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Looking back at 30 years of acoustic positioning technology and raising the Mary Rose
With offshore support vessels required to undertake increasingly complex operations, DP systems need ever more accurate and reliable position reference data. Sonardyne’s acoustic and inertial technology hits the target every time. Sixth Generation – 6G®, acoustic systems deliver precise subsea positioning in all water depths, with fast update rates and efficient vessel operations. Our new inertial navigation technology is the perfect aid to 6G®; a truly independent DP reference that allows vessel positioning to be safely maintained during periods of GPS instability. Aim higher with Sonardyne’s DP reference systems. www.sonardyne.com

IS YOUR VESSEL’S DP HITTING THE MARK?

SIMPLE. RELIABLE. PRECISE

Ranger 2 USBL
The industry standard acoustic DP reference. 1 second position updates and simultaneous tracking of targets to beyond 6,000 metres.

Marksman LUSBL
Ultimate accuracy for the most demanding DP vessels in all water depths. Options for system redundancy, riser profiling and BOP monitoring.

DP-INS
Compliments acoustic and GPS references, providing a smooth and robust DP input. Ride through short-term disruptions without disturbing operations.

HIGHEST ACCURACY. HIGHEST PRECISION

INDEPENDENCY YOU CAN DEPEND ON

ACOUSTIC POSITIONING • INERTIAL NAVIGATION • WIRELESS COMMUNICATIONS • SONAR IMAGING
In this issue of Baseline, we report on two very different subsea projects—both of which have played a part in Sonardyne’s history. First, we return to China’s Liuhua field (page 22) to upgrade the permanent field-wide positioning system we installed in the early 1990s—a system that has been in daily operation for over 20 years. We then look back even further to mark the historic anniversary of the raising of the English warship the Mary Rose from the Solent 30 years ago. Baseline invited retired Operations Director, Nigel Kelland, to share his team’s experience of the company’s longest running association. Read about it on page 24.

USBL product announcements feature heavily in the news section. On page 4, discover how GyroUSBL is delivering significant project savings on a pipeline route survey whilst if you’re considering purchasing a new USBL system, turn to page 9 to discover why Ranger 2, the best performing technology on the market, just got even better.

Following on from the wireless monitoring and control feature in our last issue, we report on the trial of a new tetherless underwater control and communications system carried out in the Western Pacific in conjunction with WHOI (page 10). Keeping it wireless, in our latest infographic across pages 16 and 17, we look at our integrated solutions for AUVs.

In the next few months, our 2013 events schedule steps up a gear with important exhibitions in Europe, the US and Asia. Our website and Twitter feed is regularly updated with information on where we are exhibiting and what you can expect to see.

Until Baseline issue 10,
As part of the pre-installation phase of the Liwan 3-1 gas field development, China Offshore Fugro Geosolutions (Shenzhen) Co. Ltd. (COFG) has taken delivery of two Ranger 2 underwater tracking systems. The contract included the supply of a pre-calibrated GyroUSBL transceiver, establishing COFG as the first company in the region to benefit from its operational cost-saving features.

Discovered in 2006, Liwan 3-1 is located in the South China Sea, 350 kilometres south-east of Hong Kong in an average water depth of 1,300 metres. COFG is a joint venture between Fugro China and China Oilfield Services Limited and on this project, the company will be using Ranger 2 to conduct route surveys of the proposed gas pipeline using ROVs.

Ranger 2 calculates the position of a subsea target by measuring the range and bearing from a vessel-mounted transceiver to an acoustic transponder on the target. To achieve optimum positioning performance, conventional USBL transceivers require careful installation and a lengthy calibration procedure to calculate sensor offsets. However, GyroUSBL has a built-in Lodestar attitude and heading reference sensor which only requires the vessel to perform a simple ‘spin-test’ to verify system performance for the client before subsea operations can begin. In addition, GyroUSBL can be deployed over the side of a vessel making temporary installation on vessels-of-opportunity simple and cost-effective.

