



**SUBSEA TECHNOLOGY**

**OCEAN SCIENCE**  
**NAVIGATE, TRACK**  
**MEASURE, MONITOR,**  
**RELEASE, OBSERVE**



**POSITIONING**  
**NAVIGATION**  
**COMMUNICATION**  
**MONITORING**  
**IMAGING**

## OUR COMPANY

# WE NAVIGATE WE TRACK WE MEASURE WE OBSERVE

**AS THE FOCUS OF OCEAN SCIENCE INCREASINGLY MOVES TOWARDS UNDERSTANDING COMPLEX PROCESSES OPERATING OVER BASIN SCALES AND ON DECADAL TIMESCALES, OUR TECHNOLOGIES HAVE EVOLVED TO MEET THE NEEDS OF THE WORLD'S LEADING OCEANOGRAPHIC INSTITUTES. CENTRAL TO THIS, IS A COMPANY-WIDE FOCUS ON RELIABILITY IN DEMANDING ENVIRONMENTS AND THE DEVELOPMENT OF SOLUTIONS TO MEET THE SPECIFIC DEMANDS OF SCIENTISTS.**

### YOUR DATA WHERE YOU WANT IT AND WHEN YOU WANT IT

The growing emphasis on ocean observing systems requires a wide spectrum of technical solutions to support ocean data collection on a variety of spatial and temporal scales, ranging from physical collection of samples by diver or submersible, to long-term autonomous and remote monitoring of marine environments. The latter is also driving a requirement for ever increasing volumes of data direct to the shore for assimilation into models.

With a proven track record in the offshore energy industry, we also have an enviable reputation for working closely with the world's leading marine institutes to adapt this know-how for ocean observation challenges. Today, we are able to offer a variety of low-power sensing solutions designed for long term seabed deployment, high bandwidth acoustic and optical telemetry, and optimised communications and positioning solutions for unmanned underwater and surface vehicles and other platforms.

### MAXIMISING SCIENCE TIME, MINIMISING DOWNTIME

We know that scientists have to work hard to win funding, so when you finally get to sea, you need to have technology that you can rely on to collect the data you need efficiently and reliably. In these terms, you're no different from our customers in the offshore industry in demanding precision technology that performs reliably in the most demanding environments 365/24/7, reduces costs and enhances safety. And in case you do need us, we're also here around the clock to install, train and maintain.

### SOLVING UNIQUE CHALLENGES

In many cases, vessels, underwater systems and operating environments are unique. That's why we'll work with you even before you procure equipment to fully understand your needs, and where standard off-the-shelf products cannot meet your specific space, weight, depth and functionality demands, we have the know-how and in-house resources to design, test and manufacture customised solutions on time and on budget.



Photo: Briese Schifffahrts GmbH & Co. KG, Research | Forschungsschifffahrt



### WHY INVEST IN SONARDYNE

- Our track record spans more than 45 years supporting demanding and complex science projects
- We work with the world's leading marine research institutes to provide them with innovative solutions on time and on budget
- Our technologies enable data collection on a wide variety of spatial and temporal scales from the coast to the deep ocean
- We offer global support before, during and after your research project – around the clock
- We are committed to maintaining a safe, healthy and sustainable working environment, with zero harm



Photo: Rolls-Royce



## RESEARCH VESSELS

# RANGER 2 LODESTAR AHRS SYRINX DVL NOAS

**WE UNDERSTAND THAT RESEARCH VESSELS UNDERTAKE A WIDE VARIETY OF TASKS, OFTEN IN CHALLENGING ENVIRONMENTS AND REMOTE LOCATIONS. TO SUPPORT THESE NEEDS, WE HAVE DEVELOPED AN UNRIVALLED PORTFOLIO OF VESSEL-BASED TECHNOLOGIES THAT UNDERPIN HIGH-PRECISION SENSOR OPERATION AND POSITIONING, WHILE OUR NAVIGATION AND OBSTACLE AVOIDANCE SONAR IS DESIGNED TO GIVE YOU THE CONFIDENCE TO OPERATE EVEN WHERE THE CHART IS LITERALLY BLANK.**

### ULTIMATE DP INTEGRITY

Out of the box, Ranger 2 Ultra-Short Baseline (USBL) provides stable and repeatable acoustic position referencing for your ship's Dynamic Positioning (DP) system, including those from GE, Kongsberg, MT, Navis, Rolls-Royce and Wärtsilä. But if you undertake critical station keeping activities close to offshore installations or windfarms, where Global Navigation Satellite Systems (GNSS) can be unstable, integration with our vessel-based inertial navigation technology (DP-INS) adds enhanced levels of positioning integrity and resilience to GNSS outages.

### LODESTAR ATTITUDE HEADING AND REFERENCE SYSTEM (AHRS)

Lodestar is a high performance, north-seeking gyrocompass and Attitude Heading and Reference Systems (AHRS) that replaces the need for a separate Motion Reference Unit (MRU) and gyro. It uses the same Ring Laser Gyros (RLG) and accelerometers fitted to most commercial airliners and space exploration platforms, so you can be assured of class-leading levels of performance and reliability. When used with a Ranger 2 USBL system, overall system performance is improved by optimising motion compensation – a configuration known as Optimised USBL.

### SYRINX DOPPLER VELOCITY LOG (DVL)

Our hull-mounted Syrinx DVL measures high precision seabed-referenced velocity speed over the ground in water depths ranging from less than one metre to 175 metres. Syrinx can also be used as a current profiler and/or used to measure speed through the water. Thanks to its use of industry standard telegrams, Syrinx is easy to install and interface with existing bridge navigation systems.

### NAVIGATION AND OBSTACLE AVOIDANCE SONAR – NOAS

When your research takes you into uncharted waters, our forward-looking sonar, NOAS, can help you see what lies ahead under the water and automatically warn of hidden dangers. NOAS generates a geo-referenced 3D model of the seabed up to 600 metres ahead of the vessel on the fly, which can be overlaid on a wide range of electronic chart backdrops. Alerts based on depth, distance from the vessel and estimated time to impact can be configured to warn of potential collision hazards.

### WHY SONARDYNE IS RIGHT FOR YOUR RESEARCH SHIP

- Compatibility with all DP and integrated bridge systems.
- Resilience to GNSS outages with high integrity DP positioning
- Simple, intuitive software
- High performance AHRS from Lodestar based on class-leading Ring Laser Gyro technology
- Vessel speed and current profiling outputs from Syrinx DVL
- Confidence to operate in shallow un-charted areas with NOAS

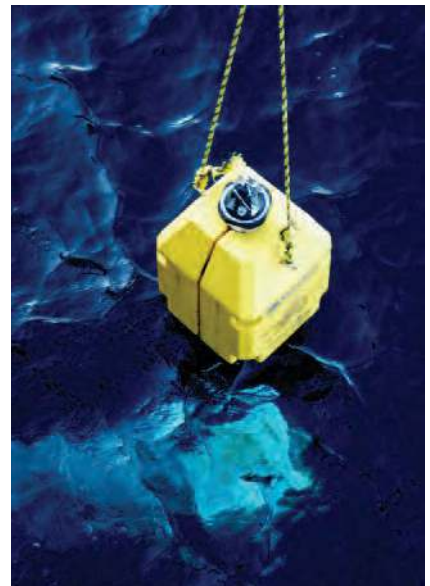
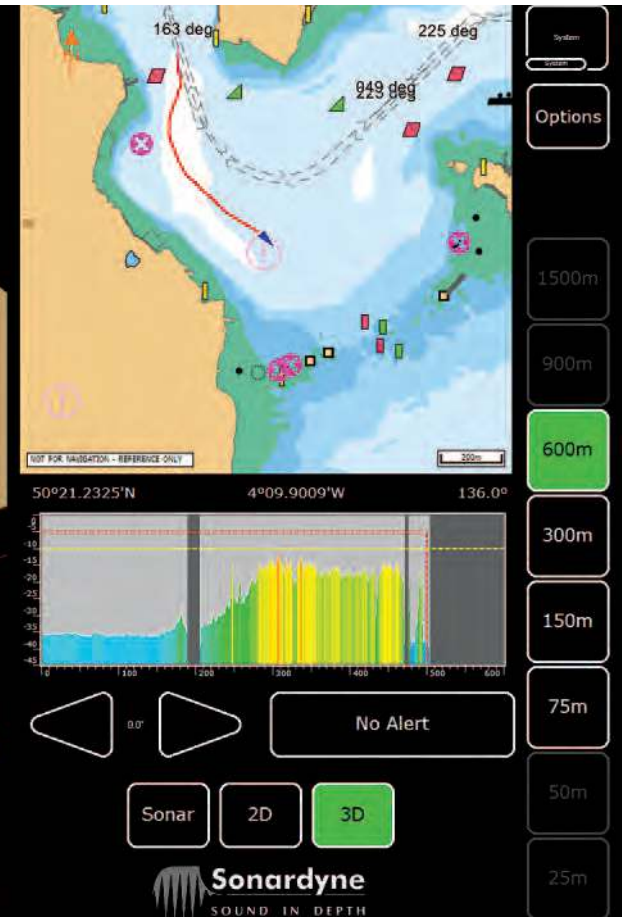
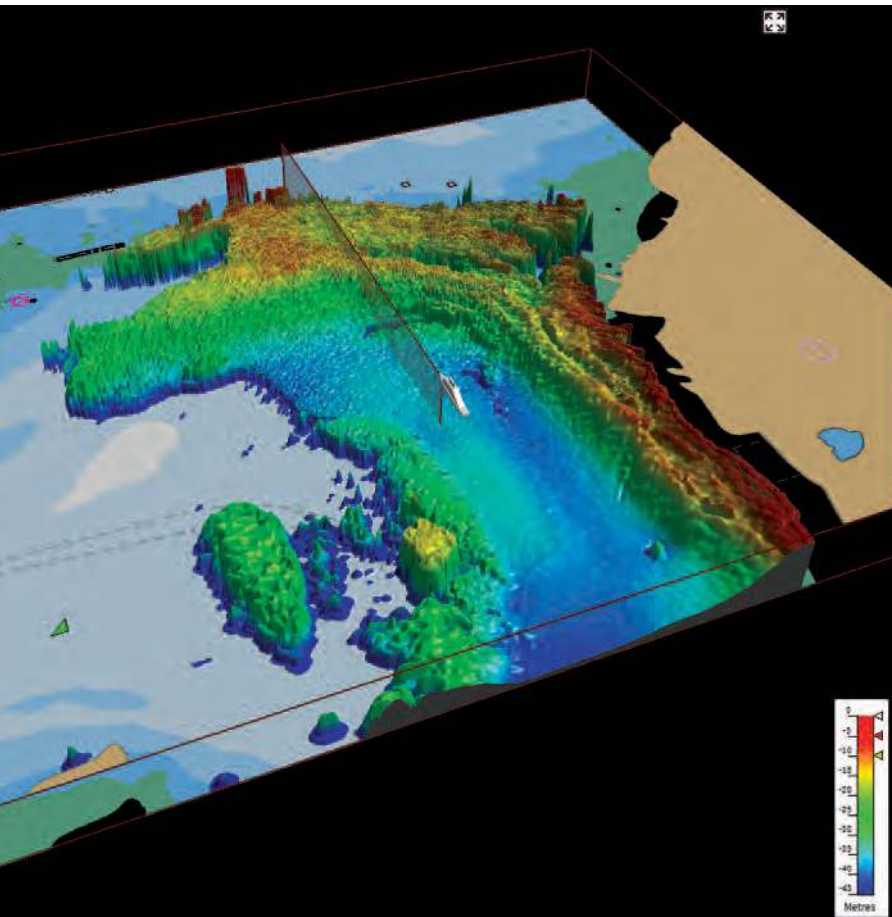




