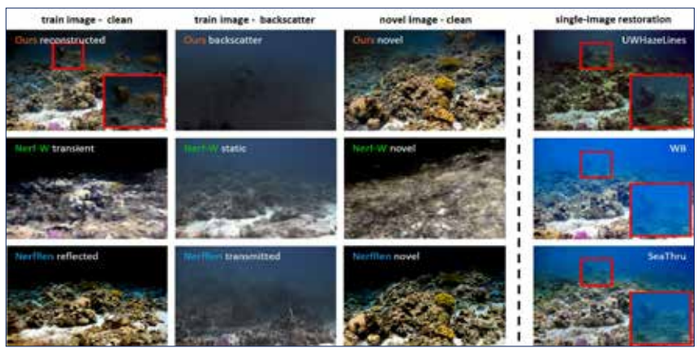
The goal of NeRFs is to generate a “novel view” image of a scene out of a set of 2D images of the same scene, acquired from different angles. This set of 2D images is used to train a neural network to predict the colour of a 3D point in the world, when viewed from a certain direction.

By using this network to predict the appearance of the entire scene from multiple viewpoints, NeRFs can create highly detailed and realistic 3D models that capture complex lighting effects and subtle details.

NeRFs became a powerful tool that could revolutionise the way we create and interact with virtual worlds, from video games to virtual reality simulations.

However, thus far, NeRFs failed to correctly model scenes immersed in a scattering medium such as haze, fog, or underwater. The issue with using this underwater is that unlike air, the water has density.

Recently, however, work has been carried out in the School of Marine Sciences and the Department of Computer Science at the University of Haifa, to create some high fidelity, photorealistic 3D models of organisms on the ocean floor.



Left to right: input image, our result, result of the original NeRF not accounting for the water, our clean image. Bottom row: On the left, estimated depth by each method, where SeaThru NeRF is the only one that can estimate depth of further objects. On the right, zoom-in into the further coral that shows the recovered details by SeaThru NeRF. Original images by Matan Yuval.

They achieved that by modelling the water effect in the rendering equations used by NeRF, and adding a network module that estimates the water properties: the colour-dependent attenuation coefficients, and the backscatter colour. This new framework enables holistic modelling of the scene, and it has several outputs: Firstly, it enables rendering novel views of underwater scenes.

Secondly, the modelling allows “removing” the water, i.e., rendering the scenes as if they were acquired without the water between the camera and the scene. Thirdly, it allows estimating the 3D map of the scene, and the water properties.

The input used for each scene rendering are 20 RAW (unprocessed) images from a regular camera (Nikon D850).

The paper citation is:
SeaThru NERF: Neural Radiance Fields in Scattering Media, Deborah Levy, Amit Peleg, Naama Pearl, Dan Roesnbaum, Derya Akkaynak, Simon Korman, Tali Treibitz, CVPR 2023

DEEPSEA

DEEPSEA POWER AND LIGHT HAS BEEN WORKING ON A NEW RANGE OF CAMERAS

MACHINE VISION CAMERAS

DeepSea has formally launched its innovative SmartSight MV1 imaging system. Built around best-in-class technology, the SmartSight MV1 is capable of producing up to 5MP images at 21 frames per second, uncompressed, over Ethernet. Unlike other camera imagery, however, it is not meant to be looked at by humans, but machines. It has been tailored to the growing needs of autonomy, machine learning, artificial intelligence (AI), and other potential machine vision applications.

The first in a new category of products from DeepSea, it is designed to push the adoption and ease of implementation of machine vision systems into next-generation autonomous platforms.

"Fully compliant with the GigE Vision 2.0 standard," said General Manager – Oceanographic Products, Aaron Steiner, "imaging system architects will now have an off-the-shelf solution to add computer vision components to their designs, freeing them up to focus on the value-add autonomy, object recognition, navigation, and inspection technology that sets them apart.

"We see it being used in industrial automation so customers can get imagery into their applications, such as for object tracking navigation feedback or object recognition. We've been developing this in collaboration with a few partners both in the science and oceanographic space in the energy sector.

"In these applications, it is desirable to work with the raw data as much as possible for high-end processing" said Steiner. "IP video stream loses a lot of the detail. We developed the SmartSight MV1 to help our customers get through that initial hump of the data burden before they can really add the value of automation tasks."

The camera is certified to 6000m, but DeepSea say that they can work in full ocean if needed.

"A typical application might be for the camera to be attached to the outside of a seabed lander or underwater vehicle in the path of sea creatures," said Steiner. "Interpretational software can scan the image and, using machine learning methods, identify species and flag specimens that do not appear in a database.

"We offer various camera and lens configurations, providing anything from a 0.4MP (more suited to lower light conditions) to a higher definition 5MP version," said Steiner.

“In addition to a video, it can also be used as a type of stills camera, linked to strobes to provide images while conserving power. This power conservation allows us to extend the mission time.

MULTI SEACAM

DeepSea recently expanded the “Multi” part of its HD Multi SeaCam product family with the introduction of four new lens options, providing both wider and more focused fields of view.

When initially launched, the HDMSC-4000 series cameras were available with either a 105deg or 72deg horizontal field of view.

DeepSea has now expanded this to include options for an ultra-wide 150deg and low distortion 125deg wide angle in the dome port configuration, along with an 85deg and a narrow 40deg horizontal option in the flat port housing.

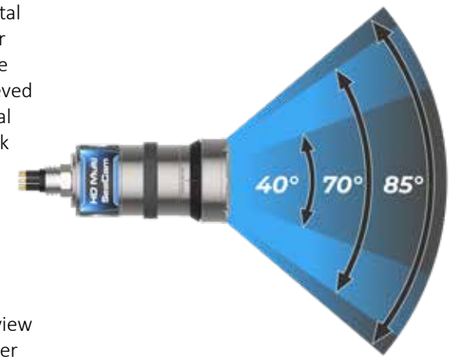
The new 2.0mm (150 deg HFoV) all-glass lens produces the widest field of view in its class with sharp corner-to-corner imaging and linear distortion that maintains consistent angular resolution across the field of view.

