SEABED GAZETTE

2026

Seabed in Thailand

End of Summer Demo Days

2025 Success Stories

SEABED

Getting to the bottom of things

www.seabed.nl

Seabed Winch

The Seabed Winch is a fully automated Winch, useable for a wide number of applications. With its stainless-steel AISI 316 frame, the Winch can be placed on the rear of the vessel, on a buoy, or on a quayside, or any other location. The Winch can be used to monitor the environment, and to make the Winch even more versatile deployable, the setup can be powered by a solar panel.

SEABED

Getting to the bottom of things

CONTENTS

Seabed 2025 Success Stories

- **3-year frame agreement with Van Oord for delivery of Norbit Multibeams**

- **Award of tender for Ministry of defense for the delivery of 3 USVs, the Maritime Robotics Otter Pro.**

- **Award of tender for University of Amsterdam for a Norbit Integrated Winghead**

- **Finish development of the AML-6 STM with real time density compensated depth**

Seabed was awarded Norbit Best Selling Partner worldwide of 2024!

Introducing the new Innomar essential

Parametric Sub-bottom Profiler System

The Innomar essential Parametric Sub-bottom Profiler is the latest evolution of extremely portable and compact sub-bottom profilers on the market. Designed as a fully integrated system with transducer and transceiver electronics in a single device, it is perfectly suited for USVs (Unmanned Survey Vehicles) and ASVs (Autonomous Survey Vehicles) but can also be mobilized on other small survey vessels and boats of opportunity. Simple integration is further accomplished by using a single sonar cable for power supply, data transfer and interfacing to NAV and Motion sensors, pin-compatible with NORBIT WBMS X and WINGHEAD X multi-beam sonars.

Key features

The Innomar essential system comes in two versions, one cost effective solution without beam stabilization and one with an electronically stabilized sound beam, which can correct for movements on agile platforms in roll or pitch direction (software selectable with a rotated sonar head). Non-stabilized devices are upgradable at any later time.

Parametric Acoustics

The system utilizes the parametric acoustic effect (non-linear acoustics) and provides a narrow sound beam of just 4 degrees in roll and 8 degrees in pitch direction for any of the operator selectable frequencies between 6 kHz and 15 kHz. The primary frequency channel of 100 kHz is also acquired and recorded. The parametric sound generation provides short transmit pulses without any ringing and results in very high lateral and vertical resolution. The system can resolve geological horizons with a thickness of less than 10 cm. Data are acquired with ping rates of more than 20 pings per second and signals are stored as raw full waveform with 24bit and a sample rate of 100 kHz.

Specifications

The integrated sonar has a weight of just 7 kg and a dimensional footprint of c. 26 cm x 15 cm. With a DC 24V power consumption of max. 35 W (typically 20 W) it is suitable for integration into most of the small USVs and ASVs currently on the market. The system is delivered in one flight ready and robust transport case with the sonar head, the sonar cable and an interface unit (SIU) for simplified connections to auxiliary equipment.


Innomar essential bow-mounted on a small USV

Together with the Innomar SESWIN acquisition software for MS Windows 10/11 operating systems, the package contains a data converter and the optional Innomar ISE processing software. Converted SEG-Y data files are compatible with any 3rd party processing software.

Applications

Applications for the Innomar essential sub-bottom profiler do include any kind of shallow water and inshore to nearshore geophysical surveys, harbour and channel surveys, fluid-mud detection, pipeline detection, environmental surveys and marine archaeological investigations.

For further information, please contact
Innomar Technologie GmbH

www.innomar.com

Innomar Parametric Sub-Bottom Profilers

- Unmatched high-resolution sub-seabed data with excellent penetration
- Usable from extremely shallow waters to full ocean depth
- User-friendly data acquisition and post-processing software
- Used worldwide for various applications

standard
compact-usv
medium-usv
medium-100
essential
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Innomar
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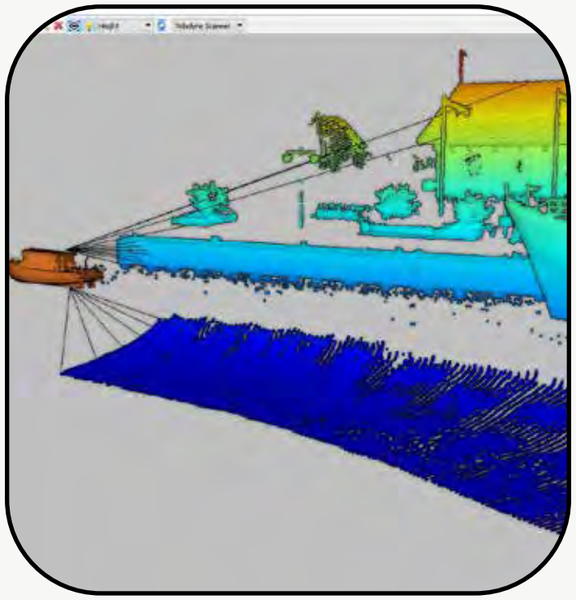
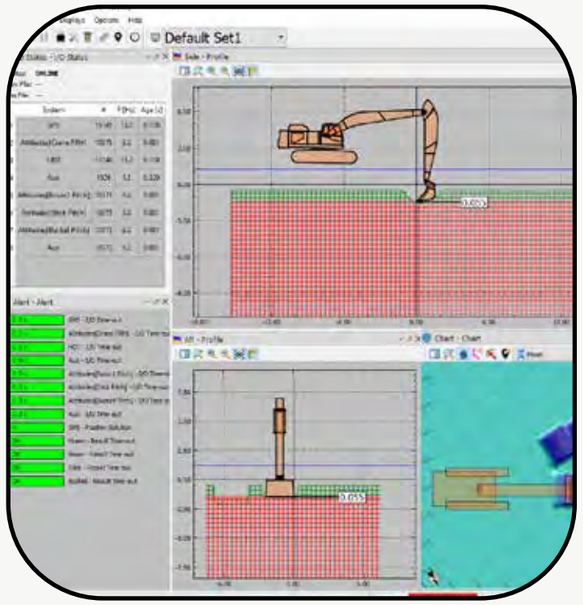
BeamworX

Hydrographic Software Suite





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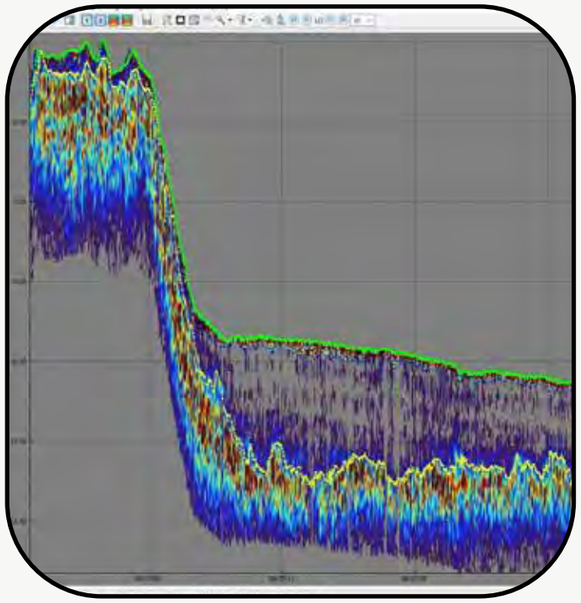


NavAQ · AutoClean · AutoPatch · TrajectEdit · SBEdit · BwxGeo

www.beamworx.com

www.seabed.nl

AML-6 CTDSV with Seabed Timing Module (STM) integration

If you are looking for real-time timestamped UTC synchronized data for an ROV deployment; Seabed and AML can provide you with the solution.

Seabed developed a miniature circuit board to integrate GNSS synchronized time output with the loggings of the AML6 instrument, with an easy integration in any subsea navigation system. The seabed timing module (STM) communicates with the AML6 internally and adds the time stamp from the ZDA string and sends the resulting data out over Ethernet. This integrated timestamp can be implemented in all acquisition programs.

The benefits of having a timing module inside the AML6 is that only one instrument is required with the highest quality timestamped with a synced GNSS UTC time.

The following key features are included with the STM:

- STM is housed inside the AML instrument.
- Data is available at a maximum of 20 Hz.
- STM is WebUI accessible over Ethernet.
- STM delivers SV output via serial.
- GNSS ZDA can be inputted via Ethernet or Serial.
- Settings for serial in and output can be adjusted in the WebUI.

The STM has been designed to meet all the requirements of the AML6, so the AML6 manual can be referenced for all power and deployment requirements.

For more information or assistance please call +31(0)20 636 84 43 or visit our website www.seabed.nl/contact/

SEABED

Getting to the bottom of things

Smiles, Frowns & Misplaced Seafloors: The Case for Accurate Sound Velocity Data

A conversation with industry expert Jonathan Beaudoin

We sat down with Jonathan Beaudoin, a Hydrographic Consultant and self-proclaimed multibeam nerd, to shed light on the critical role of accurate sound velocity data in multibeam survey results. He made one thing very clear: multibeam sonar is the backbone of modern hydrographic surveys, but its accuracy depends on one essential factor - sound velocity (SV).

If multibeam accuracy matters to you (and it should), Jonathan's Multibeam Crash Course is essential. The insights below are just the tip of the iceberg.

Sound doesn't travel in a straight line underwater - it bends, or refracts, as it passes through layers of diff erent temperature, salinity, and pressure.

Jonathan Beaudoin

HydroOctave CONSULTING

Jonathan Beaudoin, PhD is a recognized expert in hydrography and marine geomatics. With extensive experience in research, software development, and training, he has contributed significantly to multibeam sonar technology and hydrographic survey methods.

Through his company, **HydroOctave Consulting**, he provides technical expertise and dekivers his widely known **"Multibeam Crash Course"** to survey professionals worldwide.

Sound speed increases with any increase in these three parameters:	
Temperature	4.6 m/s change per 1°C
Salinity	1.3 m/s change per 1 ppt
Pressure	0.016 m/s change per 1 m (0.16 m/s per 10 m)

Adapted from Jonathan Beadoin, "Multibeam Crash Course", Module 1F.

Anything from currents to solar noon to salt domes can dramatically affect these measurements, resulting in vertical layering. In general practice, the top half of the ocean is much more dynamic than the bottom, and conditions may change by the hour. Without accurate SV data, depth measurements can be biased, seafloor positions can be misplaced, and survey results may appear "smiled" or "frowned" when mapped.