Photo: Woods Hole Oceanographic Institution



## SENSOR PACKAGE TRACKING

# RANGER 2 LMF HPT TRANSPONDERS

**DEPLOYMENT OF SENSOR PLATFORMS AND UNDERWATER VEHICLES IS FUNDAMENTAL TO UNDERTAKING SCIENCE AT SEA AND RANGER 2 IS THE PREFERRED CHOICE OF MANY OF THE WORLD'S LEADING RESEARCH INSTITUTES TO POSITION THESE. IT'S MORE THAN JUST A TRACKING SYSTEM THOUGH, WITH INTEGRATED HIGH SPEED TELEMETRY CAPABILITY AND NOW COMPATIBILITY WITH OUR FAMILY OF ACOUSTIC RELEASES. THIS MEANS THAT RANGER 2 IS AT HOME POSITIONING A SEABED CORER AS IT IS AN AUV.**

### RANGER 2 – ACOUSTIC POSITIONING AND COMMUNICATIONS FLEXIBILITY

Science users rarely have the luxury of remaining on site for long, so the ability to position and communicate with submersibles and instruments, such as corers, camera platforms and geological drills, without having to first deploy a seabed array of transponders, helps maximise your precious ship time. To meet these needs, our Ranger 2 USBL acoustic tracking technology is a highly capable and flexible system that can track multiple underwater targets. At the same time, it can communicate with, and remotely configure, seabed instruments such as our Autonomous Monitoring Transponder (AMT). It can even be used to activate our range of acoustic Release Transponders (RT 6), allowing you to release and track your moorings all the way to the surface for recovery on board.

### LONG RANGE TRACKING

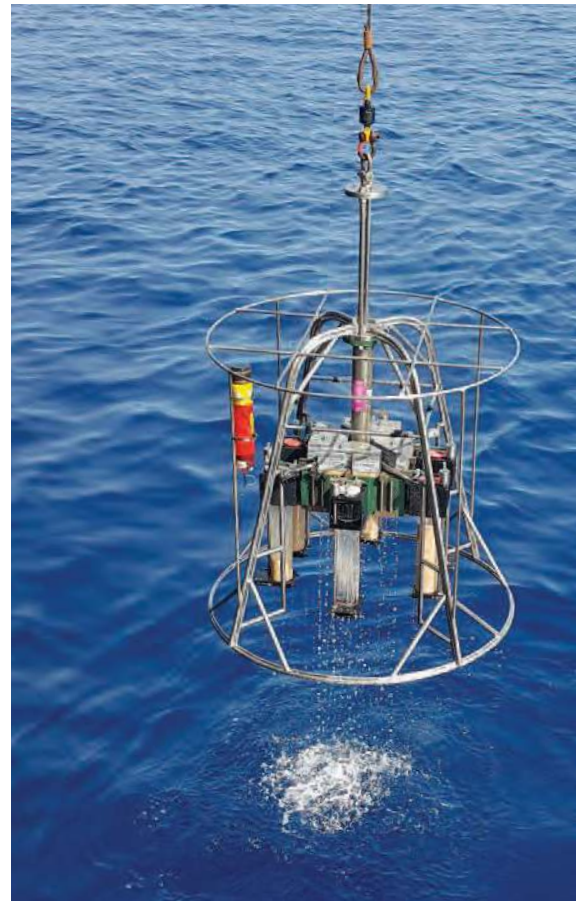
With science projects being among our most demanding for deep and/or long range tracking, we offer several innovative solutions to meet your needs. Our Lower Medium Frequency (LMF 14 – 19.5 kHz) Ranger 2 systems have proven tracking capability to beyond 11,000 metres range, while Inverted USBL (iUSBL) combines a vehicle-mounted USBL transceiver with our Lodestar AHRS in the same unit – providing a calibration-free solution for long layback tracking of towed bodies at high elevations. By mounting the iUSBL system on the towed platform, the system is able to benefit from lower noise levels than close to the ship, enabling much longer tracking ranges to be achieved.

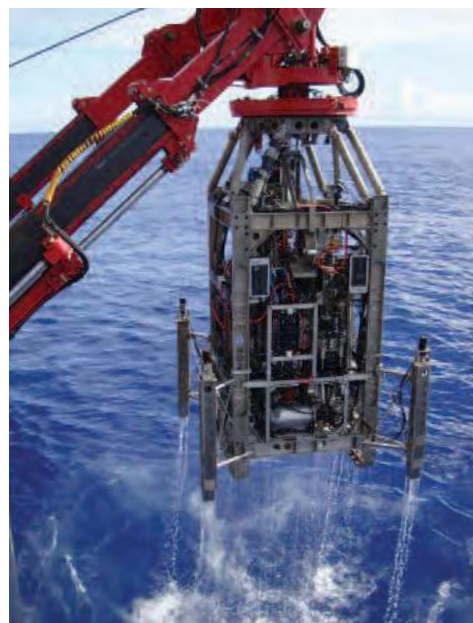
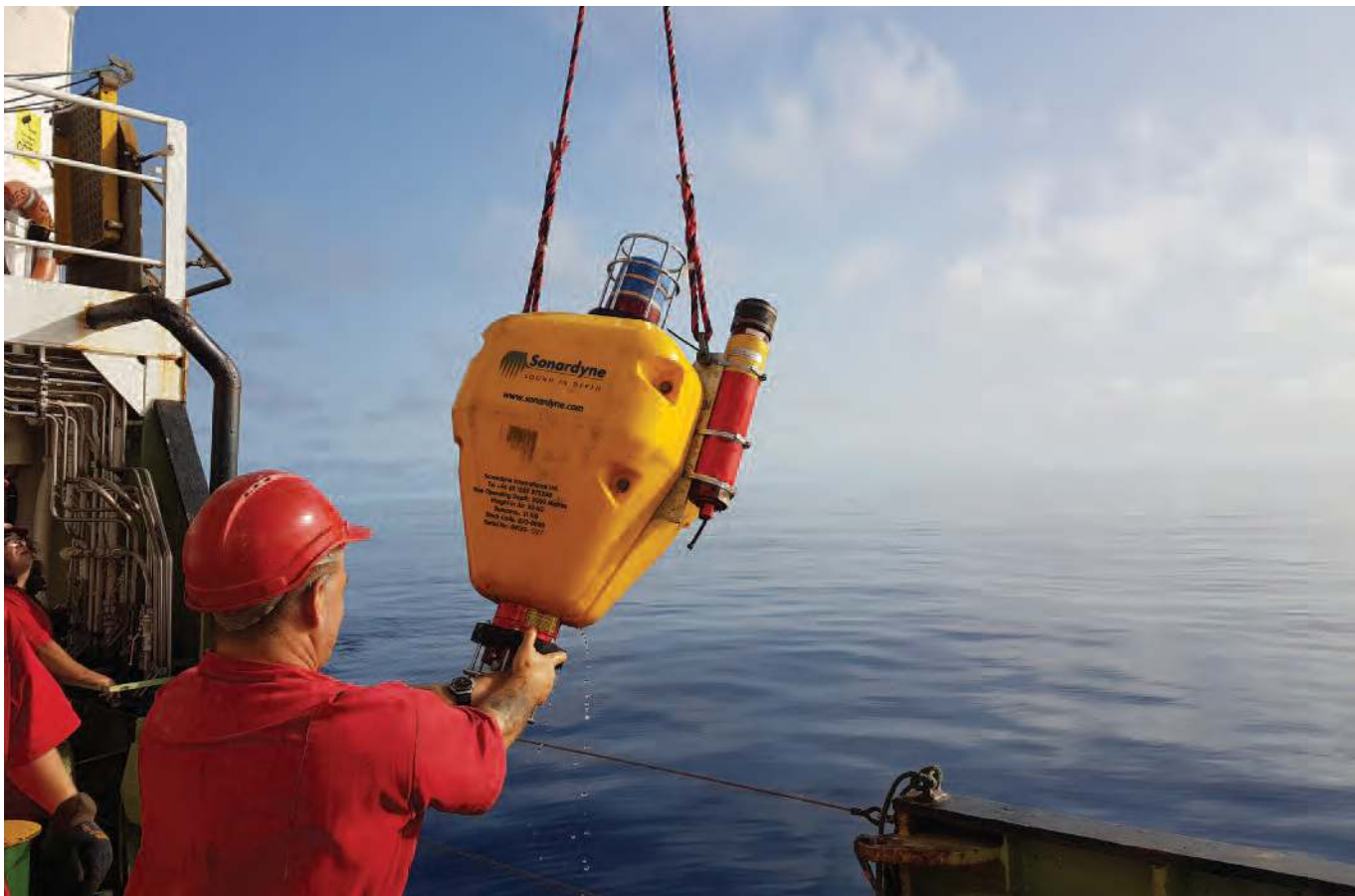
### TRANSCIVER ARRAY SOLUTIONS TO MEET YOUR NEEDS

Our USBL transceiver, called HPT, is available in a range of different designs to suit your vessel, operating environment and task in hand. If your research involves using a vessel of opportunity, then the benefits of using Ranger 2 begin before you've even left port. Our pre-calibrated, all-in-one GyroUSBL transceiver is perfect for installation on a temporary over-the-side mount or a USV, yet delivers the same precision as a permanent installation.