Mr. Qu Yan Da, the General Manager of COFG said, “The Liwan 3-1 gas project is challenging, requiring 260 kilometres of pipeline to be laid. To conduct the most precise survey with high accuracy results, we knew we needed the best available technology. Ranger 2’s deep water track record is impressive and the time and cost-savings GyroUSBL will bring to the project are expected to be significant. We now have the flexibility to move our Sonardyne systems from vessel-to-vessel without the need to perform a re-calibration.”
Estimating the transponder battery life needed for a particular operation can be tricky but thanks to our new Android Battery Life Estimator app, it now couldn’t be easier. The app estimates the battery life our family of 6G acoustic transponders require for a user defined operational scenario, allowing the user to specify the instrument type together with its navigation and telemetry settings. Based on the information entered, the app will provide an estimate, measured in days, of the total battery life needed. The free app can be downloaded from Google Play and can be used with DPT6, Compatt 6, AMT, Fetch and PIES. The app will shortly be available on other platforms.

Hydroquip completes Compatt fleet upgrade to 6G standard

Equipment rental company Hydroquip Ltd. has placed a major order with Sonardyne Inc. to continue upgrading its stock of Compatt acoustic positioning transponders to the latest 6G specification. The latest order follows a similar contract in 2012 and now means Hydroquip’s rental pool kept at SES Inc. in Katy, Texas, has over 100 Compatt 6 transponders available to support subsea survey operations in the Gulf of Mexico region. SES is part-owned by UK-based Hydroquip and acts as its US agent.

Commenting on the deal, Alan Craig, Vice President – Operations at SES said, “Compatt 5 has been a great workhorse for us over the years but recently we have been witnessing a continued increase in demand for the performance gains offered by 6G, especially here in the Gulf of Mexico. "We have been witnessing high demand for the performance gains offered by 6G”

This latest investment in Sonardyne technology ensures that we are now fully stocked to meet this demand and reinforces our position as a leading supplier of subsea positioning technology in the region.”

Every metrology project is unique. Different techniques have different advantages depending on the type of application but one thing they all have in common is the drive to complete operations more quickly, reducing vessel time and costs. With that in mind, we’re combining our in-house expertise in integrated Wideband subsea acoustics and inertial navigation to provide a new approach to pipeline metrology campaigns.

The new system makes use of our proven 6G acoustic and Lodestar aided INS hardware platforms, both of which are owned and operated by all the major offshore survey, construction and equipment rental companies. The robust inertial-acoustic integration enables the rich and reliable set of quality metrics and QC provided by 6G to be used in the inertial system. By adding inertial capability, metrology tasks can be completed more quickly, saving precious vessel and project time.

Our inertial metrology technology has now reached an advanced stage of development and has been proven offshore with results well within accepted metrology tolerances. The trials have also shown significant time-saving capabilities whilst maintaining levels of independence and quality control. For more information, including estimated time scales, please contact your local Sonardyne office.

Subsea metrology requires accurate and robust measurements. With INS capability, metrology operations will be faster, saving time and money.
In the last issue of Baseline we reported that Sonardyne Brazil had recently moved into its new offices in Rio das Ostras. Since then, the building has been officially opened by the Deputy Consul-General from the British Embassy in front of an audience of local clients and representatives. An Anglo-Brazil themed celebration followed, complete with a Brazilian BBQ and Queen’s Guards. The opening event also coincided with our 20th anniversary of first deploying our subsea offshore technology in the region.

As part of our continuing UK expansion plans, we’re pleased to announce that we have purchased a third building on Blackbushe Business Park, the home of the company’s headquarters and manufacturing centres. Following the nautical theme of all Sonardyne buildings, the new premises has been named ‘Haven House’ and will host expanded production and engineering facilities.

Sonardyne chose the annual NAVDEX exhibition in Abu Dhabi to launch its new Navigation and Obstacle Avoidance Sonar, NOAS. Designed for use on submersible vehicles, NOAS enables faster, safer and more efficient navigation by detecting and classifying potentially hazardous underwater obstacles in its path.