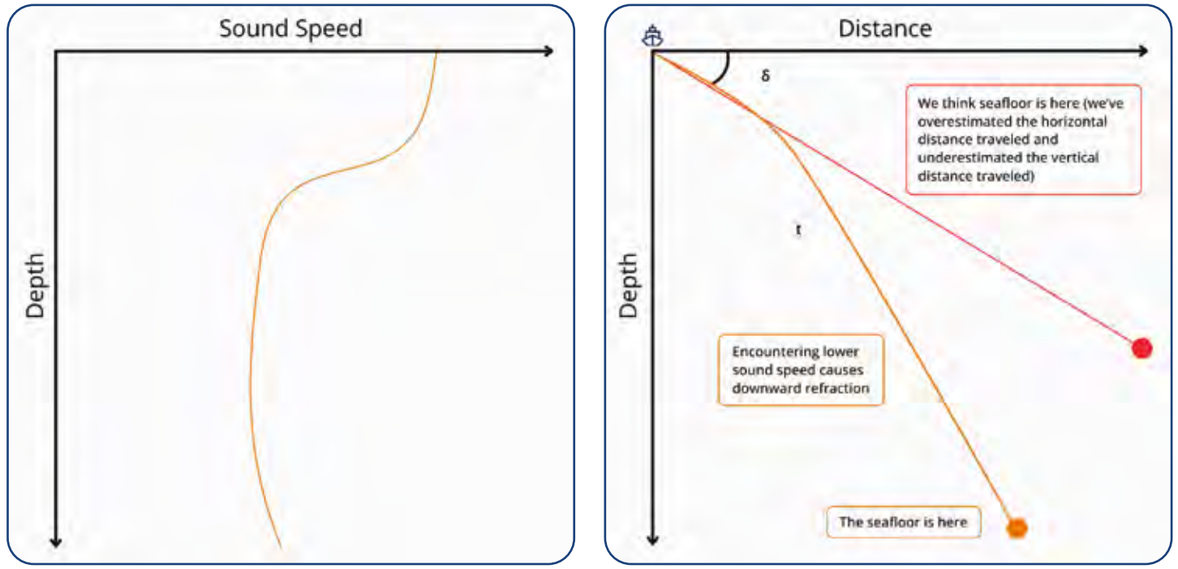
Too few profiles may result in biased data: even if it looks clean, everything may be too shallow, too deep, or even a mix of both. Over or underestimating the horizontal and vertical path of the acoustic signal leads to not only compromised survey results but potentially disastrous outcomes, such as seafloor collisions or other navigational risks.

So where exactly does SV come into play?

- At the transducer head: correct surface sound speed ensures that beams are steered at the proper launch angle right from the start. An acoustic pulse is sent from the sensor to a target and back. That travel time is measured and converted into range (depth) using the speed of sound measurement.
- Through the water column: continuous SV profi les account for refraction caused by layering - from surface heating, river outflows, or salinity changes - which strongly affect the path of the acoustic signal. It's essential that SVPs sample frequently enough to capture a realistic model of the ocean.

What is the impact of incorrect SV data?

Sound speed changing through the water column has two effects: refraction and scaling.

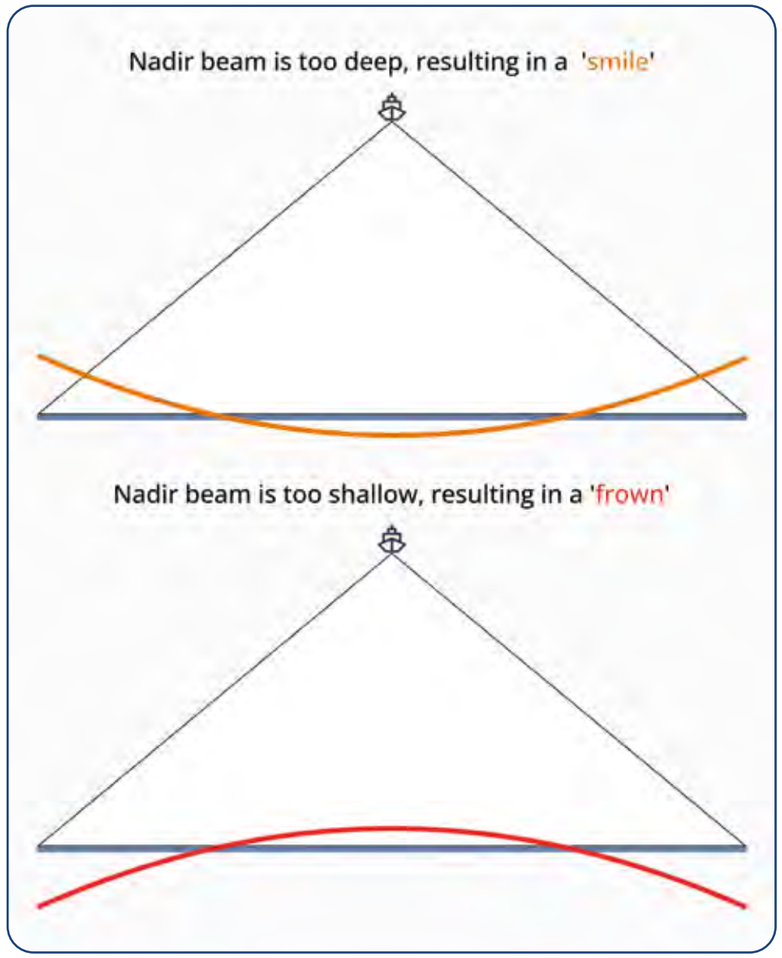


Adapted from Jonathan Beadoin, "Multibeam Crash Course", Module 1F.

Sound waves refract as they pass through layers of water with different sound speeds (this is Snell's Law in action). If the profile of the water column isn't measured accurately, the multibeam sonar system will miscalculate where each beam lands on the seafloor. Consequently, features may appear in the wrong place horizontally - too far left, or too far right - and may have incorrect depths - too deep, or too shallow.

Multibeam sonars record time-of-flight, aka how long it takes the acoustic pulse to travel down and back. To turn this into depth (distance), time-of-flight is multiplied by the assumed speed of sound. This introduces our second error: if the average sound speed is wrong, then range is scaled incorrectly. The entire seafl oor may be shifted deeper or shallower than reality - a vertical error.

Adapted from Jonathan Beadoin, "Multibeam Crash Course", Module 1F.



Compounded errors

Both of these effects happen at once: refraction distorts where surveyors think the beam landed, and scaling distorts how far it travelled along the ray path. If the SV profile is somehow outdated, too sparse, or miscalibrated, we've now got the wrong depth and location. Surveyors often summarize with "garbage in, garbage out": no amount of post-processing can fully fix a biased dataset.

With incorrect SVP, the nadir beam - the sonar beam that points straight down from the transducer to the seafloor - becomes too deep or too shallow. With an inverse relation to the nadir beam, the outer beams will typically arc in the opposite direction. Horizontal distance travelled will also be off due to refraction effects. As a result, we see "smiles" or "frowns" - two classic error patterns in multibeam data, where the seafloor appears to curve up or down at the edges of the swath. These patterns are a big redflag for hydrographers observing their data in real time, and can lead to distorted seafloor maps, safety issues, and costly rework.

The importance of accurate sound velocity data for multibeam surveys cannot be overstated: for hydrographers, it's the difference between a survey that informs and a survey that misleads.

So... how often do hydrographers need to cast to steer clear of these consequences? That's a question we'll tackle in episode two. Stay tuned.

To learn more about Jonathan's "Multibeam Crash Course", check out his website www.hydrooctave.com

Author: Georgia Haydock, Marketing Manager, AML Oceanographic

AML OCEANOGRAPHIC

Survey deadline coming up?

- Order SVP or CTD today
- Ships in 5 days
- No delays, no stress

For further inquiries, please reach out to sales@amloceanographic.com

Meet the future

Lieke Nijhuis

What are you studying?
Electrical engineering.

Why this study?
Because I thought it would be fun to work with robots. As a child I always enjoyed taking apart broken electronics to see how everything worked. These are both things you can do in the study.

Why Seabed for your internship?
Seabed looked like a place where there would be a lot of data, but it's still connected to engineering. The assignment I was offered was exactly what I was looking for: data analysis and the creation of a web application/ reports, based on the results.

What do you expect of Seabed during your internship?
I expect Seabed to give me a realistic view of what working on long-term projects is like, from first ideas to usable results.

What are your plans after you graduate?
After my graduation I would like to work in a technical field where I can combine engineering with data and problem-solving.

Tom Kleibergen

What are you studying?
Electrical engineering at the University of Applied Sciences, Amsterdam.

Why this study?
I am driven by greed and hubris. Therefore I chose electrical engineering.

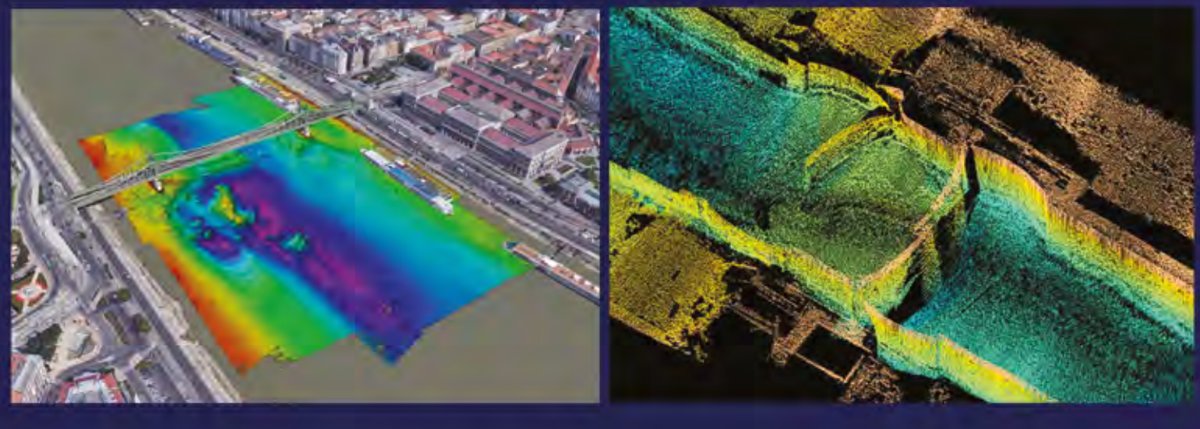
Why Seabed for your internship?
I came across Seabed while searching for an internship. Seabed seemed like an interesting company developing maritime equipment, they were localized quite close to my residence so that was also appreciated. Plus they responded almost instantly to my application which was great. They offered me internship/ project that seemed fun and I agreed.

What do you expect of Seabed during your internship?
At Seabed I expect proper mentorship during my internship and I expect a certain amount of resources/equipment to aid me with my research/development.

What are your plans after you graduate?
It's hard to tell at this moment in time. Firstly, I'm going to spend my summer enjoying myself. Secondly throughout this internship I plan to find out if I'm ready to enter the job market or if I'll continue my studies by pursuing a Master's degree.