### TRANSPONDERS

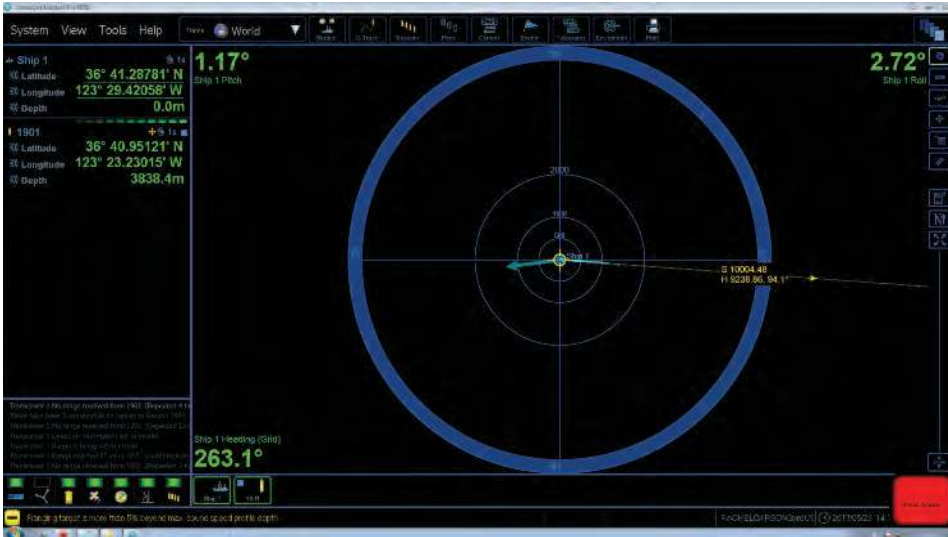
The flexibility of the Ranger 2 family is further extended by our range of transponders to support a wide variety of scientific missions. WMT is a high power transponder capable of operations to 7,000 metres, while AvTrak 6 is our most capable acoustic vehicle instrument, combining the functions of a USBL transponder, LBL transceiver and modem for demanding applications such as AUV operations.





### WHY RANGER 2 USBL IS BEST FOR TRACKING YOUR SENSORS

- Supports LMF for long range (>11 km) and long layback tracking
- Built-in telemetry supports AUVs and data harvesting from seabed sensors
- Compatible with a wide range of 6G transponders including RT 6
- 'Out of the box' operation on vessels of opportunity or USVs with GyroUSBL
- Simple and intuitive software
- Compatible with all DP systems



## SHALLOW WATER TRACKING

# MICRO AND MINI-RANGER 2

**WITH SMALL ROVS AND AUVS INCREASINGLY BEING USED IN ADDITION TO DIVERS FOR SCIENCE, THE ABILITY TO TRACK AND COMMUNICATE WITH THEM IS NOT JUST A QUESTION OF SAFETY AND EFFICIENCY, BUT ONE OF SCIENTIFIC VALUE WITH PRECISE GEOLOCATION OF SAMPLES OFTEN BEING CRITICAL. WITH OUR SIXTH-GENERATION (6G) AND WIDEBAND 2 DIGITAL SIGNAL TECHNOLOGY INSIDE, MICRO-RANGER 2 AND MINI-RANGER 2 COME WITH MANY OF THE CAPABILITIES THAT OUR USERS HAVE COME TO ASSOCIATE WITH THE RANGER 2 SYSTEM, BUT IN SMALLER PACKAGES TO MEET THESE NEEDS.**

### MICRO-RANGER 2

Micro-Ranger 2 is an acoustic positioning system for tracking divers, remotely operated and autonomous underwater vehicles. Portable and quick to mobilise, it can be deployed from any waterside location or vessel-of-opportunity, including RHIBs and small survey vessels. This makes it ideal for supporting science operations conducted in rivers, lakes and coastal waters. The system has an operating range of 995 metres and can update you with the position of each target being tracked up to twice a second. If in time your projects demand more capability, the system can be upgraded to Mini-Ranger 2 by exchanging the Micro-Ranger Transceiver (MRT) for a HPT 3000 transceiver.

### MINI-RANGER 2

Providing a standard 995 metres operating range, upgradeable to 4,000 metres, Mini-Ranger 2 can track up to 10 targets simultaneously and is a compact system, which is ideal for temporary installation on small vessels-of-opportunity, as well as being suitable for permanent fit to a small research vessel. At the heart of Mini-Ranger 2 is the HPT 3000 transceiver which is optimised for performance in shallow water and at high elevation, as well as deeper water.

### SIMPLICITY OF OPERATION

Both systems have been designed to be easy to deploy and operate, reducing the time that you need to mobilise a project. Key to this is the Ethernet Serial Hub, which provides a single, but all encompassing, robust interface. This means connection to a topside computer or ruggedised laptop is simple and user-friendly – either directly or through a ship's network via a single network socket. Ethernet based communications also enable improved in-water diagnostics, permitting the operator to both listen to, and visualise signals, and noise in the water.

### TRANSPONDERS TO FIT YOUR PROJECT NEEDS

Micro and Mini-Ranger 2 are both compatible with our small USBL transponders, ranging from Nano (weighing in at only 225 grams) to the popular Wideband Sub-Mini 6+ (WSM 6+), as well as our MF Release Transponder 6s (RT 6). Options to track AUVs using the Nano AvTrak 6 OEM are also available with the Robotics Pack. Both systems are also capable of tracking aircraft 'black box' pinger locators.







### WHY CHOOSE MICRO AND MINI-RANGER 2 TO TRACK YOUR TARGETS

- Cost-effective solutions for tracking divers, tow-bodies, ROVs and AUVs
- Portable and quick to mobilise
- Uses the same simple and intuitive software as Ranger 2 which can be installed on user's own PC or laptop
- Compatible with a wide range of our mini-beacons, as well as aircraft locator beacons.
- Suitable for use on an AUV fitted with our Nano AvTrak 6 OEM using Robotics Pack



## MARINE ROBOTICS

# LODESTAR AHRS SPRINT INS SYRINX DVL AVTRAK 6

**INCREASING ENDURANCE AND CAPABILITY HAS RESULTED IN MARINE AUTONOMOUS AND ROBOTIC SYSTEMS TRULY COMING OF AGE FOR SCIENTIFIC APPLICATIONS. HOWEVER, ONE SIZE DOESN'T FIT ALL AND THAT'S WHY OUR SUBSEA TECHNOLOGIES HAVE BEEN DESIGNED TO BE COMPATIBLE WITH VEHICLES OF ALL SIZES AND CAPABILITIES; FROM MICRO AUVS TO EXTRA-LARGE AUVS, AND EVERYTHING IN BETWEEN.**

### LODESTAR AHRS AND SPRINT INS

With a track record spanning more than 10 years, our Lodestar AHRS meets the needs of ROVs for mid-water station keeping, while SPRINT is a high quality INS that improves the speed and efficiency of ROV and AUV operations. Aiding from your vehicle's DVL, pressure sensor, USBL or LBL acoustic system – even if it's from another vendor – can further improve performance.

Both are available with a choice of performance levels and by using the same hardware platform, there is the ability to upgrade capability in the field. Lodestar and SPRINT come in a standard 4,000 metre rated titanium housing (options for 6,000 metre) with on-board data and power backup, fast settling time and a range of endcaps and connectors. An OEM version is also available for AUVs with restricted payload space.

### SYRINX DVL AND SPRINT-NAV

Syrinx meets the needs of users who require high integrity and high performance navigation aiding over a variety of depths and seabed types. Operating at 600 kHz, Syrinx works at altitudes comparable to a 300 kHz DVL, but has the high resolution expected of a 1200 kHz DVL. Available in a variety of depth ratings and as an OEM version, Syrinx has dual serial and Ethernet outputs, water blocked replaceable transducers and because it's made in the UK, is easy to export.

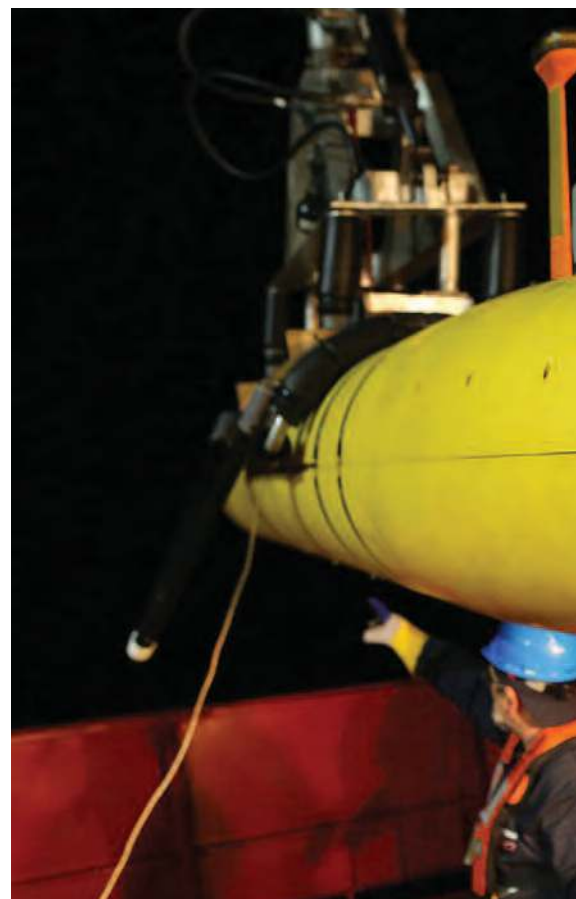
Syrinx integrated in a single housing with SPRINT becomes SPRINT-Nav, one of the smallest inertial DVL instruments available on the market. Mechanical alignment of the sensors improves the overall navigation performance and ensures a rapid and simple mobilisation, while operations in rugged terrain are resistant to loss of lock of one or two DVL beams due to tight beam-level integration with SPRINT.