Unveiled on the first day of the exhibition, NOAS provides a unique combination of long range 2D navigation performance, 3D object detection and class leading intruder detection in a single compact sonar. In 2D mode NOAS provides the crucial long range navigation information enabling underwater vessels to steer a safe course. When combined with its 3D
capability, the sonar scans the water column to enable more detailed detection and classification of obstacles, and the seabed, in front of the vessel.

"With a range of 1,500 metres and a wide field of view, NOAS redefines the capabilities of forward look sonar technology, allowing pilots to navigate their vehicles at speed with confidence and accuracy."

The first in a family of products, NOAS has been specifically developed for installation on manned submersibles and swimmer delivery vehicles (SDVs) where available space and power is often restricted. With this in mind, the compact subsea housing contains the 2D array, front-end electronics and processing whilst a separate projector is used if the optional 3D capability is required. NOAS feeds fully-processed sonar images to, and is controlled by, the host platform’s own control system, allowing the user to customise the operator displays to meet the specific needs of the platform and its operational requirements.

Speaking at the launch, Rob Balloch, Strategic Development and Marketing Director at Sonardyne said, “Conventional obstacle avoidance sonars have an operating range of just a few hundred metres so their use is often limited to navigating an SDV or submersible during its final approach to the target. With a range of 1,500 metres and a wide field of view, NOAS redefines the capabilities of forward look sonar technology, allowing pilots to navigate their vehicles at speed with confidence and accuracy.”

NOAS has been engineered by the same team that developed the company’s market leading Sentinel diver detection sonar and this capability has also been incorporated into the system. When the vessel is at a standstill or moving slowly, NOAS continuously monitors the surrounding area for underwater targets and the potential threat they present. The low false alarm detection capabilities of the system ensure that only genuine tracks with threatening intent are displayed.
Sonardyne has successfully demonstrated an integrated security system as part of a waterside surveillance system for a critical infrastructure facility in the United States. Over the course of three days, the system detected, classified and raised alerts on multiple waterborne threats ranging from unauthorised swimmers in the water to slow and fast surface vessels.

For the demonstrations, security sensors were deployed from an expeditionary trailer equipped with a ground radar and thermal imaging camera powered by a solar panel recharging system. A robust Wi-Fi connection linked the trailer to a remote monitoring centre which provided a panoramic situation awareness picture for identifying and responding to the simulated threats.

Developed with the support of the European Commission and NATO, the system being trialled integrates radar, camera, Sentinel IDS, AIS, satellite imagery and other sensor data into a single command display enabling early warning and protection against approaching threats. Using sophisticated behavioural algorithms, the system automatically detects and classifies potential threats, providing alerts and subsequent control to the operator or remote stations, including mobile devices. The system enables automatic operation of deterrents and manual intervention.

Commenting on the project, Richard Dentzman, US Business Development Manager – MarSec at Sonardyne said, “This is one of the largest test sites where this technology has been deployed but thanks to its open system architecture and autonomous operation, we’ve once again been able to demonstrate the system’s capacity to provide users with complete waterside detection capabilities, both above the water and below.”

**MARITIME SECURITY**

Sonardyne demonstrates integrated dam security system in the US

Survey assistance company, Georep has recently employed two innovative ways in which to mount a Ranger 2 USBL acoustic transceiver on a vessel. In one configuration, it was located on a magnetic custom-made deployment pole, installed over the side of a FDPSO. In the second, it was installed on the stinger tip of a DP pipelay vessel.

**Magnetic deployment pole**

The magnetic deployment pole was designed and produced by Georep for Murphy Oil Congo for use during the development phase of the Azurite field, offshore the Republic of Congo. Following the installation of a manifold on the seabed, the FDPSO (Floating, Drilling, Production, Storage and Offloading) began drilling 10 wells that each required the installation of a tree and connection to the manifold. These operations required two ROVs which needed to be precisely positioned and tracked. The FDPSO was not equipped with a moonpool or other arrangement on which a pole could be attached, so Georep developed a temporary over-the-side deployment pole for the Ranger 2 transceiver that could be magnetically attached to the vessel hull and easily removed between installations.