Ping DSP
A HORBIT Company

Ping DSP 3DSS-iDX-Series



The 3DSS-iDX series offers superior wide swath bathymetry, geometrically correct 3D point cloud imaging, and enhanced 2D imagery, all produced concurrently from a compact, easy-to-use sonar. This approach of collecting three data types at once is thanks to CAATI technology, a patented signal processing methodology that extends the single angle-of-arrival principle used in traditional interferometric systems to accommodate multiple simultaneous backscatter arrivals (e.g. the seabed, sea surface, water-column, and multipath). The 3DSS-iDX sonar also integrates SVT and INS sensors for convenient turnkey operation.

Ping DSP Inc.
www.pingdsp.com

(778) 351-337
info@pingdsp.com

~ explore more … with 3DSS ~

Advertorial

Precision That Navigates Through Open Water

Hemisphere GNSS is dedicated to delivering high-precision marine navigation and positioning solutions that support safe, efficient, and reliable operations in the marine sector. Oil and gas offshore operations are only some of the areas where Hemisphere GNSS had multiple success stories for Phantom or Vega Boards to be integrated into OEM solutions.

For the past few years, we've had the privilege of working alongside respected OEM partners across the marine industry - supporting yacht and vessel operators, survey teams, and offshore project stakeholders and solutions tailored to their operational needs. Our clients rely on us where accuracy, consistency, and real-time performance are critical. No matter if it´s simple North Finding Systems, Positioning and Heading Systems for Offshore Turbine-Platforms, Assisted Docking Systems for the Recreational Sector or helping Integrators to certify our GNSS solutions within their full solution against the latest IMO standards with wheelmark certification.

Getting Big Performance from a Small Space

One of the most important factors in marine applications tends to be the heading performance of the solution. Hemisphere always focuses on heading as part of the entire solution. It is no secret that GNSS compass heading performance improves when antennas are placed further apart. One complication of placing the two antennas close together is they can start to interfere with each other. This is not something competitors highlight in their design documentation.

Let's look at an Autonomous Surface Vehicle application. An integrator is looking to achieve 0.075° accuracy. The required distance within the competitive landscape varies from 1.07m (Hemisphere) up to 6.4m measured with 5 other devices. Perhaps the integration team realizes they need to maximize the distance between the antennas, and they determine 2.4 meters is the largest possible antenna separation. Results show the vast difference in heading performance these receivers would have with this limited-length antenna separation starting at 0.033° (Hemisphere) up to 0.200° (out of the 5 competitors).

Over the decades of providing quality GNSS heading solutions, Hemisphere has recognized the importance of accurate solutions in small form factors. This helps integrators use a heading solution in a small space that would previously be reserved for a “position only” antenna. Be it small assemblies of scientific measurement or the exotic world of virtual anchor and assisted-docking pleasure-crafts, compact solutions are in high demand. Shallow water hydrographic equipment does not have room for large antenna separations.

The platform limits how far apart the antennas can be. With autonomous vehicles of all descriptions for land, air, and on water, keeping things compact is essential to achieving efficiency. The IoT and scientific instruments market also cannot afford poor heading performance, nor large platform designs. Leisure vessel designers are looking for sleek lines, not antenna-mast structures reminiscent of WWII battleships – they want clients to look past the antennas and see their trademark designs. Minimizing antenna spacing helps achieve all of this.

When you are faced with selecting a heading solution for your next integration, consider all the factors, and understand the importance of antenna placement. Don’t get caught with a product which only meets your performance targets in open-sky conditions. Similarly, pay attention to how far apart you can comfortably put the antennas, and how similar their multipath environments will be. There are a lot of tough questions to answer, but the clear solution is to select the GNSS heading devices which provide the best performance in the most compact package, select Hemisphere.

Our Commitment for Future Applications

What drives us forward is a clear commitment:

- Accuracy that builds confidence
- Reliability that ensures operational continuity
- Precision that supports informed decision-making

As we continue to grow, our focus at Hemisphere GNSS remains on providing trusted expertise, cutting-edge technology, and long-term partnership value to our clients - whether operating in coastal waters or complex offshore environments. We look forward to supporting more marine operations with dependable navigation performance and dedicated technical support.

Hemisphere®

Hemisphere®
PRECISION+
RELIABILITY
MARINE OEM GNSS BOARDS FOR POSITIONING AND HEADING
Vega™
LEARN MORE
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Survey Equipment

NORBIT WINGHEAD i77h

The NORBIT WINGHEAD i77h is a compact ultra-high resolution curved array broadband multibeam sonar offering tight integration with GNSS/INS (Applanix OceanMaster) that is designed for use in the most demanding operational environments such as under bridges or in rough sea conditions. Characterized further by a small form factor; low power draw and tight integration, WINGHEAD i77h installation can occur on surface survey platforms ranging from small USVs to large vessel permanent hull mounts.

NORBIT WINGHEAD B41

The NORBIT WINGHEAD series is the world's first cylindrical ultra-high-resolution curved array bathymetric system designed for rapid deployment anytime, anywhere. These ultra-compact multibeam sonars are optimised for all platforms, including subsea ROVs, AUVs, and USVs, offering exceptional versatility for hydrographic surveys, underwater mapping, and marine exploration. With low power consumption, the WINGHEAD system isideal for battery-operated platforms, ensuring efficient,long-duration operations.

NORBIT WINGHEAD B43

Ultra High-Resolution Curved Array Bathymetric System for Subsea Operations.
The first cylindrical ultra-high resolution curved array bathymetric system, designed with 1500m depth rating for installation on ROV's, AUV's and Towed vehicles.
The WINGHEAD B43, due to its high performance beamformer and 0.5° receive beam width, is able to generate industry leading beam density, allowing operators to reveal the smallest details on pipelines and other subsea assets whilst achieving even the most demanding of survey requirements.

NORBIT WINGHEAD Dual Head configuration

The NORBIT WINGHEAD Dual Head configuration i77h and B41 is a compact ultra-high resolution curved array broadband multibeam sonar offering tight integration with GNSS/INS (Applanix OceanMaster) that is designed for use in the most demanding rough sea conditions and in operational environments with poor GNSS coverage, such as around offshore platforms. Characterized further by a small form factor; low power draw and tight integration, WINGHEAD Dual Head uniquely facilities both wide coverage and increased sounding density from a single user interface.

NORBIT iWBMS

The NORBIT iWBMS. This all-in-one tightly integrated broadband multibeam turnkey solution offers high resolution bathymetry over a wide swath. The high-end sonar with Applanix WaveMaster II (globally leading GNSS/INS system) embedded into the unit ensures fast and reliable mobilisation and highest quality sounding for surveys in all conditions.

NORBIT iWBMSh STX

The NORBIT iWBMSh STX with Applanix OceanMaster uses rapid electronic transmit beam scanning to combine proven 2D bathymetry into 3D georeferenced bathymetry. For dredge application, a 4D experience is achieved by visualising the change in 3D bathymetry as a function of time. Hands-free system tuning ensures quality data on the first survey.

NORBIT iWBMSh X

The NORBIT iWBMSh Stabilised Compact High-Resolution Integrated and Motion Stabilised 3D&4D Shallow Water Bathymetric System. This cylindrical high-resolution curved array bathymetric system is designed to function effectively in extreme operational environments with high vessel motion. It offers rapid mobilisation at any location and time, providing active roll, pitch and yaw stabilised bathymetry. Additionally, it delivers standard imagery and backscatter outputs, ensuring the highest quality survey data performance.

Survey Equipment

NORBIT WBMS STX

The NORBIT WBMS STX ultra compact and high-resolution multibeam sonar designed for use on all platforms. The Wideband multibeam technology facilitates long range real-time data collection and at the same time achieves high resolution data in 3 dimensions, using rapid electronic scanning to combine proven 2D bathymetry into 3D georeferenced bathymetry and 4D experience.

NORBIT WBMS

The WBMS series is the most compact sonars designed for use on all platforms. With low power consumption, the system is suitable to operate from battery. NORBIT's wideband multibeam technology facilitates long range real-time data collection and at the same time achieves high resolution data. The WBMS sonars are based on a state of the art analogue and digital platform featuring powerful signal processing capabilities, offering roll stabilised bathymetry and several types of imagery and backscatter output.

NORBIT WBMS X

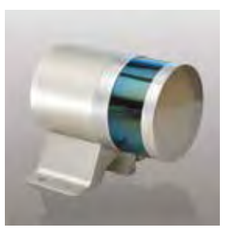
Offering precision and adaptability, this cutting-edge, ultra-compact multibeam sonar system delivers high-resolution bathymetric data tailored to your unique survey needs. Built on a modular platform, it offers unmatched flexibility and can be customized for any operational environment, ensuring optimal performance in hydrographic surveys, marine exploration, and underwater mapping..

NORBIT iWBMSh-Dual Head

The NORBIT iWBMSh-Dual Head is a Compact and high-resolution Dual head curved array bathymetric mapping system. This all-in-one tightly integrated broadband multibeam turnkey solution offers high resolution bathymetry over a wide swath. The high-end sonar with globally leading GNSS/Inertial Navigation System (Applanix OceanMaster) embedded into the unit ensures fast and reliable mobilisation and highest quality sounding for installations in all conditions.

NORBIT STX360, iSTX360 and NORdredge

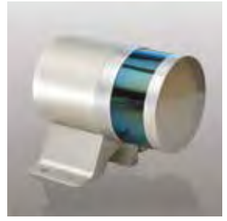
NORBIT STX360, iSTX360 and NORdredge, 4D Multibeam Solution for Underwater Construction, Dredging and Rock Dumping. NORdredge provides instantaneous 4D information to operators and project managers about the job progress through the Real-time dredging progress display, facilitates immediate corrective actions and increases operational efficiency.



NORBIT iLiDAR

The NORBIT iLiDAR is the most compact terrestrial mapping sensor fully integrated with a high resolution bathymetric multibeam system. With 300k data points per second in 30x360deg coverage, it is an ideal tool for mapping above water surface terrain for a complete picture from a single pass.

Survey Equipment



Z300 iLiDAR

The Seabed Z300 iLiDAR is an all-new multi-sensing concept that combines multiple tightly integrated sensors into one hardware platform with a single LAN connection to survey laptop. Supported sensors include any combination of bathymetric MultiBeam Echo-Sounder, Forward Looking Sonar, Forward Looking Bottom Detection and LiDAR.

Airmar

Airmar single beam SS510. This broadband 200 kHz transducer has a Q of 2 and very good sensitivity. It enables users to perform accurate surveys in shallow-water with high resolution.

Exail USBL GAPS M7

Gaps M7 is a high-performance Ultra Short Baseline (USBL) positioning and communication system for locating and communicating with subsea assets. It integrates a USBL antenna and a fiber-optic Inertial Navigation System (INS) within a single housing. USBL calibration on the field is not required anymore. Advanced acoustic techniques, including wideband signals, enable maximum performance even in the most challenging conditions. With its unique 3D acoustic array, the Gaps M7 allows for efficient tracking and communication from the deep sea to extremely shallow water, including at angles above horizontal.