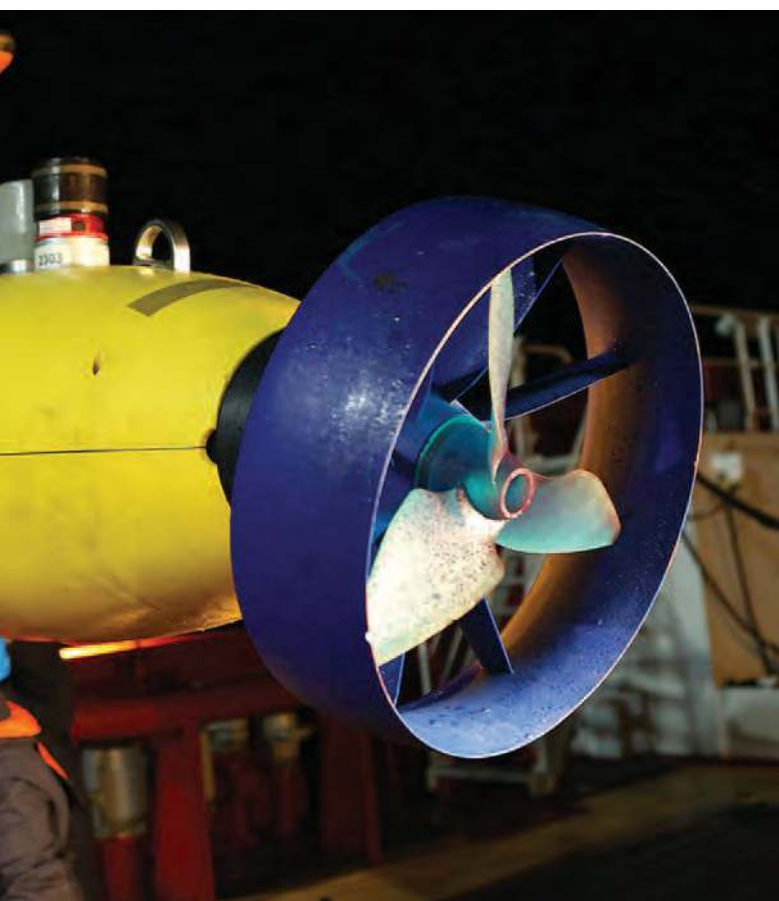
### AVTRAK 6

AvTrak 6 used in conjunction with Ranger 2 USBL systems is a versatile instrument that combines the functions of transponder, transceiver and telemetry link in one low power unit that has been designed to meet the requirements of a wide variety of AUV mission scenarios and vehicle types. Available in three different sizes to suit large and small AUVs, including man-portable variants, AvTrak 6 enables an AUV to undertake simultaneous USBL tracking and telemetry with a surface vessel, as well as AUV-to-AUV communications for swarm deployments.

### WHY CHOOSE SPRINT INS, SYRINX DVL AND AVTRAK 6

- Low-risk and proven; track record exceeding 10 years
- All from one manufacturer; acoustics, DVL and INS
- Lodestar and SPRINT built around high-grade Honeywell RLGs
- Delivers unprecedented levels of performance for ROV and AUV guidance and survey
- Syrinx is UK made for easy export
- Integration service available to equip your vehicles with our technology





## SUSTAINED OCEAN OBSERVATIONS

# ACOUSTIC RELEASES & MODEMS

**WITH AN INCREASING NEED FOR SENSORS TO BE DEPLOYED IN-SITU FOR MONTHS, IF NOT YEARS AT A TIME, THE DATA GATHERED BY THESE SENSORS IS AS VALUABLE AS THE SENSOR ITSELF. CONSEQUENTLY, WE REALISE THAT THE RECOVERY OF BOTH IS VITALLY IMPORTANT TO YOU. FOR THE INSTRUMENT, THAT MEANS HAVING ACOUSTIC RELEASES THAT YOU CAN RELY ON TO WORK LONG AFTER THE INITIAL DEPLOYMENT; AND FOR THE DATA, THAT MEANS EFFICIENT AND FLEXIBLE TELEMETRY SOLUTIONS.**

### RELEASE TRANSPONDER 6 (RT 6)

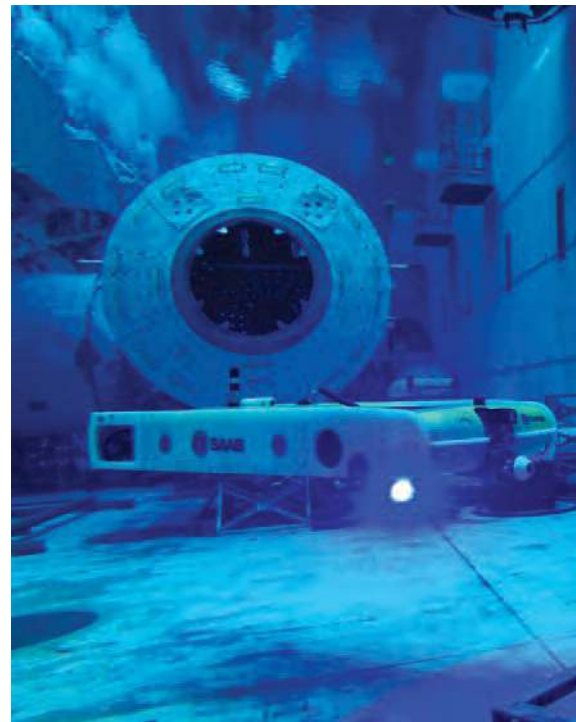
Our new range of acoustic releases, RT 6, combines the extensive track record of the previous models with the flexibility of our 6G platform, resulting in compatibility with our Ranger 2 USBL family and enhanced battery life. With release solutions for depths down to 6,000 metres and deployment life of up to four years on alkaline batteries, we can support most scientific projects with our standard off-the-shelf products. Our releases are most commonly used to anchor oceanographic moorings to the seabed. However, their compact size and compatibility with Ranger 2 makes them ideal for incorporation into instrument frames or lowered platforms to enable deployment of sub-system packages.

### MODEM 6

Whether you're working in shallow or deep; quiet or noisy waters, our family of Modem 6 instruments use our Wideband 2 spread spectrum digital signal processing to provide reliable, bi-directional communications with data rates between 100 and 9,000 bps. The technology is mature and low-risk with a track record of operations from many different platforms, including long endurance USVs which have demonstrated routine data harvesting from a network of our Autonomous Monitoring Transponders (AMT) in depths in excess of 5,400 metres. With over 500 unique addresses, you can also be assured that your operations will not interfere with other operations that might be taking place nearby.

### BLUECOMM

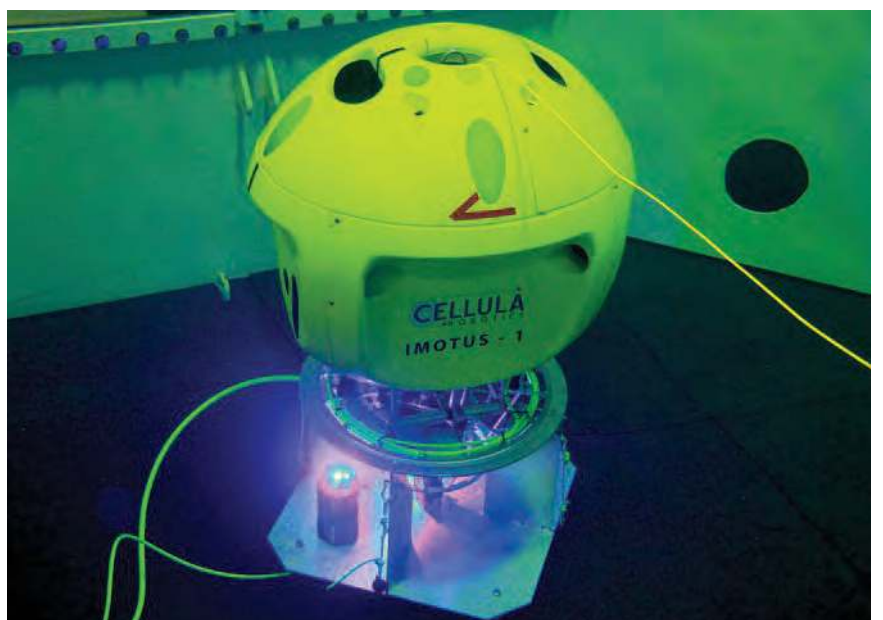
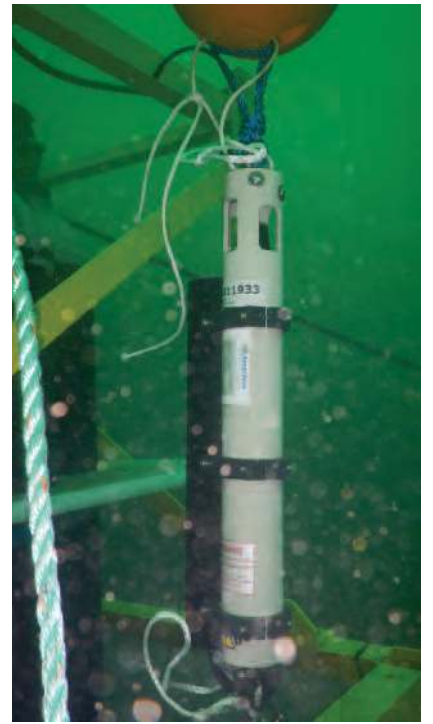
Increasingly though, acoustic telemetry systems just aren't fast enough to transmit the large amounts of data being collected by in-situ instruments. Until recently, the only recourse has been to recover the instrument to a vessel, which is both costly and time-consuming. Our high speed optical modem, BlueComm, changes everything. Using rapidly modulating LEDs, a pair of BlueComm modems can transfer large volumes of data at high speed (from 5 to 500 Mbps) over hundreds of metres to one another – and do it all using very little power, making it ideal for low-powered unmanned or autonomous platforms. Fitted with BlueComm, an AUV can pass through an area of deployed data-logging instruments and harvest their data quickly and efficiently. BlueComm is transforming the way we think about access to subsea instrument data – it's now possible to 'connect' your subsea data back to your laboratory – without the costs of a cabled observatory.





### WHY CHOOSE SONARDYNE TO DEPLOY AND RECOVER YOUR DATA

- Highly reliable acoustic releases with long endurance capability and compatibility with Ranger 2 USBL
- Depth rated down to 6,000 metres
- Up to 9,000 bps acoustic telemetry available from our 6G product range
- Acoustic telemetry solutions to meet your specific project needs, including remote harvesting using a USV
- Game-changing BlueComm provides high bandwidth telemetry capability for rapid, large data transfer
- Wide range of BlueComm applications, including live video streaming, tetherless vehicle control and data harvesting



## SEABED GEODESY

# AMT FETCH FETCH AZA

**UNTIL RECENTLY, THE INABILITY TO UNDERTAKE COST-EFFECTIVE GEODETIC MEASUREMENTS IN THE OUTERMOST AREAS OF OFFSHORE SUBDUCTION ZONES, HAS BEEN A CRITICAL FLAW IN SEISMIC HAZARD ASSESSMENT. IN RESPONSE, WE'VE WORKED CLOSELY WITH SOME OF THE WORLD'S LEADING MARINE INSTITUTES TO ADAPT OUR TECHNOLOGY TO PROVIDE NEW TOOLS THAT ARE NOW IN OPERATION IN SEVERAL TECTONICALLY ACTIVE AREAS AROUND THE WORLD.**