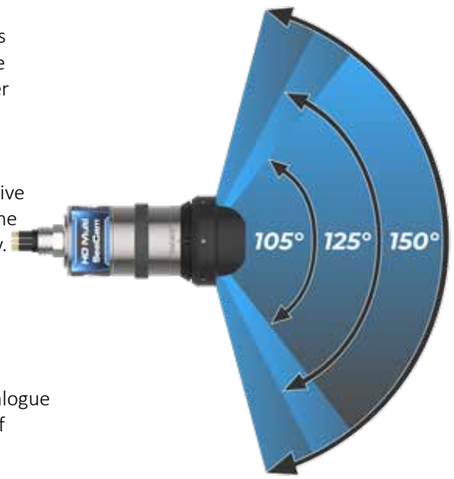
Second in the line-up is the new 2.3mm (125deg horizontal field of view) lens option, which balances a wide field of view with optimised light control to minimize ghosting and lateral colour shift. The dome port optics minimize distortion and bring out exceptional detail across the field of view.

The same 2.3mm lens is also available in the flat port housing configuration where it achieves an unprecedented 85deg horizontal field of view in water with near zero distortion. This pushes the very limit of what can be achieved behind a flat port before critical angle refraction begins to block light from entering the lens.

Finally, a narrower 6mm lens option in the flat port housing brings out the finer details by bringing the subject closer. At 40deg, the horizontal field of view in water is significantly narrower than the other options, which makes it excel at inspection tasks and gauge monitoring where the camera can be positioned farther away from the subject.

All four new lens options are available now in coax SDI, exclusive FleXlink SDI, and IP versions of the HD Multi SeaCam product family.





ANALOGUE ANACHRONISM?

In these days where there seems no alternative to digital IP cameras, it is understandable that many have assumed analogue cameras as an anachronism. It is perhaps surprising, then, that DeepSea has added analogue interfaces to its IP Apex and IP Optim SeaCam 4K cameras.

So what benefits do analogue systems still provide?

"We actually sell more analogue than digital cameras although it's just beginning to tip towards digital," said Steiner.

"If anybody is designing an ROV today, they probably won't look at analogue cameras but there is still a lot of legacy infrastructure out there.

"In situations where video requires being transmitted over a longer cable, the digital options are pretty limiting. You don't really want to put in a fibre where you can put in a coaxial cable.

"In many cases, analogue cameras can be smaller, typically because the technology is more mature and can be miniaturised more easily than the digital IP cameras or SDI type cameras.
"Users say that it is still hard to beat some of the sensitivity of high definition analogue cameras," continued Steiner.

"Of course you don't get the same level of detail – our highest resolution analogue sensor is about 700 TV lines but for the right application that's not necessarily a problem. It is generally very simple to integrate, and a lot of systems and vehicles still have analogue architecture built in.

"Analogue systems have a more square frame as opposed to the wide frame video common to HD video images. These are often more appealing to pilots who can get a better understanding of the view they are seeing.

"Analogue signals can travel much further than digital signals, possibly thousands of feet, although to do this, there are trade-offs, particularly in colour information.

"Because it's still an analogue signal, there is often a loss of some of the high frequency content and this has colour information."

Providing the Deepsea IP Optim and Apex cameras with an analogue interface is designed to improve the flexibility of those assets.

"A typical digital camera has a 170 deg field of view, which allows the pilot to see everything around. Switching over to the analogue feed provides a different perspective but all from the same interface

From a practical viewpoint, the main camera streams 4K images over the Internet. It has more than one bulkhead interface and this makes it simple to add the secondary analogue camera.

"The camera interface allows a system designer to incorporate an auxiliary video source that can be streamed via h.264 or h.265 over Ethernet in addition to the internal 4K video feed," said Steiner.

" This means that the camera can be added without the need for additional multiplexer channels making it possible to include wide-angle context cameras, tooling cameras, or low-light video on the same IP video interface that streams live 4K video. Switching between the video sources is done through the web-based user interface in just a few clicks.

In addition to the auxiliary analogue camera input, a virtual RS-485 COM port has been added which can be connected to external smart devices such as the LED SeaLite LSL-2000 family of luminaires. The demonstration unit included a total of four smart lights connected to the IP Apex in addition to an analogue camera

Using the IP Apex or IP Optim SeaCam as a communication hub allows for a constellation of lights or other networkable RS-485 devices to be operated from a common interface in real time.

NEW VISUALDVR SYSTEM

Forum Energy Technologies (FET) has released the latest generation of its video recording solutions for the survey and inspection of subsea assets.

The new Version 11 of VisualDVR, a digital video recorder produced by FET's VisualSoft product line, marks a major step forward for the technology's capability and user experience. VisualSoft was originally launched in the early 2000s and has continued to be at the cutting-edge of developments in the technology.

In common with its predecessors, VisualDVR (V11) is a multi-channel, rack mountable digital video system designed for use on remote operating vehicles (ROVs), supporting activities in the energy, defence and ocean science sectors.

The system can record up to four channels of HD video and is equipped with a host of tools and complementary applications to support real time documentation of the video images with data from subsea sensors and inspection personnel.

As part of the update, V11's user interface which has been completely modernised. Configuration of recording quality, data paths, input and output profiles can be accessed easily, and channels can be developed in a simple step-by-step process.

There are also new tools to flag potential setting conflicts while improvements have been made to allow video overlay set up to be simpler.

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FRIDAY PHOTOS

Some archive photos posted on LinkedIn over the past 2 months

Peterhead

There used to be a short cut into town from the port which skirted the boundary and allotments of the Gaol. Had some interesting dialogue on occasion with a few of the inmates shouting down from their cells whilst walking past.

On one visit, whilst in dialogue with one of them, I ended up showing him the bird He shouted down this response. My mate in Barlinnie. he's out in 5., he'll get ya!

Had the same with them when I worked on the Uncle John, one had a bit of cardboard with help written on it at his cell window

Many happy memories of working at SB Offshore.(formerly BOC) Base, Peterhead, in the 1980s. The Magnus Field hook-up project was in full swing plus growing e&p support traffic.
Eventually, rivals, ASCO Group bought over the business because of the competition.