Geometrics' G-882 Marine Magnetometer

Geometrics' G-882 Marine Magnetometer is the leading marine system in the industry . The G-882 is the only system that meets the standards required for UXO clearance in the North Sea. This very high-resolution Cesium vapor marine magnetometer is small in size, and offers flexibility for professional surveys in shallow or deep water.

Falmouth Scientific HMS-621-LITT CHIRP

Falmouth Scientific HMS-621-LITT CHIRP, Sub-bottom profiling applications in diverse sediments in shallow water environments require compact tools as well as multiple frequency bands to support a variety of survey requirements. The HMS-621 CHIRPceiver LittTM and transducer arrays fill this wide range of survey needs. The user selectable frequency bands supported by the HMS-621 include standard LF (1KHz-10KHz), or HF (8KHz-23KHz).

Falmouth Scientific HMS-624

Falmouth Scientific HMS-624 Side Scan Sonar System utilizes advanced technology to provide superior imaging capabilities for deep and shallow water applications. The Tow Fish electronics incorporate FSI's CHIRPceiverTM 24-bit CHIRP signal processing along with dual simultaneous 100/400 KHz operation which results in very high resolution side scan data at towing depths up to 2,000 meters.

Survey Equipment

AML Moving Vessel Profiler (MVP)

AML Moving Vessel Profiler (MVP) is the market leader in underway profiling systems. The world's only automated, real-time solution is backed by 20 years of experience and thousands of successful surveys. Accommodates CTDSV, SVPTu, CTD, SVP and multi-parameter instrumentation. The Moving Vessel Profiler was designed for high-density water column profiles continuously and in real-time. AML's updated MVP is now able to complement SVP or CTD profiles with a wide array of environmental and scientific data. Once simply a hydrographic survey tool, the MVP is now a standard in the ocean science suite of solutions.

AML-6 CTDSV with Seabed Timing Module (STM) integration

Seabed developed a miniature circuit board to integrate GNSS synchronized time output with the loggings of the AML6 instrument, with an easy integration in any subsea navigation system. The seabed timing module (STM) communicates with the AML6 internally and adds the time stamp from the ZDA string and sends the resulting data out over Ethernet. This integrated timestamp can be implemented in all acquisition programs

Seabed Winch

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Norbit PortusPole

Built specifically for NORBIT's integrated sonar systems the new PORTUS Pole fits in a single airline checked luggage case. With a combined weight of 60lbs/27kg, including wheeled hard ski case, it is safely transported to your next vessel of opportunity and set up by a single person.

Ping DSP 3DSS-iDX

Integrated INS Shallow Water Mapping/Imaging System. Superior shallow water hydrography. Accurate, high resolution, ultra-wide swath echo-sounding and 3D/2D imagery, with integrated real-time surface sound velocity, high accuracy INS position/attitude and optional RTK, PPK, PPP provide the best available hydrographic survey and imaging performance in shallow water.

Otter USV Sea drone by Maritime Robotics

Uncrewed surface vessel (USV) for sheltered coastal waters. Robust and effective, designed for precise data acquisition, environmental monitoring, and surveillance. The Otter's versatile design allows for easy integration of diverse payloads, ensuring precise data collection. Its Vehicle Control Station (VCS) simplifies access to survey sites by combining remote and autonomous navigation. The VCS also provides real-time data visualization through a user-friendly interface.

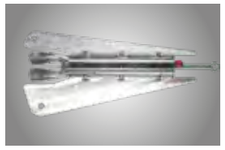
Environmental

AML-3

The AML-3 is THE most versatile, multi-sensor oceanographic instrument currently available. The AML-3 has three sensor ports on the endcap; sensor payload is modular and can be field-swapped to meet project requirements, for example SVP or CTD.

AML-6

The AML-6 is a multi-parameter sonde, designed to combine CTD data with other oceanographic parameters such as Dissolved Oxygen, pH, ORP or Fluorometric sensors. This instrument has six sensor ports on the endcap; sensor payload is modular and can be field-swapped to meet project requirements.



The admodus®USP pro

The admodus®USP pro is an innovative in situ measuring probe for online monitoring of the nautical bottom in harbours and waterways. The system provides a depthdependent density profile quickly and reliably, as well as a variety of other indicators for characterising suspended matter and sediments.

Ocean Sonics IcListen HF

Ocean Sonics IcListen HF, records high-frequency underwater sounds with the cutting-edge real-time smart digital hydrophone. Small enough to carry in one hand, the simple, accurate, and reliable icListens allow users to collect, analyze, and listen to ocean sound data in real-time.

Sub C Imaging Rayfin Benthic or Coastal camera

Sub C Imaging Rayfin Benthic or Coastal camera, Recording and viewing your underwater survey in real-time is made easy. The Rayfin Benthic has a depth rating of 6000m and is fully compatible with ROV, AUV, drop, tow, and observatory systems.

Seabed Orinoco Solo

Orinoco Solo tide gauges multiple sensor data acquisition system. The basic unit is a high capacity data logger with up to eight analogue inputs and up to four RS232 inputs (optional) and one serial data output which supports multiple formats.

Seabed SVC500E

Seabed SVC500E, the Electric vibrocorer has been designed to obtain cylindrical cores in soft, cohesive soils at a maximum water depth of 50 meters (standard version). After the unit is placed on the seafloor, the electrical vibration head drives the core-barrel containing the PVC core-liner into the seafloor. The stationary piston system assist in the intrusion of seabed sediment into the barrel with minimum disturbance. After recovery the vibration unit and core can be rotated in a horizontal position to facilitate the removal of the liner with the sample. The slide indicator enables you to check the achieved penetration.

Positioning

Hemisphere R632 GNSS

The R632 GNSS receiver is a full- solution product in a compact and powerful package, built on the foundation of Hemisphere's new Lyra, Cygnus and Aquila core technologies, the R632 offers amazing new interference rejection and multipath mitigation. The result is an exceptional combination of performance, communications, and connectivity.

Hemisphere S631 GNSS

The S631 GNSS receiver is powered by Athena RTK technology. With Athena, S631 provides state-of-the-art RTK performance when receiving corrections from a static base station or network RTK correction system. With multiple connectivity options, the S631 allows for RTK corrections to be received over radio, cell modem, Wi-Fi, Bluetooth, or serial connection. S631 delivers centimeter-level accuracy with virtually instantaneous initialization times and cutting-edge robustness in challenging environments.

Exail Rovins Nano

Exail Rovins Nano merges the established high-grade iXblue inertial navigation system with our competitive IMU. Built on iXblue's renowned FOG solid state technology and offshore instrumentation expertise, Rovins Nano offers the unbeatable stability and accuracy of the inertial position while simplifying the operation with its autonomous external sensor management.

Exail Octans

The fifth generation Octans is an all-in-one product for diverse challenging applications. Octans raises the industry standard in measurement accuracy for roll, pitch, heave. IMO-HSC and certified, Octans is built on Exail's trusted and unique ultimate-performance Fiber-Optic Gyroscope (FOG) technology with thousands of units manufactured.

Exail Hydrins

Hydrins is a high-performance Inertial Navigation System (INS) based on Exail Fiber-Optic Gyroscope (FOG) technology, electronics, and embedded processing. Compact and lightweight, it delivers highly accurate real-time position, heading, attitude, motion (heave, surge, sway), and speed data, for direct spatial referencing.

Exail Phins

Phins is an Inertial Navigation System (INS) providing position, true heading, attitude, speed, depth and heave. Its high-accuracy inertial measurement unit is based on Exail's Fiber-Optic Gyroscope (FOG) technology coupled with an embedded digital signal processor that runs an advanced Kalman filter.

Hemisphere VS-i8

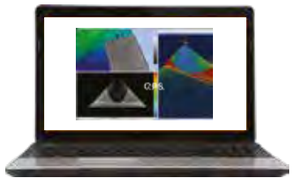
Inertials systems, such as Hemisphere VS-i8 with a 0.03° heading, 0.015° pitch and roll accuracy on a 2m baseline. Applanix Wavemaster II with up to 0.02° roll and pitch performance and Applanix Oceanmaster with 0.01° roll and pitch performance.

Positioning

Satel

Telemetry, different services and instruments available such as correction signals, modems, WIFI bullets and Satel radio's.

Software



QPS

Powerful software from hydrographic data collection to piloting. Offering Qinsy for Survey planning, acquisition, and real-time hydrographic data processing, Qimera for Hydrographic data processing made simple and intuitive, while also containing the most advanced and cutting-edge tools and Fledermaus the 4D analysis toolbox, with movie-making tools and integrated video. The gold standard for presentation and communication.

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specialized in the acquisition, processing and integration of single- and multibeam echosounder data. OfferingNavAQ, a user-friendly and versatile online navigation and data acquisition program for Single/Multibeam Echosounders/Laser Scanners and Sidescan Sonar and Autoclean as User-friendly and robust point cloud cleaning program for Bathymetric and Lidar point data. In times where software becomes more and more complex we present a new cleaning tool that is focused on day to day cleaning on board of survey vessels or near site.

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SEABED

Meet the Seabed Team

From left to right in the back row: Evert Bootsman - Team Leader, Federico de Francesco - Mechanical Engineer, Hans Tuinman - Director, Bart Admiraal - Electronical Engineer Mitch Kuska – Survey Engineer, Robert Hooiveld - Sales Admin.
Front row:
Anya Siemons - Financial Admin, Elice Collewijn - General Manager, Suzanne Cranfield - Process Manager, Remy Pronk – Engineer.

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Ultra-High-Resolution Multibeam Mapping from Coastal to Offshore Depths with the NORBIT WINGHEAD X

Figure 2. Survey location in Sardinia, Italy.

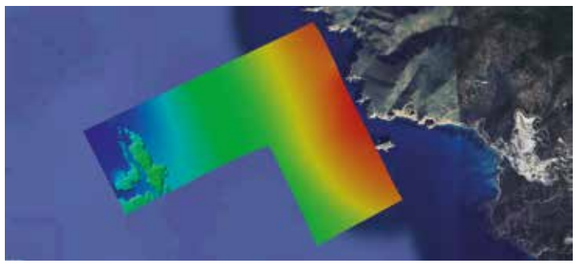


Figure 1. Processed 1m grid data.

Introduction

The NORBIT WINGHEAD X is the latest addition to NORBIT's family of multibeam echosounders, delivering ultra-high resolution bathymetry and backscatter data. Built on a unified platform, it brings all existing features from the WINGHEAD series into one adaptable system that provides complete operational flexibility. A core configuration is provided as standard, with optional features that can be enabled over time, including:

- 1024 beams
- Dual Swath 2048 beams
- Pitch Stabilisation
- Yaw Stabilisation
- STX scanning
- Backscattering Strength Output

Designed with a maximum operating range of 600m, the system was deployed in Sardinia, Italy, to evaluate its performance across a wide water-depth range, from relatively shallow coastal environments (20m depth) to deeper intermediate zones (100m depth). The objective was to demonstrate the system's ability to deliver high-resolution data across diverse environments, and to highlight the efficiency benefits of advanced features such as Pitch Stabilisation and Dual Swath.