### AUTONOMOUS MONITORING TRANSPONDER (AMT)

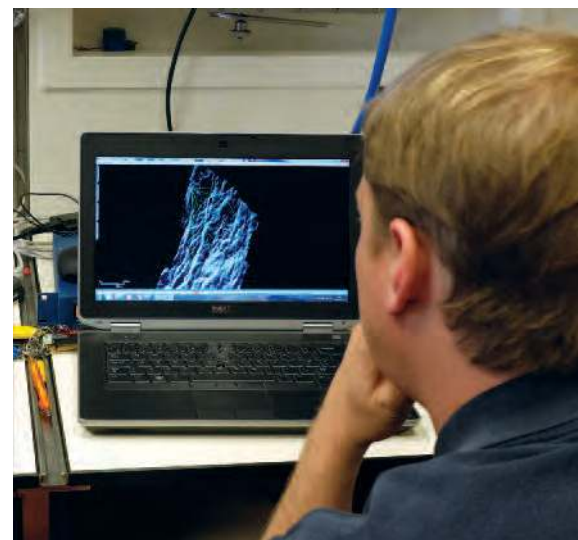
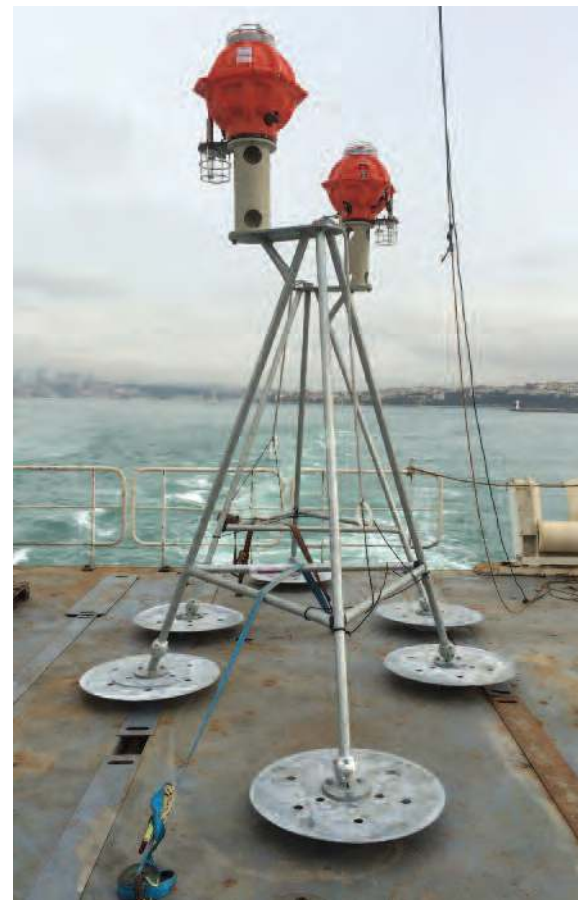
AMTs are capable of recording hundreds of thousands of stable, highly precise geodetic observations, safely log the data and on command, wirelessly transmit it up to the surface. AMT is a long-life (up to five years depending on configuration), deep-rated acoustic instrument fitted with high resolution pressure, sound velocity and temperature sensors, all built around our 6G hardware platform and Wideband 2 digital signal technology. AMTs run a fully automated logging regime, gathering acoustic travel time (range) between neighbouring units, pressure, sound velocity, temperature and tilt data at intervals defined by the user. The integrated modem transfer rate of up to 9000 bps enables data to be extracted in minimal vessel time, reducing operational costs, or alternatively we can supply systems for an AUV, gateway buoy or USV to harvest data remotely on demand.

### FETCH

Fetch supports the most demanding long-term seabed geodesy projects. It's available with many of the same features as AMT but thanks to its glass sphere housing, it can be equipped with a high capacity primary lithium battery pack (up to 505 Ahr), to support deployments in excess of 10 years. Additionally, Fetch can be fitted with up to three high precision pressure sensors on a single manifold, with scope for other internal and external sensors to be fitted as required. Bluetooth and serial links are available for testing and configuration before deployment. The ultra-low power platform only powers up sensors when required and logs and timestamps the data to an internal SD memory card. We also supply a GPS-Acoustic (GPS-A) payload for USVs that enables precise, absolute positioning of Fetch deployed on the seabed.

### FETCH AMBIENT-ZERO-AMBIENT (AZA)

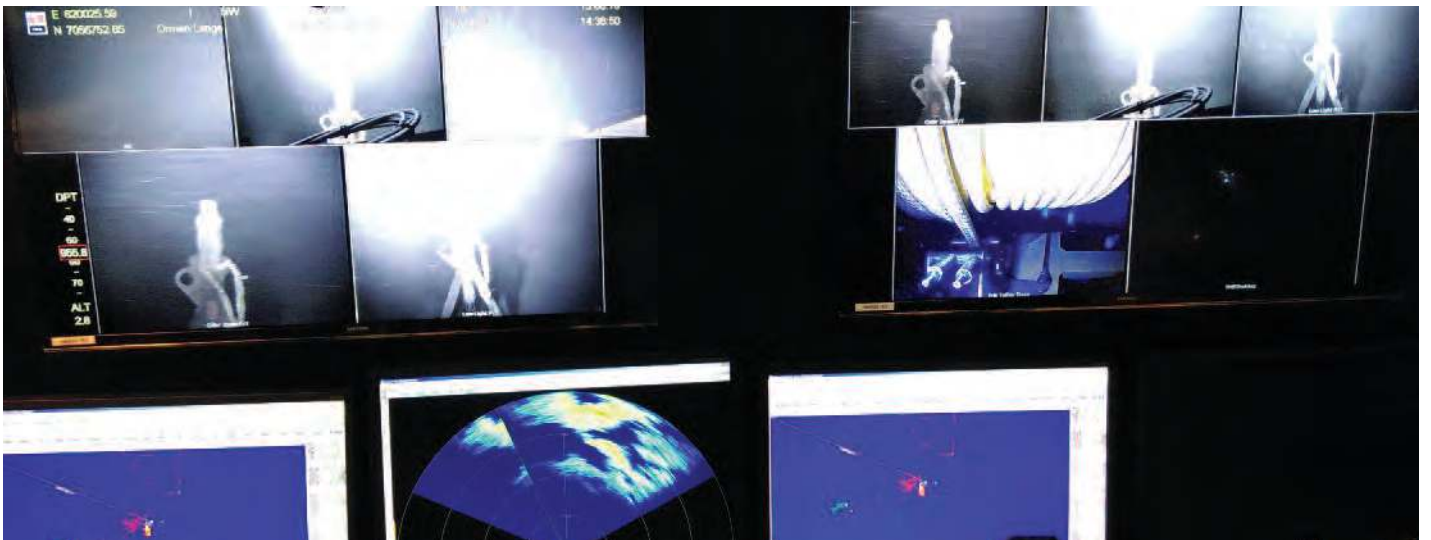
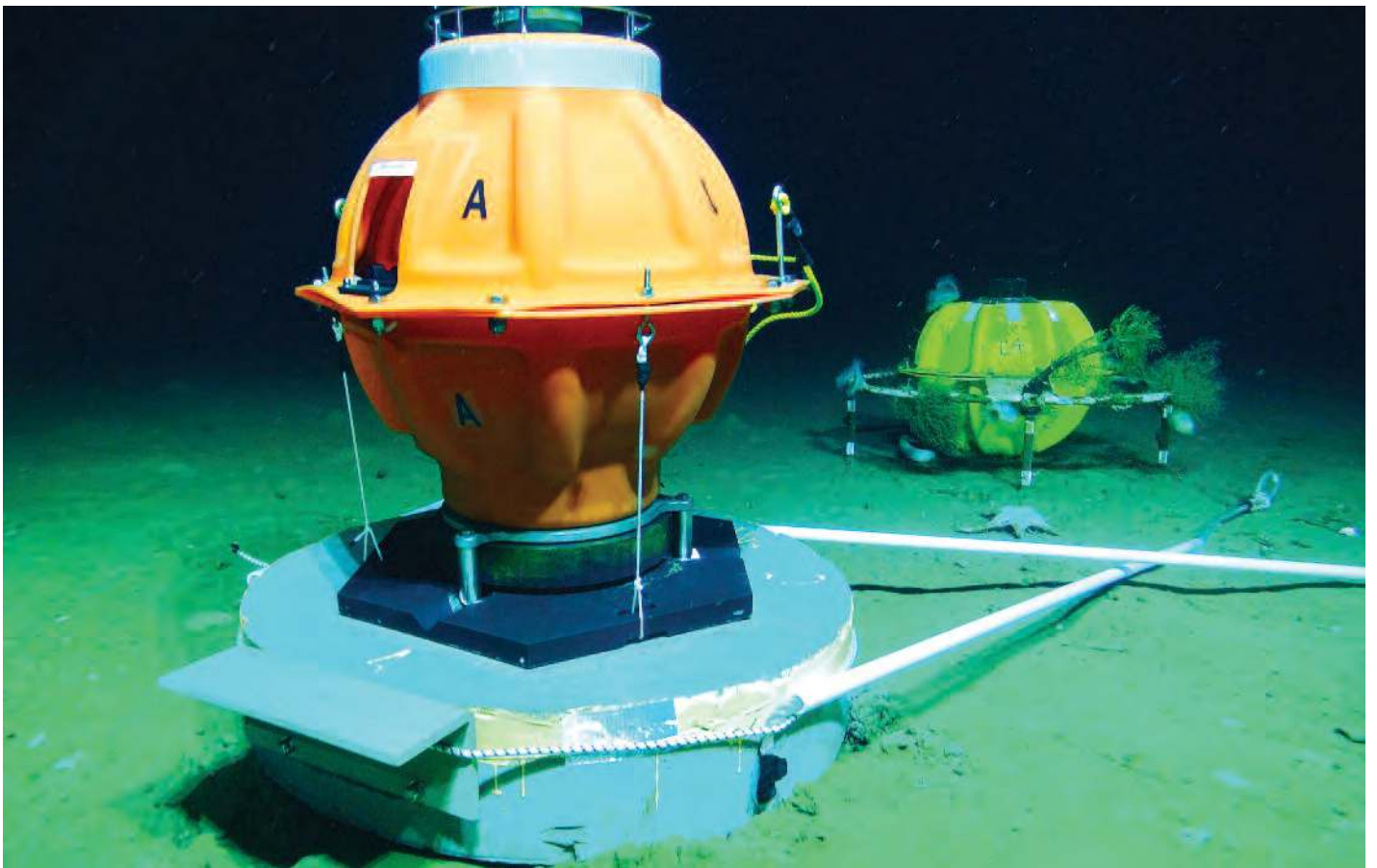
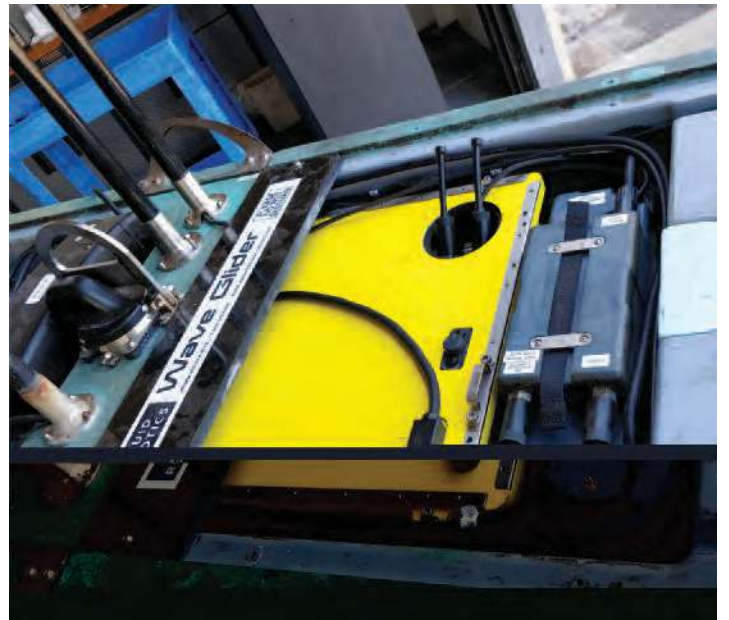
Fetch AZA has been developed in response to the fact that despite the best efforts of manufacturers, all pressure sensors drift to some degree similar to, or even greater, than the actual subsidence signal – potentially between 2 and 20 cm/year in 2,000 metres of water. That's why it's important to regularly recalibrate pressure sensors, but this obviously conflicts with the need for long term deployments. AZA uses a patented system to periodically calibrate the high pressure measurement sensor against a low pressure reference sensor at near zero pressure. Because of the reference sensor accuracy and its very low drift, the drift of the high pressure sensor is effectively eliminated.