Uncle John, Seaway Osprey, Bar Protector, Alliance, but I forgot the name of the other semi.
could well be the Constructor, not sure when they put the bigger crane on her

MSV Amethyst 1 after her diving days with Stolt Comex never did drilling the Derrick was for work over ops only with Sedco and Pride International down in Brazil

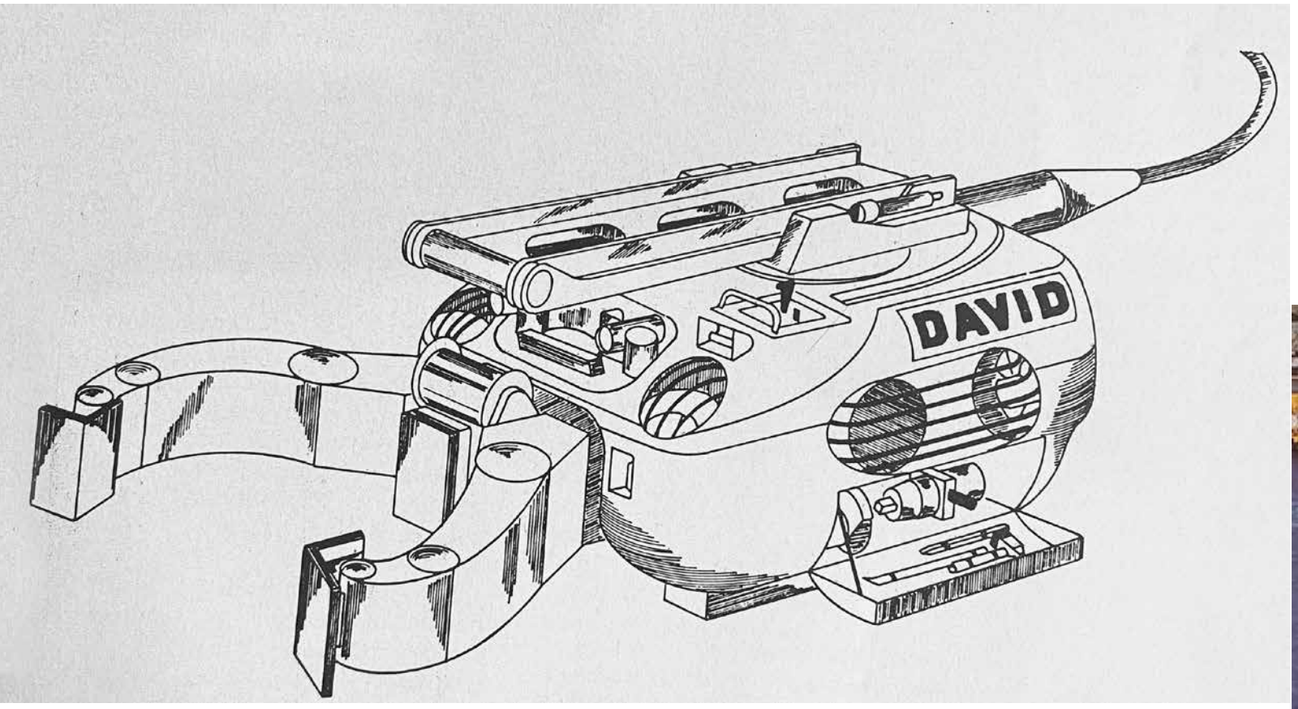
Looks lile the Uncle John in the background?

Uncle John nearest camera. The other is a small drilling semi. One of the Ben. maybe? Can't see a name

There'a a few legendary vessels in this shot, is that the Condor at bottom right? Yes Amethyst and UJ. Is that the old Stena Constructor alongside?
I think the Constructor before her crane conversion to a Kenz. But also possible Bar Protector. Also Uncle John.
Regards Geoff. Ex both.

Subsea Offshore at the Offshore Europe show

by Lloyd Duncan



Dive support vehicle 1982

Developed by ZF Herion-Systemtechnik, the DAVID was designed to provide a diver with underwater power, a work platform and mobile toolbox.Other facilities include a power winch, range of hydraulic power tools, water jetting and pumping equipment.

I was on a 2w mobilstion on the Deepeater 2 in 1986 when the DAVID was trialed offshore it originated in Germany the principal was good but the deployment operation was fundamentally flawed
The reason being that when you are flying from the ship to the platform you need a reasonable meta centric height ie a distance between the centre of mass and the centre of buoyancy to allow the vehicle to be stable in water but when you want to rotate it at the work site you want a very small if no meta centric height otherwise it would take to much power from the thrusters to rotate it
Consequently it had to be ballasted to be stable in the water this is what happened so it was not a success on the trials

I used it in the Frig field

yep me too- ROV Supervisor was Barry Lloyd Jones and Nelson Bittar. ROV manager was Phillips L'Amour. Systems we're OK- didn't last very long as the Braso crew kept knicking my personal items. Tools and other equipment that went AWOL didn't allow for safe operations.

Interesting. Very compact for something in the 80s with a power pack onboard. At first I thought it was most likely deploy-to-place but looks like it has thrusters to help it along- a bit like a lumpy UFO but un-flyable.

As far as I remmember the Power Pack was on the Surface, the Umbilical must have been about 150 to 250 mm in diameter.
On the trial the Umbilical got ripped and hydraulic oil was leaking everywhere. And the Vehicle was big. Standing next to it, it was tallerbthan headheight.

Ekofisk 1989

At Alfjord.
The two wall units grow at rates of 3m/day.

Castoro Sei 1985

Saipem's Castoro Sei laying the UK's first stainless steel pipe on Inde and Sean in the Southern basin

Those were the days! Weird shaped dining trays in the mess room, wine with dinner and suppositories but that's another story.

Fond memories of road kill and bone meat on the menu Christmas dinner 2006 jellied pig

Great cheeses and wines on the castoro sei when working outside of the UKCS !!

1st pipelay barge I went on!
Laying 28” & 18” (if I recall correctly) pipe for the Norsk Hydro Grané project in the Norwegian Sector of the North Sea.

She has been used on several Statoil pipeline projects in the eighties and 1998/1999, she was also used on the winter pipelay on Europipe II together with Semac and Solitaire. Last time I saw her in operation was on the 48" pipelay on Nord Stream 1.

Morecambe Bay

I can still vividly remember that early morning on the Douglas Accommodation (DA) platform, almost 20 years ago now, when the Highland Pioneer supply boat collided with us, and gave us a jolly good wobble. That was a genuine brown trouser moment

End result was a big hole in the side on the starboard side of Pioneer, thankfully above the waterline, and the collison didn't even chip the DA's paint. And I've also just remembered that's not the first time I've been on a rig when a vessel has crashed into the rig. The very same thing happened to me on the Brae Bravo hookup back in 1986/87. Hard to conceive a platform that huge swaying the way that it did that day!