Equipment Setup

For this case study, the system configuration included:

- WINGHEAD X multibeam sonar mounted on a 20m survey vessel.
- Integrated GNSS/INS subsystem, providing a full sonar and navigation solution, with the IMU built into the sonar head.
- Single cable connecting the wet-end components to the topside unit.
- Data acquisition using NORBIT's DCT software, and real time visualisation of the raw data using NORBIT's newly launched web-based 3D point cloud viewer.

Figure 3. WINGHEAD X Installation.

Real-Time 3D Point Cloud

While NORBIT's DCT software provides 2D coverage monitoring and line-planning functions, the 3D point cloud viewer builds on this by delivering a fully interactive perspective with georeferenced 3D bathymetry data displayed live as the data is collected. When used alongside DCT, the 3D point cloud viewer enables faster interpretation and offers an additional layer of real-time quality control.

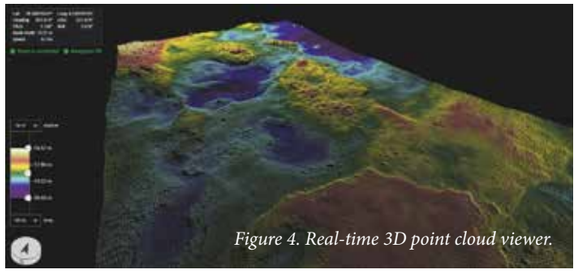


Figure 4. Real-time 3D point cloud viewer.

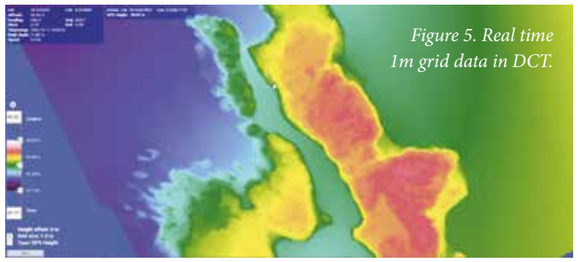


Figure 5. Real time 1m grid data in DCT.

Since the 3D point cloud viewer runs entirely in a web browser, it also supports remote collaboration, allowing project managers and clients to review live results from anywhere in the world. This makes it easier to validate data, plan follow-up operations, and approve deliverables with confidence.

The ability to explore and measure features directly within the 3D environment also makes it an excellent inspection tool, ideal for assessing structures and subsea assets in real time.

Performance Across Varied Depths

The frequency-agile design of the WINGHEAD X allows operators to adapt the sonar's performance to the environment, using higher frequencies for detailed mapping in shallow waters, and lower frequencies for efficient coverage in deeper areas while maintaining ultra-wide wide swath coverage.

The swath was electronically steered to capture details up to the waterline on Pan di Zucchero, a natural monument close to the mainland, named due to its resemblance to the Sugar Loaf mountain peak in Rio de Janeiro. This was achieved without changing the physical installation, made possible by NORBIT's curved array technology, which enables wide steering angles and full coverage flexibility.

Figure 6. Processed point cloud data from Pan di Zucchero.

The deeper areas mapped reveal a complex, rocky terrain covering a 0.5x1.5km2 area, while the corresponding backscatter data, collected simultaneously, reveals intensity changes where the seabed composition changes from rocky to softer sediments.

The results demonstrate that a single system can be used to effectively map a wide depth range, producing multiple data type outputs, offering operators one system rather than multiple specialised units.

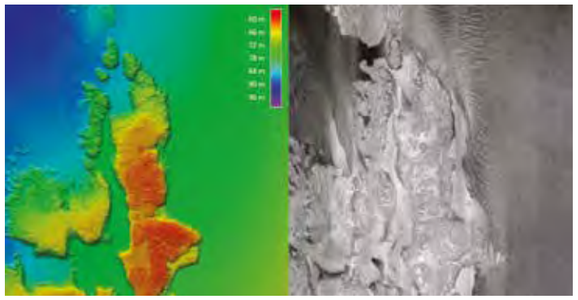


Figure 7. Left: Processed 1m grid at 60-100m depth range. Right: Processed snippets backscatter mosaic.

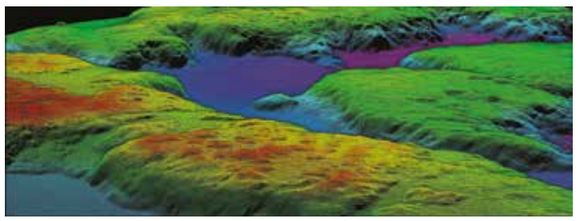


Figure 8. Processed data with multiple overlapping lines at 60-100m depth range.

The results demonstrate that a single system can be used to effectively map a wide depth range, producing multiple data type outputs, offering operators one system rather than multiple specialised units.

Efficiency Gains with Dual Swath

The WINGHEAD X supports Dual Swath as an optional feature, producing 2048 beams per ping. This offers two potential benefits for the operator:

1. Sounding density can be doubled, which is useful in applications with strict sounding density requirements.
2. The survey speed can be increased while maintaining the same sounding density as single swath, allowing surveys to be completed faster.

The real-time gridded data in DCT, coloured by sounding density, shows 15 soundings per grid cell (blue) with single swath mode and 1024 beams at 50m water depth. By comparison, Dual Swath with 2048 beams increases the along-track data density and provides an average of 30 soundings per grid cell (green), doubling the total number of soundings.

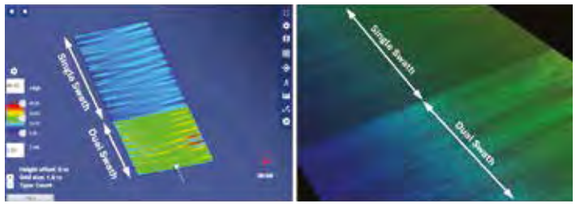


Figure 9. Left: Real-time grid data in DCT, coloured by sounding density. Right: Real-time 3D point cloud.

Uniform Sounding Density with Active Motion Stabilisation

The WINGHEAD X supports active Roll Stabilisation as a standard feature, along with Pitch and Yaw Stabilisation as optional features. Without Pitch Stabilisation, variable sounding density in the along-track direction is observed as the vessel pitches up and down, which is reflected on the real time gridded data in NORBIT's DCT software, where some regions are oversampled (red grid cells) and some regions are under sampled (blue grid cells) during each pitch cycle.

With Pitch Stabilisation enabled, the transmit beam is steered dynamically in response to vessel pitch motion, providing uniform sounding density and consistent coverage, which allows smaller bin sizes and more reliable target detection.

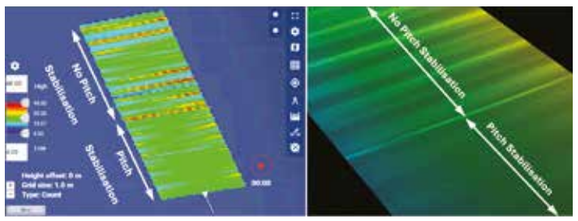


Figure 10. Left: Real-time grid data in DCT, coloured by sounding density. Right: Real-time 3D point cloud.

Shallow Water Performance

A shallow water area was surveyed at 20-30m depth range, revealing a mixture of softer sediments and harder materials. The bathymetry data reveals small depressions and relief features, while the corresponding backscatter data shows a distinct change in the sonar signal response between the bottom types.

The example demonstrates that the same system configuration can capture fine nearshore detail without re-tuning or changing the hardware setup.

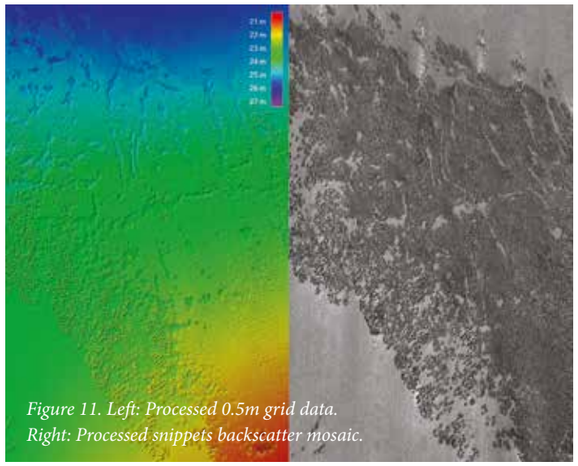


Figure 11. Left: Processed 0.5m grid data. Right: Processed snippets backscatter mosaic.

Conclusions

The WINGHEAD X demonstrated consistent, high-quality performance across a wide depth range from 20m to 100m, efficiently covering both nearshore and offshore environments with the same hardware configuration. The results confirm that a single multibeam system can deliver high-resolution data in diverse conditions without re-installation or major reconfiguration, maximising survey productivity.

Optional software features such as Pitch Stabilisation and Dual Swath were shown to provide clear operational advantages, enhancing sounding density, maintaining uniform coverage in dynamic sea states, and improving overall efficiency. These capabilities can be activated through licensing to unlock advanced functionality without any hardware changes or downtime, offering users an adaptable and future-proof system.