### WHY CHOOSE SONARDYNE MONITORING TECHNOLOGY

- Compatibility with Ranger 2 USBL for tracking, data recovery and acoustic release
- Low-risk and proven; track record exceeding 10 years
- Wide variety of sensor options and designs to suit any applications
- Extremely long endurance deployment of up to five years (AMT) and in excess of 10 years (Fetch)
- Ambient-Zero-Ambient (AZA) option for Fetch provides in-situ calibration of pressure sensors



## SEISMIC EVENTS

# TSUNAMI DETECTION SYSTEM

**SONARDYNE'S TSUNAMI DETECTION SYSTEM IS BASED ON OUR WORLD-LEADING EXPERTISE IN PRECISION PRESSURE MEASUREMENT AND UTILISES OUR PROVEN COMPATT PLATFORM. CONSEQUENTLY YOU BENEFIT FROM AN EXTENSIVE DEPLOYMENT TRACK RECORD THAT MEANS YOU CAN DEPLOY OUR SYSTEMS FOR MANY YEARS WITH COMPLETE CONFIDENCE. ALREADY DEPLOYED IN NATIONAL MONITORING NETWORKS FROM THE PACIFIC TO INDIAN OCEANS, OUR LATEST SYSTEMS ENJOY ALL THE BENEFITS OF OUR 6G HARDWARE PLATFORM AND WIDEBAND 2 DIGITAL SIGNAL TECHNOLOGY.**

### DEEP OCEAN MONITORING

A tsunami wave in deep water creates a small but measurable change in pressure that will be maintained for as long as 20 minutes. By monitoring any such changes, our Bottom Pressure Recorder (BPR) will trigger an alarm that sends an acoustic warning message to any suitably configured third-party surface buoy fitted with a 6G transceiver. From there, it can be forwarded by satellite transmission to a monitoring centre, where it can be correlated with other seismic sensors so that a warning can be issued to vulnerable coastal communities if appropriate. This means that the first warning of a tsunami, caused by a small variation in water pressure on the seabed thousands of miles from shore, can be in the office of the monitoring organisation within minutes.

### TECHNOLOGY THAT YOU CAN RELY ON

The BPR is a customised version of our highly successful Compatt 6 acoustic transponder, featuring Wideband 2 digital acoustic technology to provide robust data transmissions even in difficult acoustic conditions. Operating in the LMF (14 – 20 kHz) band, the system is supplied with a buoy-mounted transceiver, but also works with any of our compatible surface dunkers or transceivers, including a Ranger 2 LMF HPT. This two-way link also enables the unit to be remotely configured, for example, if the operator wishes to put the unit into an alert mode in anticipation of a tsunami. The instrument is optimised for low-power consumption and long battery life for long term deployments, and can also be supplied as a glass-sphere (Fetch). This can be deployed for up to 10 years without needing to recover the instrument and in water depths down to 7,000 metres.

The BPR continuously monitors water pressure, saving data every 15 seconds and in routine operation acoustically transmits this data hourly to a buoy on the surface. Alongside this, the instrument runs the same NOAA algorithm as used in the Deep-ocean Assessment and Reporting of Tsunamis (DART) system, which compares the measured pressure with the predicted tidally modified pressure based on the previous three hours history to correct for local conditions. If two consecutive differences between both measurements exceed three centimetres, the instrument goes into an alert mode and transmits a sequence of messages containing high resolution pressure data to the surface over the next few hours.

### WHY CHOOSE SONARDYNE'S TSUNAMI DETECTION SYSTEM

- Based on our low-risk 6G hardware platform and Wideband 2 digital signal technology
- Compatible with LMF Ranger 2 USBL for tracking during deployment and recovery, as well as data recovery
- Uses NOAA's standard detection algorithm and DART® message format
- Deployments of up to 10 years
- 100–900 baud, user payload, bi-directional acoustic telemetry between seabed instrument and surface buoy







## OCEAN CURRENTS

# PRESSURE INVERTED ECHO SOUNDER

**OUR PRESSURE INVERTED ECHO SOUNDERS (PIES) ARE POWERFUL SCIENTIFIC INSTRUMENTS CAPABLE OF SUPPORTING OCEAN CURRENT AND WATER/AIR INTERFACE RESEARCH. IN COMMON WITH OUR OTHER IN-SITU MONITORING INSTRUMENTS, PIES IS BASED ON OUR LOW-RISK 6G HARDWARE PLATFORM AND WIDEBAND 2 DIGITAL SIGNAL TECHNOLOGY**

### TWO-WAY TRAVEL TIME

The Pressure Inverted Echo Sounder (PIES) is a long-life sensor logging instrument that accurately measures the average sound velocity through a column of water from the seabed to the sea surface. It works by transmitting a wideband acoustic pulse from its stable location on the seabed. This pulse is reflected off the sea surface and returns to the seabed, where it is detected by PIES. The resulting data enables two-way travel-time, often known as Tau ( $\tau$ ), to be calculated. At the same time, an accurate measurement of depth (distance to the surface) is made using a highly accurate internal pressure sensor. Using a robust empirical relationship between  $\tau$  and vertical profiles of temperature, salinity and density (derived from historical measurements), arrays of PIES can be used in large scale observations of ocean currents.

PIES is also capable of monitoring sea state (and by inference wind-speed) as periods of low sea state are characterised by larger, stronger and more specular reflection from the surface; while weaker, more diffuse returns result from high sea states.

### ROBUST DATA RECOVERY

As with our other in-situ instruments for ocean science, PIES is based on our existing highly successful 6G hardware with Wideband 2 digital acoustic technology, which also provides robust data transmissions even in difficult acoustic conditions. Operating in the LMF (14 – 20 kHz) band, any of our LMF surface dunkers or transceivers can be used to recover recorded data at data rates ranging from 200 to 9,000 bits per second. These include our LMF Ranger 2 USBL systems, which can also be used for positioning during deployment and recovery. Nominally set up to transmit and record every five minutes, PIES can be configured serially before deployment as well as using the telemetry link once deployed.

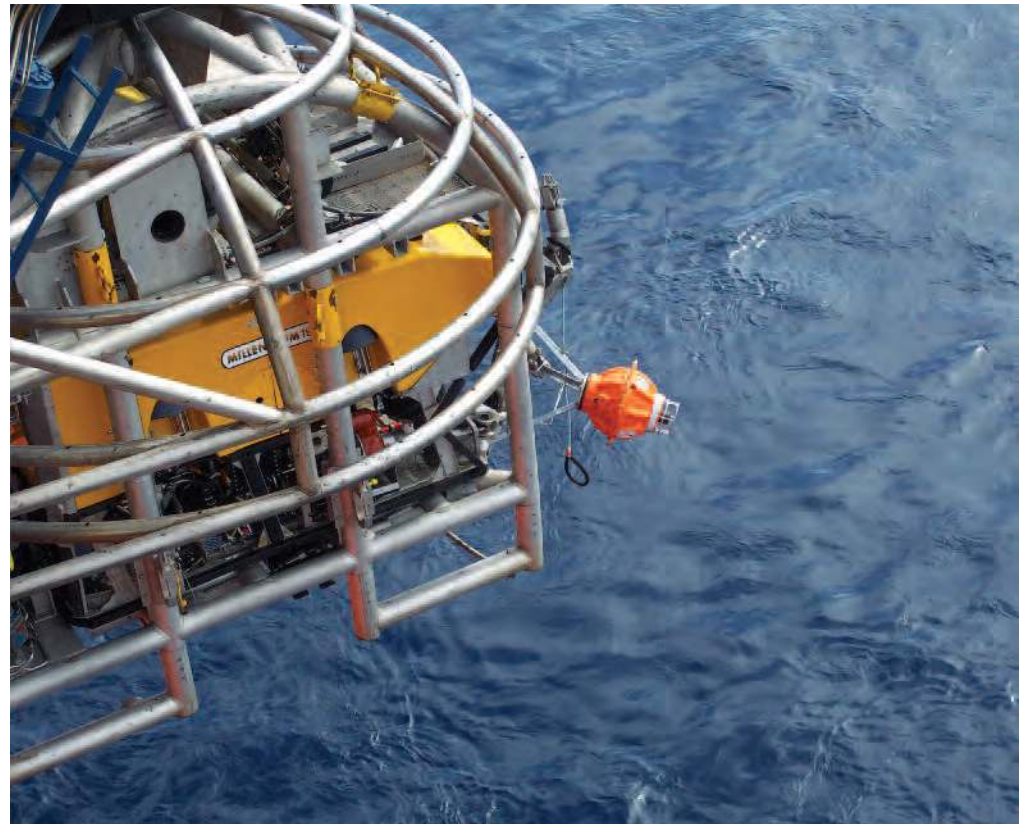
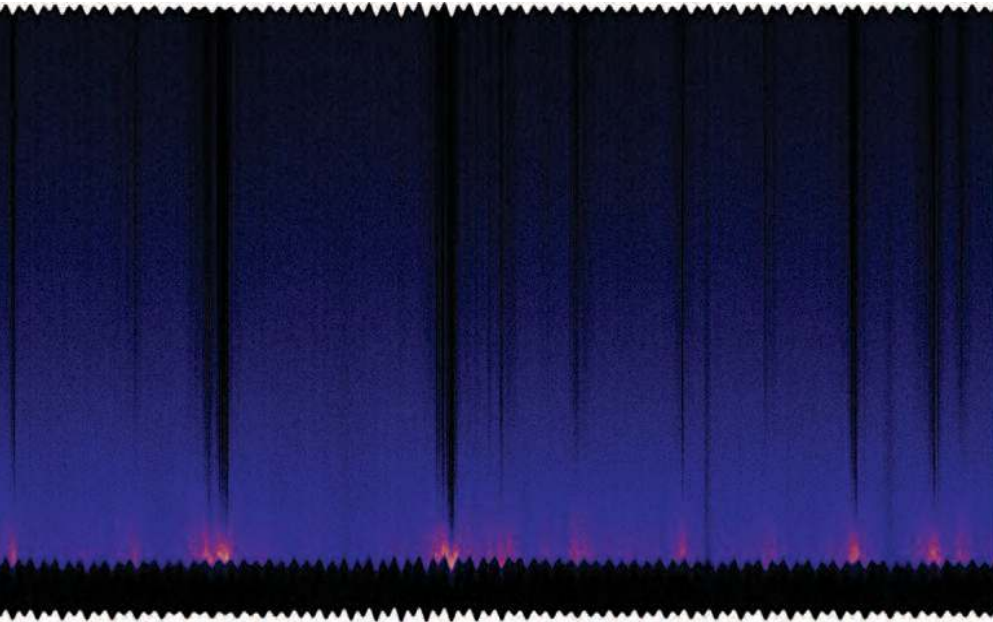
### GETTING THE MOST FROM YOUR PIES DEPLOYMENT