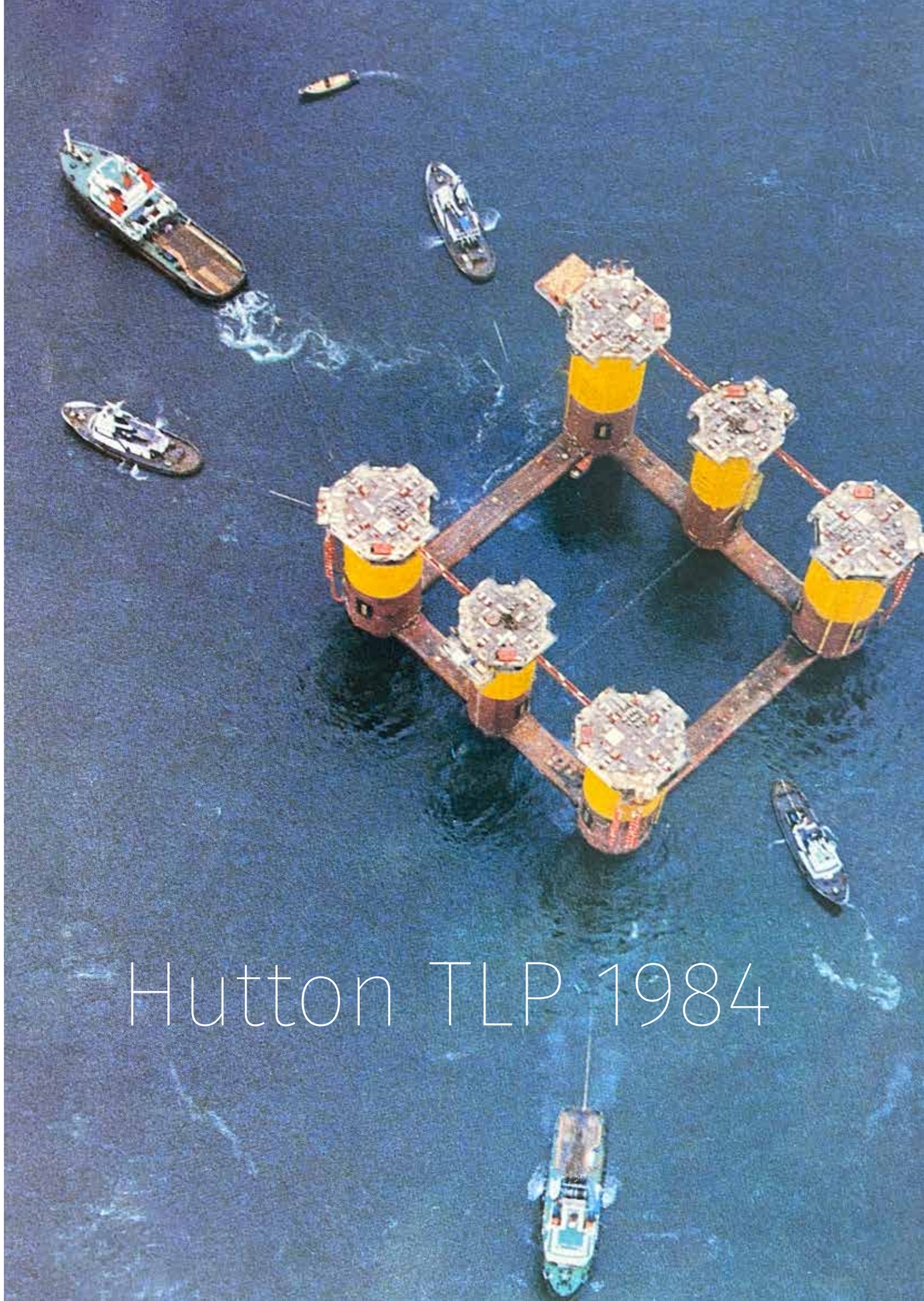
I worked on the DP4 Deck built at Port Clarence by Cleveland Offshore now Wilton Engineering. The shot blasting and painting programme was horrendously impacted by steel fabrication delays and must have been an awful job to do in situ.

Jack Tighes had to build plywood boxes around the plate girders for their guys to go inside and blast and paint it must have been like the Black Hole of Calcutta for them- it was the only way that some sort of progress could be achieved with steel erection also ongoing at the same time

One trip holiday relief as an Assistant Driller in 1984 (Kelly Racked on the Slant Mast, Floor at 30 degrees, passing double stands to/from the vertical racking etc. a lot of hard work without satisfying drilling time. 4 man cabins with showers at end of corridor which was a step back for a rig built in 80's. Passed on the opportunity to stay as was keen to get a Driller's job on a semi (KUK).

Recall doing well production flow testing on the Bg platform, having to rig up a sacraficial 4” xxs pipework line handballing from the wellhead along the deck and up the that flare boom! Only to flow from a couple of hours at most…! The joys!

Morecambe Flame. Now the accommodation for the Douglas Platform.