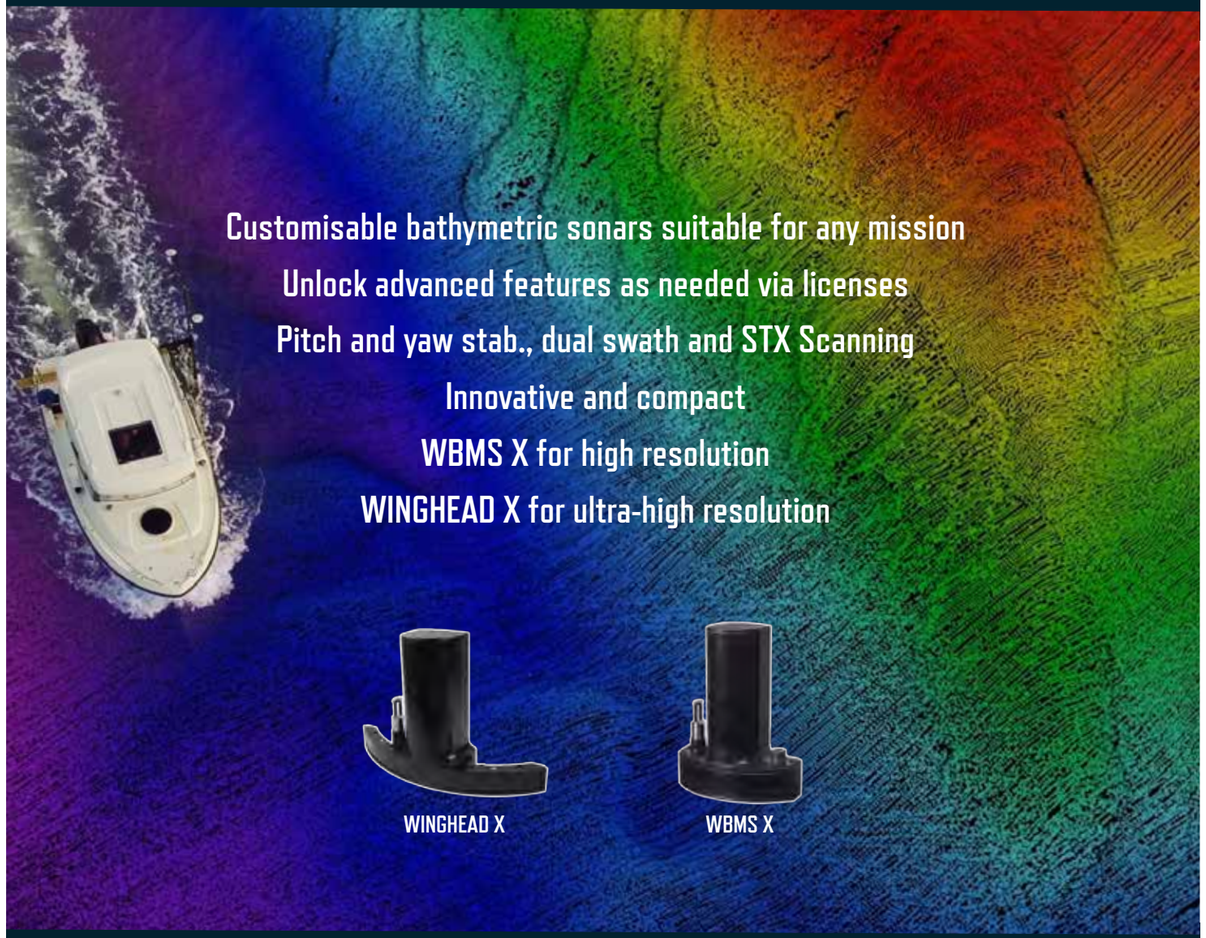
Compact and lightweight, the WINGHEAD X is equally suited for rapid pole-mounted deployment on vessels of opportunity or permanent hull-mounted installations on dedicated survey platforms. This flexibility, combined with its proven data quality, range performance, and productivity benefits, makes the WINGHEAD X a versatile solution for a wide spectrum of hydrographic applications.

For further information, contact www.norbit.com/subsea.

NORBIT

Figure 12. Survey Vessel

Meet the NORBIT X-Series:
a new paradigm for multibeam sonar systems



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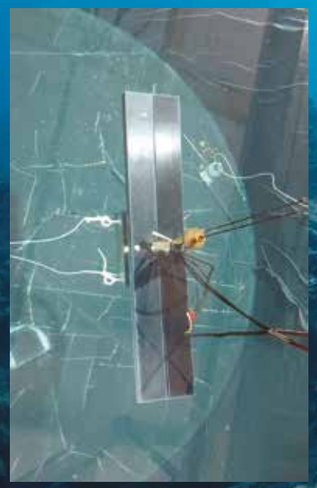

VLF Transducer

FSI

Falmouth Scientific Inc.
33 Jonathan Bourne Dr, PO Box 326, Pocasset, MA 02559 USA
Tel: +1-508-564-7640 • Fax: +1-508-564-7643
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HMS HEGG MARINE SOLUTIONS

Advertorial

Falmouth Scientific: Underwater Acoustic Specialists

Designing for challenging underwater environments

In marine acoustics, low frequency has always been difficult. Long wavelengths interact strongly with the water surface, the seabed, and the sediments in between. Performance is shaped as much by mechanical behavior and environmental coupling as by electronics. As a result, systems designed for the low-frequency end of the spectrum tend to behave very differently from their higher-frequency counterparts.

Falmouth Scientific Inc. (FSI) has spent decades working in this part of the acoustic landscape. Founded in 1989 and based in Massachusetts, the company designs and manufactures acoustic sources, sensors, and transducers for marine environments worldwide. With technology roots in Woods Hole Oceanographic Institution and in-house design, manufacturing, and testing capabilities, FSI has focused on building systems that behave predictably and reliably in the field.

This focus on predictable behavior in real environments connects FSI's work across multiple product areas, from acoustic sources to transducers and measurement systems..

AquaPulse — controlled low-frequency acoustic sources

Generating low-frequency acoustic energy in marine environments is challenging, particularly when consistency and repeatability matter. At long wavelengths, small changes in source behavior can strongly affect the resulting signal, making stable pulse generation more important than peak output alone.

AquaPulse acoustic sources use an electro-mechanical approach to generate a short acoustic pulse in the water. Electrical energy is briefly applied and converted into controlled mechanical motion. It is this mechanical motion that produces the acoustic pulse, rather than the electrical event itself.

Because the motion follows the same pattern each time, the resulting acoustic output is highly consistent. When viewed over longer time windows, sub-bottom records show a clean initial pulse followed by coherent low-frequency energy extending well beyond the first arrival.

By avoiding high-pressure systems, AquaPulse integrates easily into standard shipboard operations. The source operates from conventional electrical power and does not require pressure vessels, compressors, or dedicated support equipment, simplifying logistics and deployment across a wide range of vessels.

Transducers at the low end of the spectrum

Below a few kilohertz, acoustic transducer performance is increasingly dominated by mechanical behavior rather than electronics alone. Wavelengths grow rapidly, efficiency depends strongly on mechanical design, and practical size constraints begin to limit what is possible.

FSI designs and manufactures a broad spectrum of acoustic transducers, including standard low-frequency designs available for integration on AUVs, towed systems, and other space-constrained platforms.

In addition to sensing and imaging, some low-frequency transducers are used for acoustic transmission in long-range communication and training applications. Across all uses, the emphasis remains on predictable behavior and repeatable performance in real-world conditions. Where required, custom designs are developed to meet specific application requirements, including operation at and below the 1 kHz transition into very low-frequency bands, extending into the few-hundred-hertz range.

VLF Transducer with cantilevered bender design. High power, very Low frequency, full ocean depth transducer designed to operate in the 10Hz to 1000Hz range.

Standard proven measurement systems

Among FSI's standard product offerings, the ACM-PLUS current meter represents a proven and widely deployed measurement system.

Accurate current measurements are fundamental to many marine operations, from engineering and environmental monitoring to navigation and safety. Many modern current profilers rely on Doppler techniques, measuring water velocity by listening to sound scattered back from particles suspended in the water column.

However, Doppler methods depend on the presence of scatterers and can be challenged near boundaries such as the seabed or the surface, or in very clear water where backscatter is limited. These boundary regions are often where accurate measurements are most important.

The ACM-PLUS current meter uses a proven acoustic measurement approach based on direct travel-time measurements. Acoustic signals are transmitted directly between fixed transducers mounted on rigid extensions from the instrument. Signals are sent in both directions along each path to remove timing and electronic bias.

Velocities measured along multiple paths are combined to form a current vector, which is referenced to geographic direction using an internal compass and tilt sensors. Because the measurement volume is fixed and does not depend on backscatter, ACM-PLUS performs reliably in clear water and near boundaries where other approaches can struggle.

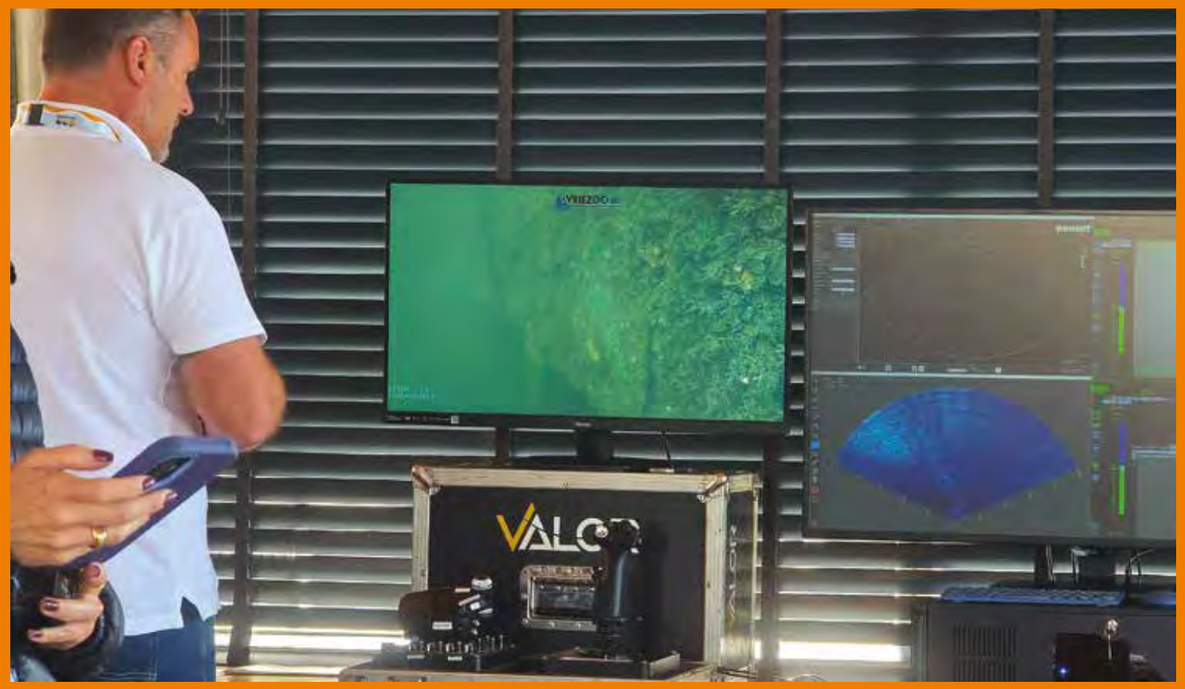
Conclusion

FSI's underwater acoustic systems are designed to perform reliably in environments where pressure, boundaries, and long operating periods dominate system behavior. As users gain experience, performance becomes evident in the data itself and is reinforced through shared results among operators working in similar environments.

This approach—rooted in oceans of quality, advanced through waves of innovation, and reflected in echoes of excellence—has guided decades of work across marine environments.

SEABED END OF SUMMER DEMO DAYS 2025

We can look back on two very successful demo days.We hope to welcome you again in 2026!



Digital Imaging Without Fiber: Upgrading Legacy ROVs With the Rayfin Uplink

Advertorial

Across subsea inspection, survey, and monitoring work, expectations for visual data have changed. HD and 4K video, clear digital stills, and consistent documentation are now standard requirements, not differentiators. Yet many ROV systems still in daily use were designed around analog video and non-fiber communication paths that limit image quality and operator control.

In many cases, these vehicles are mechanically sound and operationally proven. Pilots know them well, and they continue to perform reliably in a wide range of environments. The challenge is not the platform. It is the imaging and data link between the camera and the surface.

For operators looking to improve image quality without replacing vehicles or retrofitting fiber, a new class of digital imaging upgrades has emerged.