To achieve long term deployments, the ultra-low power platform only powers up sensors when required and logs and timestamps the data to an internal SD memory card. In its basic configuration, PIES can easily achieve deployments of several months, while a glass-sphere variant with battery options ranging up to a 505 Ah, is also available to support extended deployments of several years depending on sampling interval configuration.

### WHY CHOOSE SONARDYNE'S PRESSURE INVERTED ECHO SOUNDER?

- Low-risk and proven; track record exceeding 10 years
- Compatible with LMF Ranger 2 USBL for tracking, data recovery and acoustic release
- Options for data recovery, including via USV
- Based on our core 6G hardware platform and Wideband 2 digital signal technology
- Extremely long endurance deployment; up to 10 years





## SEARCH AND RELOCATION

# SPRINT-MAPPER SOLSTICE DEEP MARKERS

**WE PROVIDE A COMPREHENSIVE TOOLKIT OF TECHNOLOGIES FOR LOCATING AND IMAGING WRECKS AND OTHER ITEMS ON THE SEABED, WHETHER THOSE ARE CENTURIES OLD OR HAVE ONLY BEEN IN THE WATER FOR A MATTER OF HOURS.**

### SPRINT-MAPPER

Advances in underwater laser, LiDAR and multi-beam technologies mean that it's now possible for an ROV (or manned submersible) to rapidly conduct highly detailed surveys of wrecks, archaeological and benthic science sites. SPRINT-Mapper underpins this capability with tightly integrated, acoustically-aided SPRINT inertial and Syrinx DVL navigation, which is post-processed using our powerful software tool for positioning and orientation of the laser/ camera, LiDAR or multi-beam sensor data. Typical accuracies of one centimetre in the geo-referenced 3D point cloud are achievable for single run line distances of around 20 metres. For these projects, we can provide a complete equipment, planning and operations service.

### SOLSTICE

Solstice is a Multi Aperture Sonar (MAS) that provides class-leading imagery with co-registered swath bathymetry. Specifically designed for installation in low logistic platforms, including AUVs, it has a compact design and low-power consumption of only 18 Watts. MAS operates by dynamically focussing Solstice's 32 elements across the whole 200 metre wide swath, which also produces enhanced Signal-to-Noise Ratio (SNR). This results in highly detailed side-scan imagery, accurately draped over the bottom topography, while on-board processing supports Computer Aided Detection and Classification (CAD/CAC) and Automatic Target Recognition (ATR).

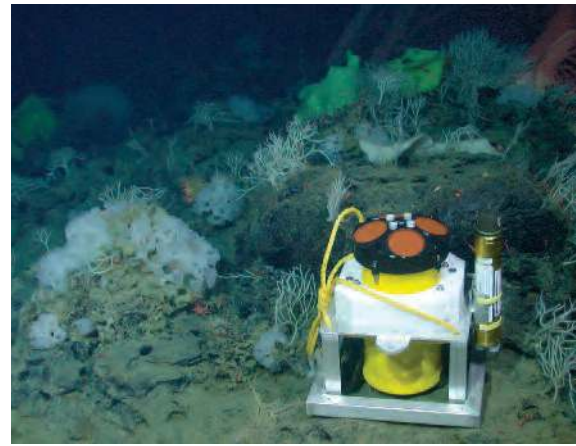
### DEEP MARKERS

We provide a range of instruments for fast and efficient routine or emergency marking and relocation of underwater structures, diving bells and instruments on the seabed – even in zero visibility. Where deep operations are involved (12,000 metres), our deep marker beacon, features a long life battery pack making them ideal for use as permanent markers. Each transponder is individually encoded enabling many transponders to be used on the same site to unambiguously mark the location of your targets.

These beacons can be relocated using either our hand-held range and direction device Homer-Pro, or ROV-Homer for ROVs. Both work by interrogating the designated transponder to determine its range and direction and indicating the direction in which to move. In the case of ROV-Homer, this is displayed on the user's PC, while with Homer-Pro, the information is displayed on the instrument.

### BLACK BOX LOCATION

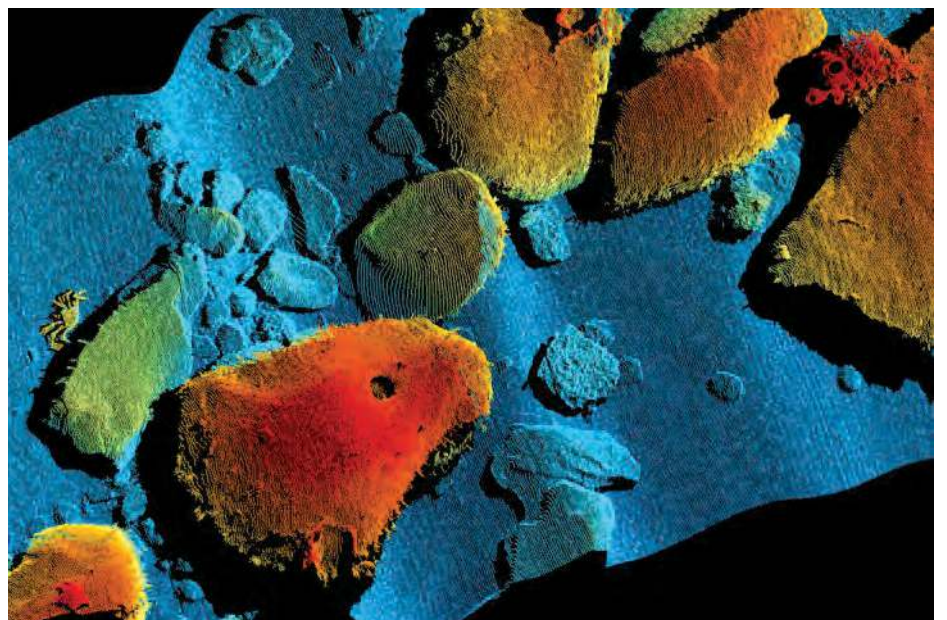
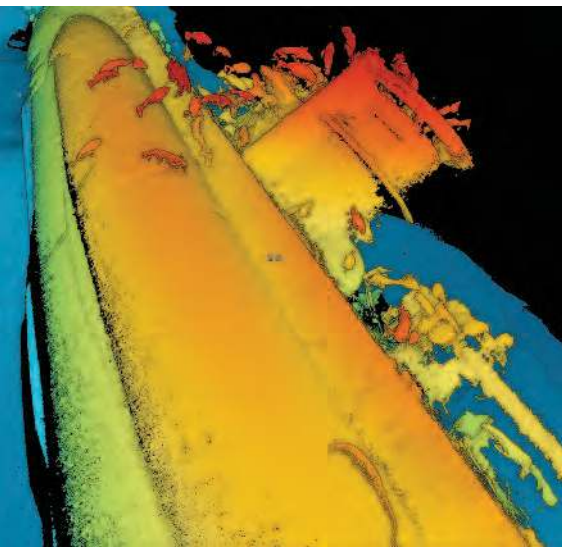
When a commercial aircraft is lost over water, the race begins to locate its flight data and cockpit voice recorders. Our ROV-Homer, Homer-Pro and Ranger 2 USBL systems be used to detect and localise emergency pinger signals.



### WHY INVEST IN SONARDYNE SEARCH AND RELOCATION

- Tightly integrated acoustic, DVL and INS gives you the most accurate positioning data for your mobile mapping missions
- Highly trained personnel ensure your SPRINT-Mapper project is a success, from pre-planning right through to data delivery
- Solstice images are designed to be of the highest quality possible from side-scan sonar
- Solstice increases the operational envelope of your vehicle by providing wide swath coverage
- Our transponders provide low-cost and long endurance target marking





# OCEAN SCIENCE CAPABILITIES

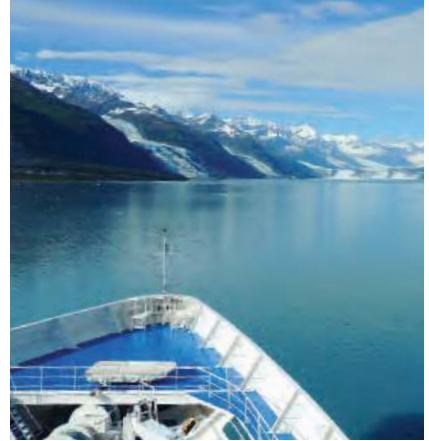
## AT A GLANCE

### RESEARCH VESSELS > RANGER 2 / LODESTAR AHRS / SYRINX DVL / NOAS

DP-INS supports resilient dynamic positioning as a complement to our Ranger 2 USBL systems, while Lodestar AHRS and Syrinx DVL underpin the highest precision of positioning and orientation required for research vessel operations. NOAS provides a real-time 3D representation of the underwater topography ahead of your ship when operating in shallow, confined and poorly charted waters.