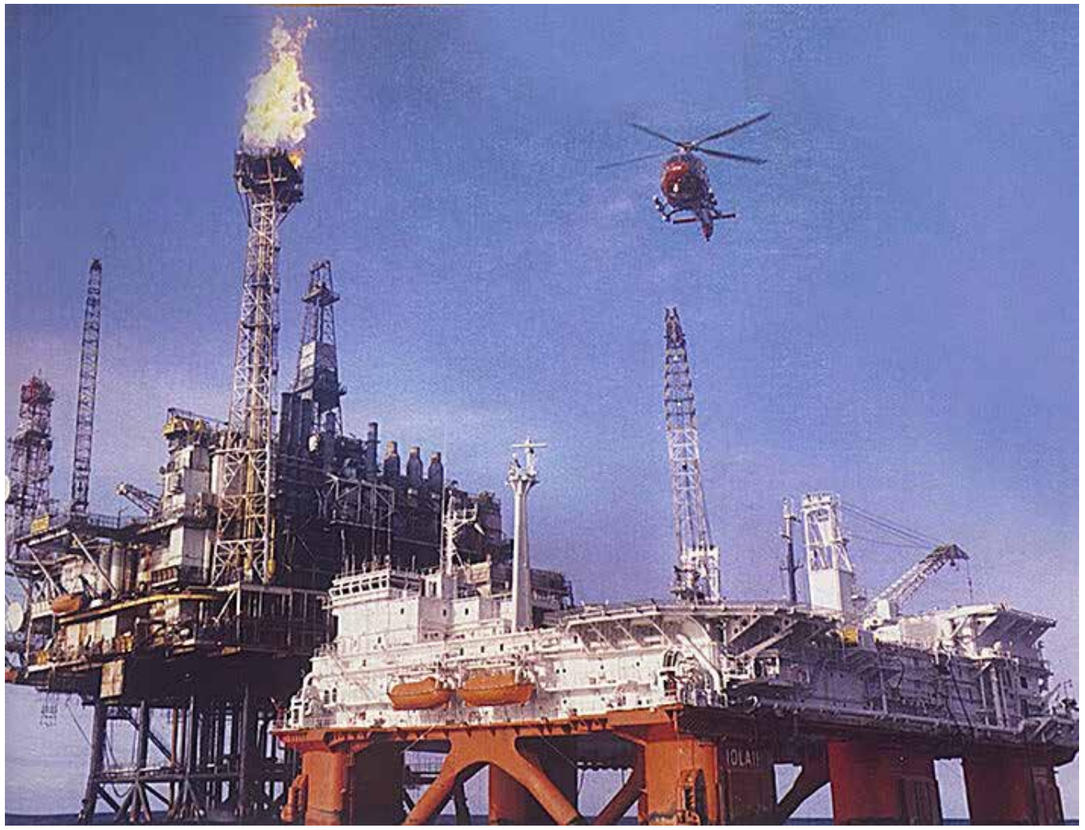


Hutton TLP 1984

Interocean II

In 1989, the Interocean II was declared a total loss after coming adrift in poor weather and capsizing. This was from happier times- being towed from Japan to Mexico a decade earlier.

Forties and Iolair



BUCKINGHAM PALACE

19th November, 1981

Dear Mr Williams,

Thank you for your letter of 11th November enquiring about the use of the name "Balmoral" for your newly located oil field. It is very courteous of you to enquire about the use of the name - to which The Queen has, I think, no exclusive claim. You will probably be aware that there is already a bun and a hat known as a "Balmoral".

In any event, The Queen would not wish to put any objection in the way of your use of this name for your new field, which Her Majesty hopes will have a long and profitable life.

Yours sincerely,

Wilma Heseltine

D. Williams, Esq.

Balmoral

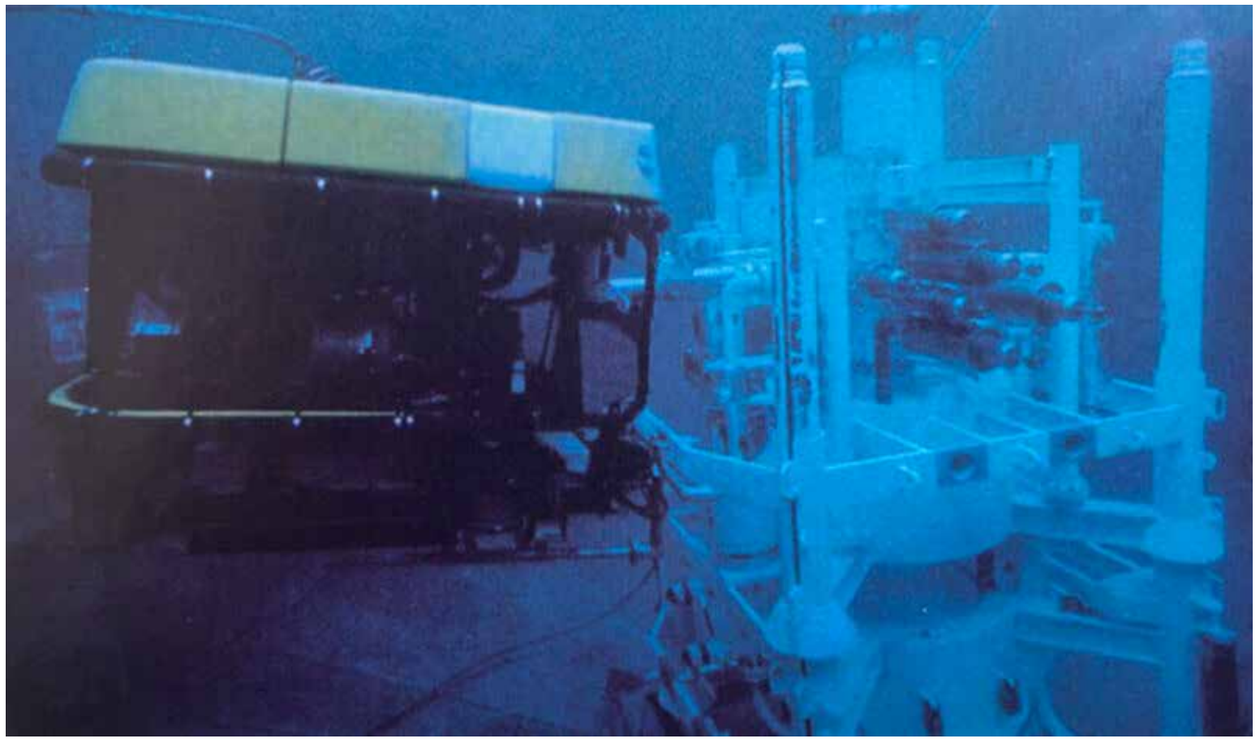
Did you know that when Sun Oil wanted to use the name Balmoral for their field, they wrote to the Queen asking for permission!!!!

I believe ConocoPhillips/Chevron did the same for Britannia

I did know as I wrote the request !!!!David Williams

Later in Balmoral's life, we also did two step outs, namely Glamis and Blair and sought permission from the then Lord Atholl for Blair. I remember his very nice reply saying he would enjoy paying the facility a visit. I was Project Engineering Manager at the time in 1998.

Gemini 1986



TechnipFMC recently developed the Gemini ROV. But it wasn't the first Gemini ROV.

Here, the original Gemini is preparing to dock with the Jabiru tree in tank test to evaluate tools needed for subsea completion. TheJabiru field in Australia Timor sea stood in 400m of water.

VSEL 1992

We have had a few yard photos in the past but not from VSEL. Surprising, as it was the largest marine engineering company in the UK

The company acquired Seaboard Lloyd in 1991 to established its Oil and Gas venture Vickers Offshore as 'a new force in the design and manufacture of wellhead completion and flow controlled pipeline products. It already had a partnership with WS Atkins.

Rowan Gorilla III

It has a 504ft leg length meaning it could drill in 450ft of water.