**Touchdown Point Monitoring**

The second innovative mounting was developed in cooperation with the Survey Department of Subsea 7 in order to provide a solution for stand-alone touchdown monitoring during shallow water S-lay operations. Typically, a hull mounted transceiver cannot reliably ‘see’ through the thruster wash at the rear of a DP pipelay vessel. In this new configuration, Ranger 2 was installed at the end of Subsea 7’s Seven Polaris pipelay stinger, sufficiently away from DP thruster noise. Sonardyne Compatt transponders were then attached to the pipeline at regular intervals and Ranger 2 was successfully used to acoustically track their position, ensuring the pipeline was accurately laid along its designated route.
François Chalverat, owner of Georep said, “Working on custom projects such as these has been a very interesting experience. Both presented challenges that required innovative solutions and proven technology, which is where Sonardyne came in. Having successfully verified this stinger technique using Ranger 2, we are now looking to co-locate either a Sonardyne Lodestar AHRS or combined GyroUSBL unit.”

Edd Moller, Sonardyne’s Survey Support Group Manager commented, “Seeing our equipment deployed in these novel ways is fascinating. Locating a transceiver out on the stinger is a great solution for ensuring that vessel noise disruption is rejected and that operators receive the highest accuracy and precision available from our technology.”

As part of our ongoing commitment to supporting your subsea operations with the best available technology, Sonardyne now supplies a complimentary Wideband Mini Transponder (WMT) with all purchases of Ranger 2 USBL systems.

The WMT is fully 6G compatible, providing Wideband 2 interrogation in transponder mode which is far more robust when operating in the presence of ROV noise and acoustic interference.

The longer Wideband 2 transmissions provide more signal and hence maximise USBL precision. In addition, integrated two-way telemetry enables remote control of power, gain, sensors readings and provides signal diagnostics to the Ranger 2 USBL system.

The WMT includes a responder trigger, an integrated rechargeable Li-Ion battery pack that is charged from an ROV’s power supply and full RS232 communications enabling channel set up, power and gain etc. to be changed from the surface. WMT is also fully compatible with Sonardyne’s new acoustic transponder test and configuration device, iWand.

“Customers already using WMTs have reported impressive performance improvements over non-Sonardyne beacons,” said Paul Griffiths, Sales Manager at Sonardyne. “By including WMT as standard with every Ranger 2, we’re ensuring that all users get the best performance from their systems, straight out of the box.”

How do you deploy yours?

If you are using Sonardyne USBL technology in an unusual way, we’d love to here from you. Email us at marketing@sonardyne.com to tell us about your operations.

PRODUCT UPDATE

The WMT is on us

Get the best performance from your Ranger 2 USBL system straight out of the box with WMT, now supplied as standard.

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Following on from the wireless monitoring and control feature in the last issue of Baseline which examined real-world applications for Sonardyne’s acoustic and non-acoustic technologies, Engineering Director, Simon Partridge, and Director of Subsea Product Development, Darryl Newborough report on the trials of a tetherless underwater control and communications system developed in conjunction with the Woods Hole Oceanographic Institution (WHOI).
Wireless subsea control and communications

**Underwater optical communications** is an emerging technology, complementing the long range capabilities of acoustic communications. High bandwidth signals support extremely high data rates which can be used to transmit large amounts of data between underwater assets separated by up to a few hundred metres. As part of the continued development of these technologies, Sonardyne was invited to join WHOI on its latest expedition trialing a new concept in tetherless hybrid AUV and ROV operations using BlueComm high bandwidth wireless video transmission.

BlueComm is a short range, through-water wireless optical communication system capable of broadband speed data transmission. Originally developed by principals at WHOI, a joint company was set up by Sonardyne to further develop and market the technology. BlueComm provides a high speed optical data uplink coupled with a low data rate acoustic downlink. The system allows for the extraction of large amounts of data in an energy efficient manner and supports the transmission of camera imagery and high definition video in real time.