- Resilience to GNSS outages/ interference with DP-INS
- Class-leading AHRS performance with Lodestar
- Syrinx DVL provides both vessel velocity and water track capability
- NOAS designed in consultation with ship masters



### SENSOR PACKAGE TRACKING > RANGER 2 / MINI-RANGER 2 / MICRO-RANGER 2 / TRANSPONDERS

When you need to invest in Ultra-Short BaseLine (USBL) acoustic technology to support your underwater operations, Ranger 2, Mini-Ranger 2 and Micro-Ranger 2 have the performance you need, at the investment level you can afford to track your ROVs and AUVs in any situation.



- Simple and intuitive software
- Tracks multiple underwater robots simultaneously
- Fast position update rates
- Easy to install and configure
- Global record of success on all types of vessel
- Support available globally 24/7

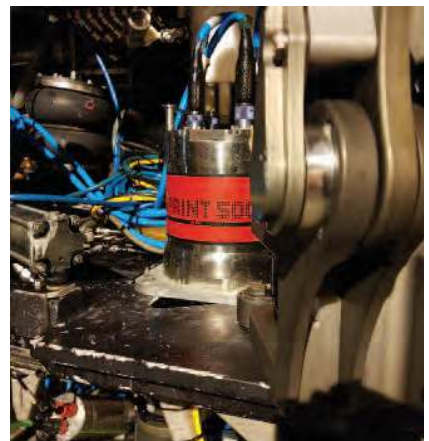


### MARINE ROBOTICS > LODESTAR AHRS / SPRINT INS

With a track record spanning 10 years in survey, dynamic positioning and vessel applications, our Lodestar AHRS and SPRINT INS range has now evolved into its third generation to meet the needs of any subsea application.

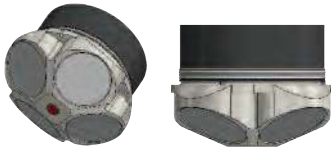


- Developed for complex survey and vehicle guidance
- Small, lightweight and easy to install
- Multiple performance levels
- Fast settling time so you can get straight to work
- OEM options available
- Honeywell gyros inside



## MARINE ROBOTICS > SYRINX DVL

Syrinx is a 600 kHz Doppler Velocity Log (DVL) for surface and subsea vehicles. It combines the high altitude of a 300 kHz and high resolution of a 1200 kHz DVLs in a single, easy to install navigation instrument.



- Class-leading precision
- Current profiling option
- Easy to set up and use
- Reliable and adaptive bottom lock
- Replaceable transducers
- Water-blocked transducer array
- OEM options available



## MARINE ROBOTICS > AVTRAK 6

With AvTrak 6, AUVs can alter mission plans, provide health status updates and even share mission goals with other AUVs and underwater platforms operating nearby. It is also compatible with the 6G systems fitted to many vehicles and ships across the oceans.



- 3-in-1 instrument; USBL transponder, LBL transceiver and two-way acoustic modem
- Models to suit all vehicles
- Low power and easy to install
- Emergency relocation mode
- Depth options to 7,000 metres



## SUSTAINED OCEAN OBSERVATIONS > RT6

When you need a reliable acoustic release for long term deployments, we can supply an RT 6 variant to work in environments ranging from coastal waters to the deep ocean. Compatibility with our Ranger 2 USBL systems provides additional flexibility.



- Compatible with Ranger 2 USBL systems
- Depth options to 6,000 metres
- Long endurance; up to 4 years on alkaline batteries
- High Working Load Limits



## OCEAN SCIENCE CAPABILITIES

# AT A GLANCE

### SUSTAINED OCEAN OBSERVATIONS > MODEM 6 / BLUECOMM

Modem 6 is a family of versatile acoustic modems built around trusted mechanics and Wideband 2 signal architectures. BlueComm optical modems deliver fast and efficient data recovery via AUV, ROV or USV deployed dunker.



- Wideband 2 delivers robust performance in all environments
- Reliable, low-bandwidth, bi-directional communications
- BlueComm is highly energy efficient
- Up to 500 Mbps data rate
- Compatible with subsea Ethernet networks



### SEABED GEODESY > AMT / FETCH / AZA

AMT, Fetch and AZA deliver the precision, reliability and flexibility you need for long-term geodetic projects on the seafloor. With a wide range of sensor options available, we can configure a system to meet the specifics of your research project.



- Range of SV, temperature and pressure sensor options
- Battery options to support deployments in excess of 10 years



### SEISMIC EVENTS > TSUNAMI DETECTION SYSTEM

Reliability is critical to the operation of any tsunami detection system and ours is built on the long track record of our core Compatt technology, as well as multiple operators world-wide. They're also built to stay in-water over many years, saving on costly ship time.



- Uses NOAA detection algorithm
- Wideband 2 telemetry resilience for noisy environments
- Depth options to 7,000 metres
- Variants available for deployments up to 10 years





## OCEAN CURRENTS> PIES

Our PIES is not only a high precision system for measuring pressure and two-way travel time, but comes with all the benefits of our 6G Wideband 2 technology for data transmission and remote control of seabed units.



- Range of Inclinometer, SV, temperature and pressure sensor options
- Multi-year deployments depending on variant and sampling regime
- Wideband 2 telemetry as standard
- Compatible with LMF Ranger 2 USBL systems
- Integrated acoustic release

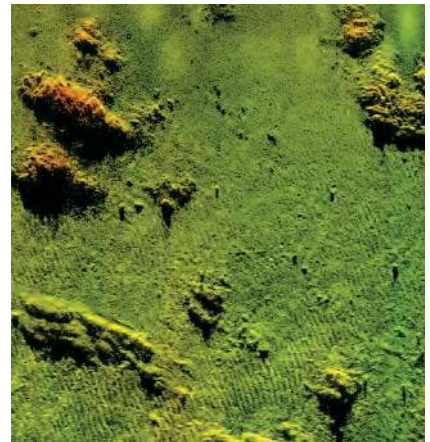


## SEARCH AND RELOCATION> SPRINT-MAPPER / SOLSTICE

SPRINT-Mapper offers dynamic centimetric-level navigation with fast update rates to enable high-tempo subsea mobile mapping projects. Solstice provides ultra-high resolution imagery with low power consumption for AUV operations.

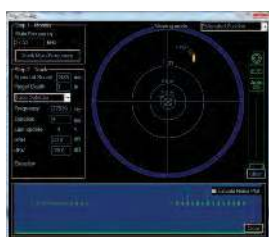


- SPRINT-Mapper built around low-risk, field-proven technologies
- High levels of QC and redundancy from INS, DVL and acoustics
- Multi Aperture Sonar (MAS) suitable for low-logistic AUVs
- Suitable for Search, Classify and Map (SCM) operations

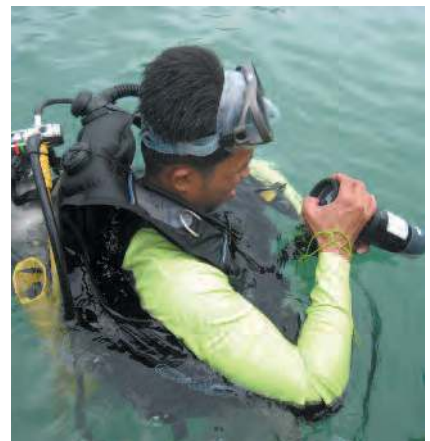


## SEARCH AND RELOCATION> MARKER BEACONS / ROV-HOMER / HOMER-PRO

ROV-Homer, Homer-Pro and our marker beacons provide a complete suite of solutions for marking and relocating items of interest on the seabed in waters from the coast to the deep ocean. Use Ranger 2 to search for flight data recorders.



- Marker beacon variants available for depths down to 12,000 metres
- Up to 3,600 unique addresses
- Long life up to 4.5 years
- Compatible with Association of Offshore Diving Contractors (AODC) transponders
- Aids operations in zero visibility



## SUPPORT

# WE DESIGN, WE ENGINEER, WE INTEGRATE

**WITH HUNDREDS OF INSTRUMENTS SUCCESSFULLY DELIVERED AND INSTALLED, WE HAVE THE EXPERIENCE TO WORK SIDE-BY-SIDE WITH YOUR ENGINEERS, SCIENTISTS, VESSEL CREW AND PLATFORM OPERATORS TO MAKE INVESTING IN, AND INTEGRATING SONARDYNE TECHNOLOGY IN YOUR OCEAN SCIENCE PROGRAMS STRAIGHT-FORWARD AND SIMPLE. IT'S ALL PART OF THE SERVICE THAT HELPS LOWER YOUR OPERATIONAL RISK, SPEED UP YOUR RESEARCH AND MAXIMISE THE TIME YOU HAVE TO CONDUCT YOUR STUDIES.**

### EXPERT ADVICE

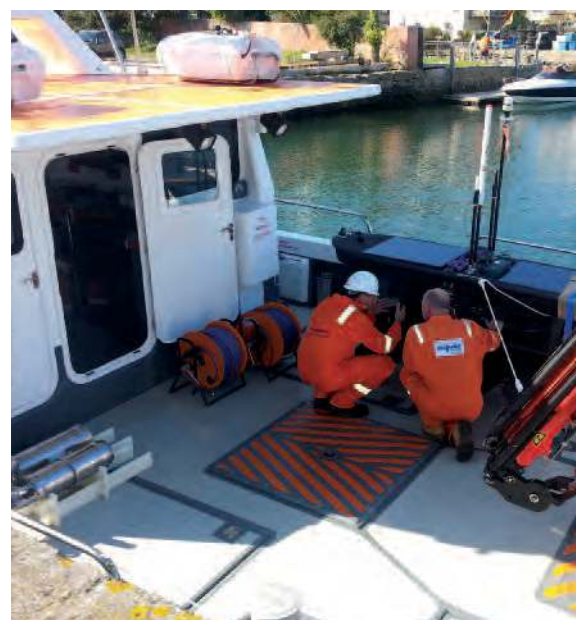
Our long-term partnership with oceanographers, institutes and vessel managers has enabled us to develop a unique and extensive insight into the diverse nature of science operations and the associated academic and operational pressures. We understand that the technology investment decisions you make today, will affect your research capabilities for years to come so they need to be right.

That's why you can trust our global commercial and technical teams to give you expert advice on which Sonardyne system is best for you, how to finance it (now including lease and rental options), where and how it should be installed, what customisation it may need, and the typical performance you can expect to see based on how and where you'll be using it.

### OPERATOR TRAINING

Once you become a Sonardyne client, you gain automatic access to our customer care programme. A dedicated email helpline connects you to product engineers ready to answer your questions but if it's more urgent, our 24 hour worldwide telephone helpline is standing by ready to resolve any operational issues you're facing.

Of course, the best way to ensure your equipment always performs as it should is to service it regularly. Book an annual service visit, and one of our field engineers will inspect the health of your vessel and vehicle's Sonardyne technology, including updating software and firmware and inspecting through-hull deployment machines to make sure regular checks are being carried out.







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