Above:

DB30

Left:

Bruce PUQ Jacket 1992

At the time, BP's 9425t Bruce PUQ was the heaviest jacket yet lift-installed.
Ahead of Veslefrikk (9050t), East Brae (9300t) and Dunbar (9100t).

Peterhead

Worked on the Amethyst when it did not have a drill Derek could have been midwater arches work out of Peterehead

Peterhead Fabrications for spool work and many mobilisations
In the good old days

I recognise the 2 DSV's but could not say what their names were back then

Bar Protector and Wilchief I think.

I think DSVs are the Bar Protector and the CSO Alliance

I have worked as dive supervisors/ diver on most structures in photo repair work on breakwaters

Took a couple of jack ups out of there over the years.
Always got a good crowd at the entrance!
Relief maybe?

Swimmer 2002

At the turn on the century, Cybernetic was developing its innovative ROV/AUV concept designed to provide a solution for IRM activities on deepwater subsea fields. To take the concept further, the company formed a joint venture with Statoil and FMC Kongsberg.

And it took from 1994 to 2018 before the technology really allowed industry to build a true seafloor resident vehicle. Great concepts are very often will ahead of the current computer and manufacturing capabilities.

I remember this system, cutting edge technology 20+ years ago.

Prior to this Saipem/Sonsub experimented with the SAF concept for Luna40 which was tied back to FPSO Firenze. It was also an FMC initiative that was based around a small ROV with TMS permanently residing on a tree module. It was a unique one off. Perry built the system and the Triumph ROV- c1994.

Gyda

The jacket and piles were fabricated by Aker Verdal. Building the jacket vertically was said to mean 500 or 600t less steel as it only experienced loads in the upright position.The nodes were supplied to Aker by RGC at Methil.

Due to the practical limitations of height in building the jacket vertically, it was constructed by Aker in 2 sections.
It was a challenge in joining the 2700t top and bottom section of the 6-leg platform. It employed four 91m towers. Work was carried out by RMS of Gothenberg

Dived on this field development Nov '87 Hermod was utilised for installation offshore.

I worked for McDermott Harvey Division and we fabricated our share of Tripod, four pile, six pile and eight piles along with the top side decks. Go old days

Bullwinkle

Bullwinkle was the tallest steel platform in the world standing in 1353ft of water. Over 75000t of steel were used to make the platform of which 49 000t were for the jacket.It took 3 days to tow the jacket the 330 nautical miles to the launch site.

Intersub PC1202. 1977

This nicely describes what a lock-out submersible does. Here, the PC1202 is working for Esso Norge recovering debris.

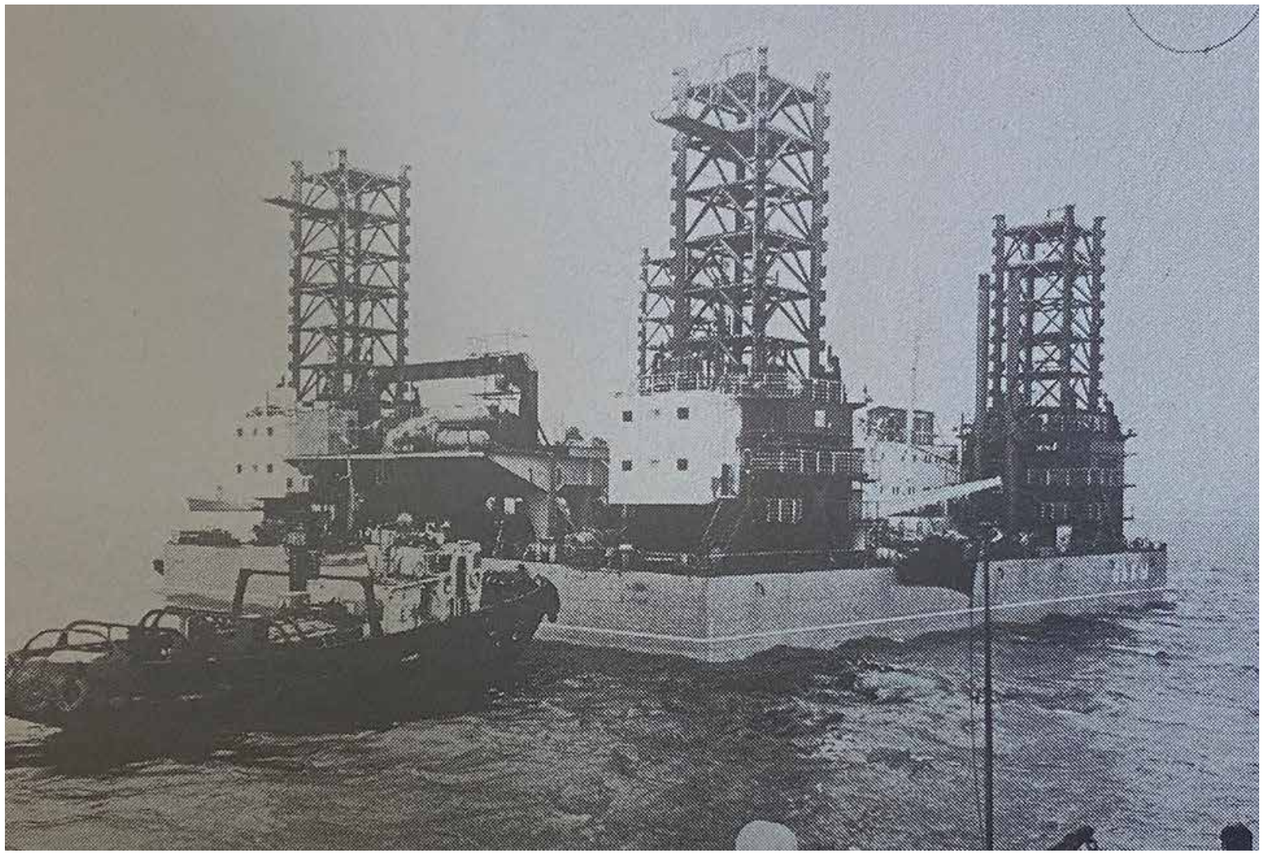
In November 1977, the NPD surveyed 3 blocks and saw that vast amounts of debris were left at abandoned drill sites. A video showed the appearance of a potential 'underwater scrap yard'. Esso began immediate action, deploying the PC1202 supported by the Intersub III, the Comex dive support vessel Oregis and the Decca Engineer survey boat.