The limitation is the link, not the camera

Traditional analog ROV imaging systems were built for standard-definition video transmitted over coax or twisted-pair conductors. While dependable, this approach restricts resolution, reduces fine detail, and limits the ability to control image parameters in real time.

Even when newer cameras are added to older vehicles, the signal path often becomes the bottleneck. Analog transmission compresses dynamic range, softens edges, and makes it difficult to adapt imaging to changing visibility, lighting, or inspection requirements. On the surface, older recorders and monitors compound the problem by limiting how footage is captured, reviewed, and stored.

As inspection standards increase, these constraints affect more than image quality. They affect confidence in visual assessments, repeatability of inspections, and the ability to deliver inspection-grade documentation.

Why fiber upgrades are not always practical

Fiber optics provide the bandwidth needed for modern digital imaging, but upgrading to fiber is not always a viable option. Retrofitting a fiber tether typically involves replacing the tether itself, modifying junction boxes, updating topside equipment, and allocating time for integration and testing.

For operators managing mixed-age fleets or working under tight schedules, this level of disruption can be difficult to justify. Full vehicle replacement introduces similar challenges, including high capital cost, pilot retraining, and changes to established workflows.

In many cases, operators are not looking to rebuild their systems. They are looking to improve the quality of the data those systems produce.

Digital imaging over existing tether conductors

The Rayfin Uplink by SubC Imaging was developed specifically to address this gap.

Rather than requiring fiber, the Rayfin Uplink enables real-time digital video and still image transmission over the coax or twisted-pair conductors already present in many ROV tethers. It creates a digital link between a Rayfin camera and a topside control unit, allowing modern imaging performance without changing the tether or core vehicle infrastructure.

At the subsea end, the Rayfin camera captures digital video and high-resolution stills. That data is compressed and transmitted through the existing tether conductors to the surface. At the topside end, the Rayfin Uplink unit converts the signal to standard Ethernet, allowing operators to view, control, and record digital imagery in real time using familiar workflows.

This approach allows legacy and analog ROVs to deliver HD and 4K video, along with high-resolution digital stills, without the cost or downtime associated with fiber retrofits.

Just as importantly, it restores full digital camera control to the pilot. Exposure, gain, color balance, and other image parameters can be adjusted live during a dive, rather than being locked into factory presets.

What this enables operationally

By working within existing infrastructure, the Rayfin Uplink minimizes disruption. Installation does not require tether replacement or major vehicle modification. For many systems, it can be integrated quickly and brought into service with minimal changes to topside operations.

From an inspection standpoint, the impact is immediate. Operators gain clearer imagery, better control in challenging visibility, and access to digital files that are easier to review, transfer, and archive. The result is stronger visual documentation and greater confidence in inspection outcomes.

This capability is particularly relevant for operators who rely on compact or work-class ROVs without fiber, and for fleets where some vehicles are newer and others are expected to remain in service for years..

Validation in the field: Vriezoo ROV Services

Vriezoo ROV Services provides underwater inspection services across wind farms, ports, quays, and inland waterways. Much of their work is carried out using compact ROVs operating on non-fiber tethers, which historically limited them to analog or lower-resolution imaging.

Client expectations for clearer imagery made those limitations increasingly difficult to manage. “With small, non-fiber ROVs, getting 4K video to the surface just wasn’t possible,” said Willem de Vries, founder of Vriezoo ROV Services. “The Rayfin Uplink finally changed that.”

By integrating the Rayfin Uplink, Vriezoo was able to achieve real-time 4K digital imaging using their existing ROVs and tether infrastructure. Beyond resolution, the ability to control image settings during a dive proved critical.

Photo credit: Vriezoo ROV Services

“With other cameras, you’re stuck with factory settings,” de Vries said. “With the Rayfin, you can adjust everything. Exposure, color, gain. Even live during a dive. That’s a big plus, especially when you’re working in muddy or green water.”

For inspection work where conditions vary from site to site and even minute to minute, that flexibility directly affects data quality.

From better images to better inspection outcomes

For Vriezoo, improved imaging translated into stronger deliverables and a competitive advantage. “The quality of the images is superb compared to the cameras we normally used,” said de Vries. “With the Rayfin, I know I can deliver better inspection results and stand out from others in the field.”

This reflects a broader trend across subsea operations. As inspection requirements become more demanding, the ability to capture clear, consistent imagery reduces uncertainty and minimizes the need for repeat passes or follow-up work. Digital stills and video that accurately represent conditions improve reporting and support more confident decision-making.

By focusing on the imaging link rather than the entire vehicle, operators can achieve these benefits while preserving established systems and workflows.

Extending the useful life of proven ROVs

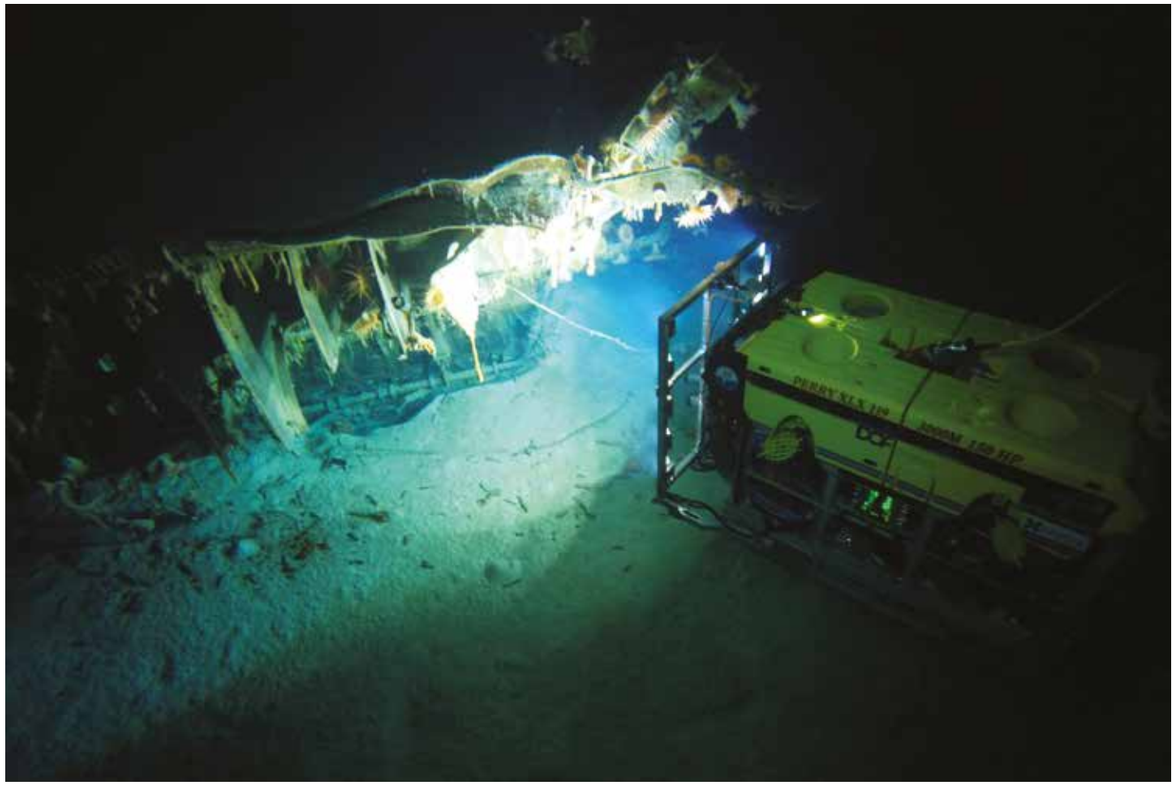
Legacy ROVs continue to play a vital role across subsea inspection and survey work. While their imaging systems may not have been designed for modern digital requirements, many platforms still have significant service life remaining.

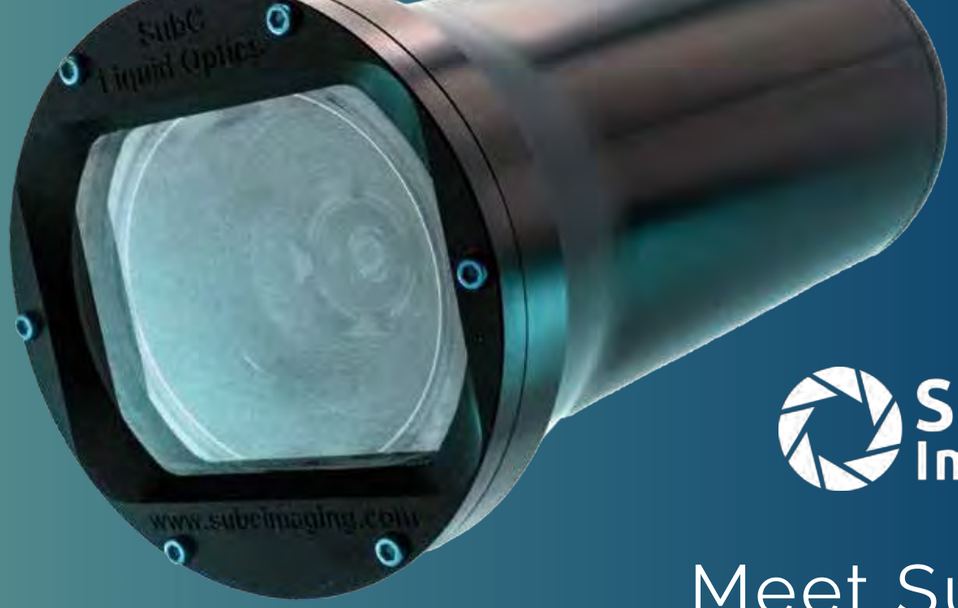
The Rayfin Uplink provides a practical way to bridge that gap. By enabling digital imaging over existing tether conductors, it allows operators to upgrade image quality, control, and data handling without rebuilding their systems.

For teams under pressure to deliver clearer imagery and s tronger documentation without introducing unnecessary cost or downtime, this approach offers a direct and efficient path forward. In many cases, improving how data is captured and transmitted is the most impactful upgrade an operator can make.

For more information visit **subcimaging.com**

SubC Imaging





SubC Imaging

Meet SubC's
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Ocean Business 2025

admodus®

Hydrography – growing in importance

Safety for maritime traffic and harbours

International trade is booming, and shipping along with it. Given the ever growing quantity of shipments and the expansion of harbour locations, there is a corresponding increase in requirements for the secure maintenance of waterways and harbour basins.

In many of the world's largest harbours, appropriate hydrographic monitoring of suspensions accumulating as fluid mud, as well as sediments in the form of more or less consolidated silt, is a necessary requirement in order to keep dredging costs for maintaining a satisfactory nautical bottom[1] within commercially sensible limits.

Every year in Germany alone action taken to secure the prescribed water depth produces an accumulation of around 45 million cubic metres of dredged material, the disposal of which entails high financial and environmental costs. Accurately determining the nautical bottom allows for a considerable reduction in operating costs, since dredging work can be carried out more systematically and efficiently.