Dan F

LEFT:
If you wanted to choose sea conditions to install a jacket, you couldn't get better than this! In 1986, the Hermod lifted the Dan F wellhead jacket into place. They don't make North Sea weather like they used to.

Baky

BELOW:
In 1975, this was one of Russia's newest rigs. It is shown dropping anchor in the Caspian Sea off Baku. The rig was able to drill 6km wells in 80m of water. It had 100m legs which were designed to work in the stormy Caspian Sea waters. It housed a 54m derrick. There is also a helicopter landing pad there somewhere to transport the 30 strong crew.



NE Frigg 1983

The unmanned remote control station on an articulated column being floated out at a draught of 90m. This was located 150m from the 6-well template. These were all linked to the main Frigg field 18km away.

I worked for Elf Aquitaine on this development, North East Frigg on Concept, detailed design at EMH in Paris, fabrication in Egersund through to Commisioning in the fjord before tow out and was actually on the support boat during the mating when this photograph was taken.

It was a pleasure to work on this project from the beginning to the end. We designed from scratch the first Subsea equipment in the North Sea such as Trees, actuated valves, UTA, hydraulic connectors, stab plates, Manifold etc. It was a experimental project designed to produce for 5 years but eventually we decommissioned it after 11 years.

NEDDRILL 3

One-atmosphere suit. 1986

No reason for this but I always wonder what it would be like to be in one

Newt suit

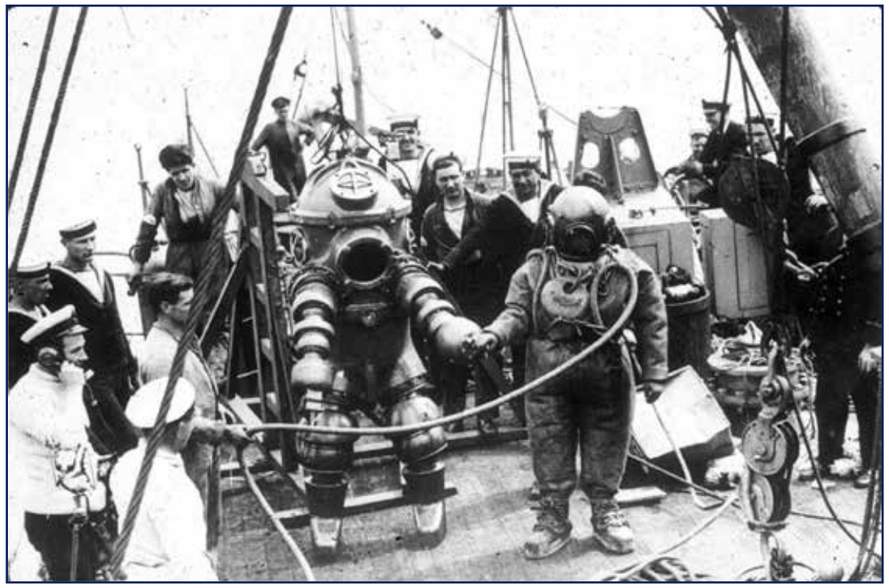
Aren't they the 'JIM' suit? I think I saw one once in Slingsby's boneyard in Kirbymoorside

Used to work with an old diver who'd used these. His stories were terrifying! My personal favourite was if the water goy past your knees, one of the seals wasn't sitting right!

Yep I remember those suits on the Keydril Aleutian Key moored semi rig that I was the night company man in early 1982 while at Tenneco Oil E&P drilling on a Green Canyon block in about 1200 ft WD, offshore GOM.

The Wasp arms needed to be moved as you went deeper or they would be locked up when you arrived on bottom.

I remember pilots bashing into objects to break an arm free.



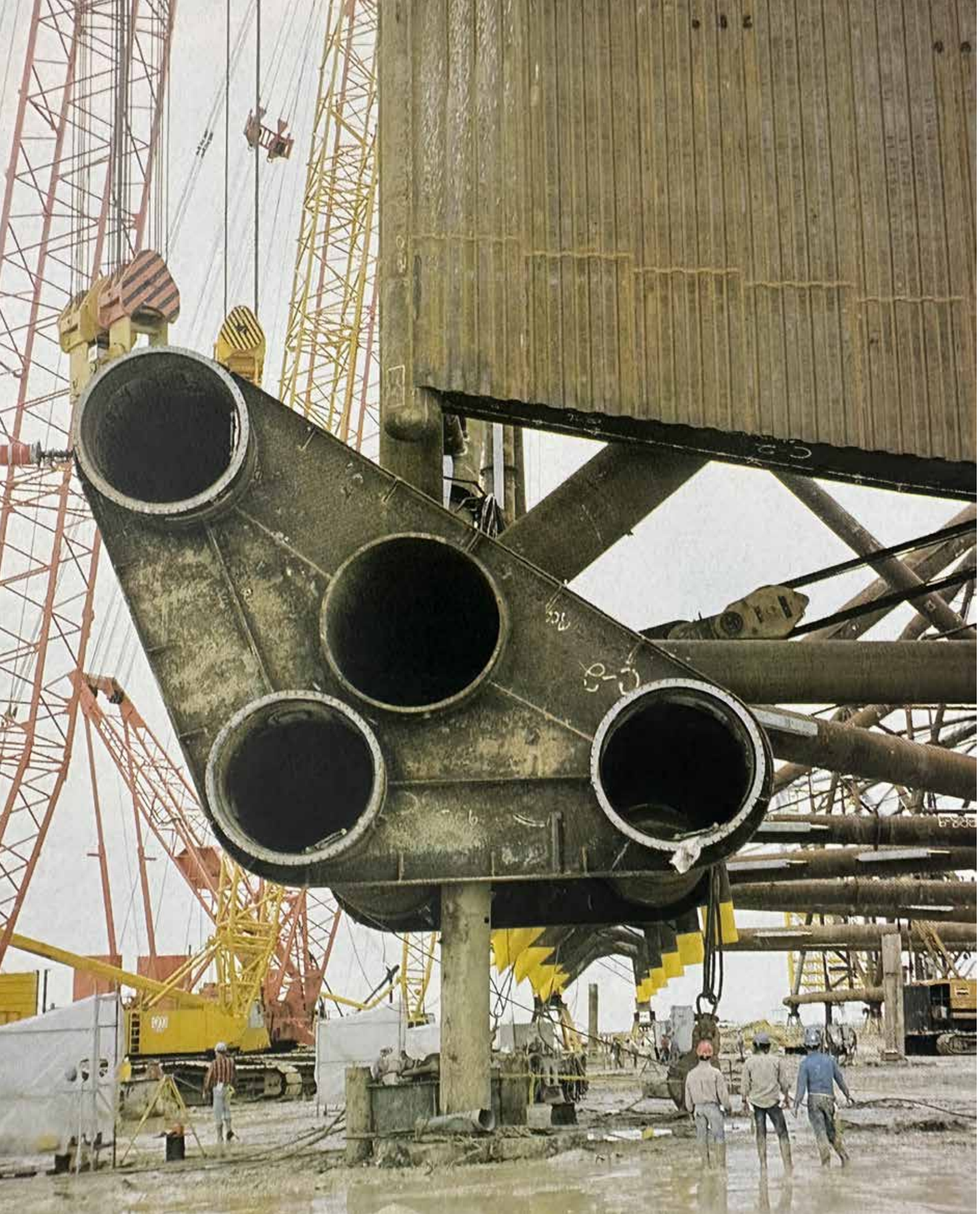
P12-SW

Around 1990

The Hermod lifts Mobil Netherlands' P-12-SW deck from the transport barge for installation on the jacket.

Great vessels, her and the Balder, these transformed installation methods and capabilities. Much better than the Challenger and Pearl Marine, though DP capable, they still used anchors at that time right up to the DB102 when full DP was tried on Ekofisk

The Apache reelship laid the long 12" with 3" piggyback pipeline using Amsterdam Haven



BP's Mississippi Canyon 109

1991
92in diameter skirt pile sleeves on each the jacket's 4 legs. Temporary mud mats provide stability when it first touches down on Gulf soil.

Brown & Root fabricated the topsides at Greens Bayou in Houston from November 1990-September 1991 (only 10 months). At that time it was the second largest deck in the GoM.

I used to have a shirt with an Amberjack patch on it. Did some work for BP on that platform and once flew out to it on way to VK 989 (Pompano) in the supply helicopter.

Rowan Halifax/Kotter/Lancelot

Land and Marine working in the Dutch sector of the North Sea back in the day. The Rowan Halifax is drilling over the Kotter platform

Kotter is now long gone, removed in 2019. Many other assets in the area will follow the next few years, sadly.

The first rig I ever worked on with a Top drive. thought I'd died and gone to heaven leaving a Kelly rig (Rowan California) and roughnecking on the Halifax in 1985

Don’t forget the Iron Roughneck, too!

10 years on the Halifax, knew that rig inside out

Spent 15 years on the Halifax. Good times

Orion 1978

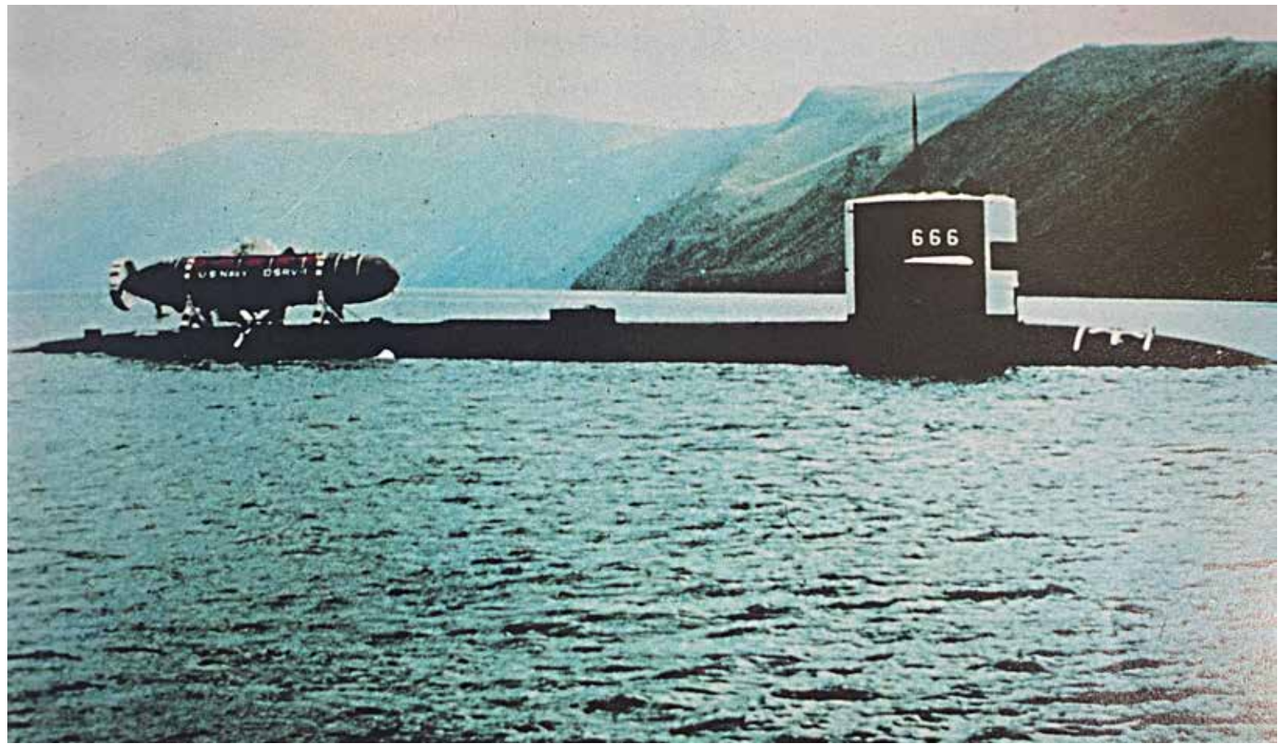
The four-leg jack-up Orion on the Grandes Rockies near Guernsey. It was stuck for four weeks in ice, snow and gale force winds before it was freed.

The Orion was bound for Brazil and was just a day out of Rotterdam, when the towing tug ran aground in force 9 winds. A few days later and a second gale force 9 wind saw it only as far as the channel. Winds were forecast from the south west but it was then hit by force 10 winds from the North West and the tow line parted.

JIM Suit

DSRV

The Deep Submergence Rescue Vehicle used by the US Navy to rescue work. The submarine carried it down to the submarine in distress.



Draugen 1993

The topsides- more than twice the weight of any integrated deck at the time, being floated over the 22m squared top of the GBS monotower

JFP THREE 1982

Built by NKK in 1982, it was later renamed the Trident XII

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