[1] The nautical bottom is defined as „the level where physical characteristics of the bottom reach a critical limit beyond which contact with a ship's keel causes either damage or unacceptable effects on controllability and manoeuvrability"
(Joint PIANC-IAPH Report on Approach Channels: A Guide for Design, Vol. 2, 1997)

admodus®

admodus® solutions for cost-effective waterway management

Echo-sounding is an internationally recognised technique for establishing the depth of a body of water. Dual frequency echo sounders such as the admodus®*SONAR* work with signals of differing frequency. Where there is a firm subsurface, both signals deliver identical readings for the depth of water, and in this case the readings correspond to the nautical bottom. However, if the results show greater variance this indicates the presence of sediment suspension: while the high frequency signal is dispersed at layers of low density, the low frequency signal penetrates through the suspended matter almost entirely, and is only reflected from deeper, more solid layers. Even though this technique succeeds in identifying accretions of low-viscosity suspended matter and fluid mud, it is not possible to determine the exact location of the nautical bottom. For this, an additional in situ analysis is required.

A method of analysis still frequently used, albeit one which is very time- and cost-intensive, is that of sampling combined with subsequent offline analysis in the laboratory.
An innovative and significantly more cost-effective option is the highly accurate online characterisation of suspensions and sediments achieved using the admodus®*USP pro* depth-profiling probe. The probe is lowered from the vessel, and can thus carry out real-time measurement of the density profile of the layers through which it penetrates, as well as record other parameters of rheological value. With the help of this profile, the nautical bottom can be established on the spot and with great accuracy[2].

[2] The nautical bottom can be defined more dependably by a limiting density of approximately 1.200 g/cm3.
„Determining the Nautical Bottom", Markus Jaren

admodus®*USP pro*

Determining nautical depth in real time

The admodus®*USP pro* is an innovative in situ measuring probe for online monitoring of the nautical bottom in harbours and waterways. The system provides a depth-dependent density profile quickly and reliably, as well as a variety of other indicators for characterising suspended matter and sediments.

The probe is a robust and easy-to-use device made of seawater-resistant stainless steel. With its high inherent weight it can be used even in extreme flow conditions

The admodus®*USP pro* is linked via high-speed Ethernet to a PC which displays all measurement data clearly laid out and in real time, stores them, and exports them as a PDF report as required. The user software features an automatic recording mode which permits serial measurements without interaction.

As the probe descends it continuously records its depth and inclination, as well as the density, frequency-dependent acoustic loss, speed of sound and temperature of the medium.

The measurement data ascertained can be stored together with the GPS data of an external receiver, so that the precise location of measuring points and a correlation with echo sounder bearings are both easily achieved.

The highly accurate point-by-point measurements achieved with the admodus®*USP pro*, combined with the area data capturing of the dual-frequency admodus®*SONAR* echo sounder, are one of the most accurate methods for hydrographic surveying currently available.

- Monitoring the navigability of harbours and waterways
- Supporting intelligent dredging management by technically efficient measurement
- Silt and sediment characterisation
- Analysis of fluid mud layers (e.g. in estuaries)
- Monitoring in sedimentation basins
- Investigation of sediment transport
- Online analysis in place of costly sampling

admodus®*SONAR*

Registering and recording sediment layers

The admodus®*SONAR* dual-frequency echo sounder is especially suited for hydrographic surveying of harbours, waterways and coastal water areas.

The admodus®*SONAR* can be operated as a self-contained echo sounder with a variety of different transducers. Furthermore, it can be used as a passive digital supplement to existing analogue echo sounders.

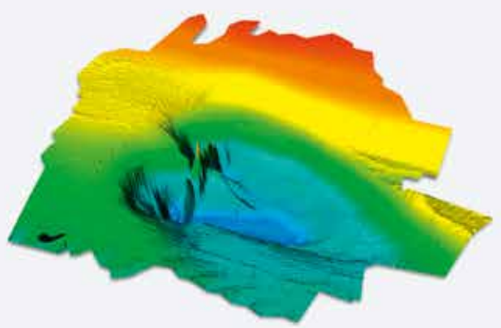
The single beam system with dual frequencies enables effective surveying of seafloor conditions, and of the different layer formations of suspended matter and sediments, ranging from fluid mud to well consolidated silt.

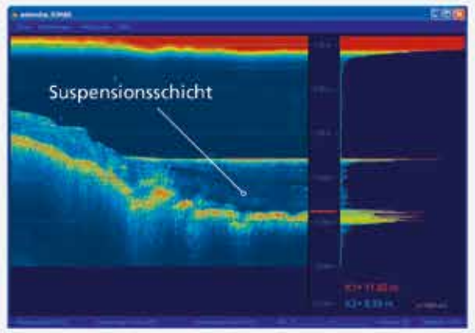
All data are transferred in real time to a computer via Ethernet, then visualised and stored. In addition, the admodus®*SONAR* user software provides an interface with widely available surveying software programs such as QINSy, WinProfile and Profile 2000, so that the horizons identified can also be externally recorded and further processed.

With its compact dimensions and the splash-proof design of its housing, the system is also highly suitable for mobile field work.

The area data capturing of the dual-frequency admodus®*SONAR* echo sounder, combined with the highly accurate point-by-point measurements achieved with the admodus®*USP pro*, is one of the most accurate methods currently available for hydrographic surveying.

- Hydrographic surveying of harbours, waterways and coastal water areas
- Area monitoring of fluid mud and silt layers
- Supporting intelligent dredging management by technically efficient measurement
- Creation of digital terrain models
- Digitalisation of existing analogue echo-sounder systems



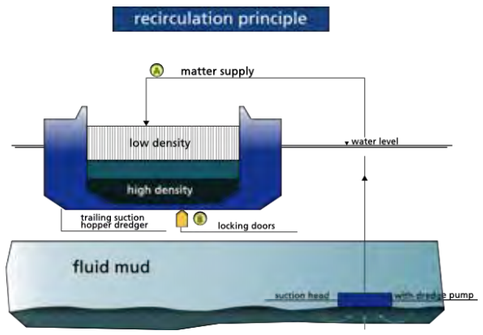


DENSITY matters...

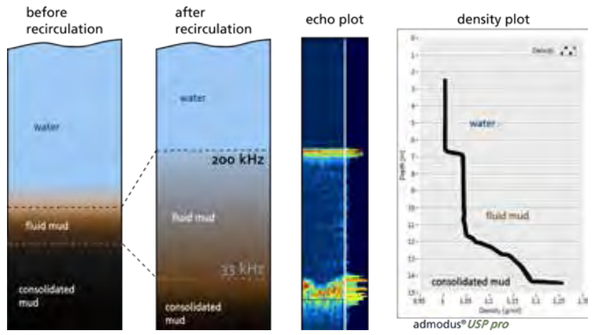
Port of Emden, Germany reducing dredging costs by 90%

In many of the world's largest harbours, appropriate hydrographic survey is a necessary requirement in order to keep dredging costs low. The port of Emden succeeded in reducing the dredging costs by 90% with the help of a new dredging management and hydrographic survey using the density probe **admodus®** *USP pro*.

In 1994, after many years of research, the port authority managed to maintain the fluidity of suspended sediments, which were carried into the harbour basin by the river Ems. This so called "sediment conditioning" is mainly based on the prevention of the fluid mud's reconsolidation process by a regular treatment (recirculation). As a result, these sediments no longer have to be **removed** from the harbour basin and a lot of disposal costs can be saved.



Recirculation principle



Fluid mud layer before and after recirculation.

The challenge:

How to monitor the density of this 'fluid mud' or measure the nautical depth in the harbour basin in a fast and reliable way, in order to guarantee navigability?

After 10 years of experience and development, **admodus® MARITIME DEVICES** released the new **admodus®** *USPpro* in 2013, with improved precision, ruggedness, better software and easier handling like the one-man-automatic-mode. The port of Emden was the first customer who purchased and still uses this device with great success.

Conclusion

A lot of maintenance costs can be saved by an intelligent dregding management. Investigations in recent years have shown, that ships can navigate safely through fluid mud layers up to a density of 1.15kg/dm³ at the port of Emden. This 1.15kg/dm³ horizon is often much deeper than the 200kHz horizon of an echo sounder. Thus, there is 'more water' under the keel with less dredging.

admodus®MARITIME DEVICES is a brand of Synergetik GmbH - Am Nusskopf 20 – 66578 Schiffweiler, Germany
Phone: +49 6821 40172-0 - Fax: +49 6821 40172-11 - E-mail: info@admodus.de

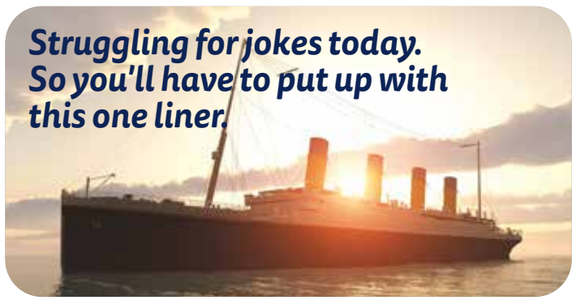
Save the Date

Wednesday 9th and Thursday 10th of September 2026.
Restaurant het Bosch at the Nieuwe Meer in Amsterdam.
Looking forward seeing you! Please sign in via rsvp@seabed.nl

SEABED
END OF SUMMER
DEMO DAYS
2026

Find the 7 differences

Make them laugh



Puzzle

N	S	A	T	E	L	L	I	T	E
A	O	R	E	C	E	I	V	E	R
A	E	I	H	A	R	B	O	U	R
T	M	G	T	L	A	T	N	E	R
J	I	S	E	A	B	E	D	O	A
E	T	A	O	B	V	Z	E	M	T
V	I	B	R	O	C	O	R	E	R
O	R	I	N	O	C	O	N	D	T
E	A	T	H	A	I	L	A	N	D
A	M	S	T	E	R	D	A	M	I

AMSTERDAM
BOAT
DEMO
HARBOUR
INNOVATION
MARITIME
NAATJE
ORINOCO
RECEIVER
RENTAL
SATELLITE
SEABED
THAILAND
VIBROCORER

The object of the puzzle is to find the listed hidden words. The words may be hidden in any direction: horizontally, vertically, diagonally, forwards and backwards. The letters that remain make up the name of a publication.

Contact

Seabed BV
Asterweg 117
1031HM Amsterdam
The Netherlands

Tel: +31 (0)20 6368443
E-mail: sales@seabed.nl
Website: www.seabed.nl

Colophon

Editor: Elice Collewijn
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Seabed Electric Vibrocoror (SVC) series

The SVC-series have a long track record and are successfully being used by our clients world wide on various types of soil including soils containing gravel. The Seabed vibrocorer has been designed to obtain cylindrical cores in soft, cohesive soils at a maximum water depth of 200 meters.

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