As water depths increase, conventional ROVs and their associated tether, launch and recovery systems need to be larger and heavier, requiring larger and more expensive vessels. However, BlueComm may one day eliminate the need for such tether cables, offering a new degree of freedom in underwater robotics with data being wirelessly transmitted at rates of up to 20 megabits per second.

**Offshore trials**

The trials took place off the island of Guam in the Western Pacific onboard the research vessel MV Alucia, which had been mobilised with Nereus, WHOI’s hybrid unmanned vehicle. Depending on its mission, Nereus can either swim freely as an AUV or be transformed into a conventional ROV by connecting up a micro-thin fibre optic tether. The tether allows the transmission of high quality, real time imagery from the vehicle to the surface but is fragile and therefore needs to be replaced after each deployment.

The technology trialled by the Sonardyne and WHOI teams eliminates the need for an umbilical altogether by combining the complementary characteristics of wireless acoustic and optical systems. Acoustic methods can transmit data over long distances but due to the speed of sound in water, that data can only be sent at a relatively low speed. Optical signals on the other hand can send high bandwidth signals for real time control, but only work over a range of a few hundred metres. Beyond that, light is absorbed by seawater and the signal is lost.

To support the trial, Sonardyne provided a suite of 6G navigation technology including a vessel-based Ranger 2 GyroUSBL system to track Nereus, Compatt 6 and Wideband Mini Transponders (WMTs) plus two AvTrak 6 multi-function acoustic navigation and communications instruments. The company’s latest test and configuration device, iWand, was also used through the trials to setup and acoustically check each vehicle-installed transponder on the back deck prior to deployment.

**Going deeper**

To begin with, Nereus was deployed 700 metres (2,296 feet) below the surface and acoustically tracked from the surface using Ranger 2. Due to the short duration of the project, the system’s pre-calibrated GyroUSBL transceiver had been deployed on a pole over-the-side of the vessel.

A depressor equipped with a BlueComm optical communications receiver, depth sensors, an AvTrak 6 transceiver for acoustic vehicle and manipulator control using low latency SMS capability and a WMT for USBL tracking was then lowered close to the seabed behind the Nereus. A purpose-built ‘lander’ designed to mimic a subsea manifold was then deployed to the seabed. Installed on the lander was a Compatt 6 transponder that acted as both a seabed positioning reference and, once the trials were complete, used to release the lander so that it could return to the surface.

Multiple dives over a few days then took place in water depths up to 1,700 metres where the AUV and depressor were deployed and tracked via a feed into the vessel’s control room. Alucia, a non-dynamically positioned vessel, was equipped with a visual output from Ranger 2 on the bridge to enable manual manoeuvring to ensure the depressor remained within roughly 150 metres of Nereus. With each deployment, Nereus fed real time video back to the control room of the Alucia with a HD stills camera also providing imagery every few seconds. The AUV was then commanded to autonomously fly from its location to the lander approximately one kilometre away. The pilot then used low latency acoustic communications and the wireless video...
The depressor begins its journey behind Nereus, remaining within 150 metres for efficient data transmission. (Left) Wand is used to configure and check installed transponders. (Above) Ranger 2 tracks Nereus, the depressor and seabed positioning reference simultaneously. (Right) The ‘lander’ is retrieved from the seabed after the world’s first wireless ROV intervention. Streams from the AUV to the depressor to manually command the AUV’s robotic arm to successfully ‘stab’ a connector into the lander, believed to be demonstrating the world’s first wireless ROV intervention capability. Using BlueComm, multiple full-frame rate colour video streams were simultaneously transmitted in real time at a date rate of 1.5 megabits per second.

**The future is wireless**

High speed wireless communications are not just useful for controlling ROVs and AUVs. Wherever there is a subsea application requiring control, monitoring or the point-to-point transmission of data, ‘going wireless’ is now a credible alternative.

For those involved in monitoring our oceans, for example, the technology simplifies the process and lowers the cost of harvesting data from long life seabed sensor networks. These devices would store logged data in their onboard memory until a ship or autonomous surface vessel could be sent to retrieve the data. Using optical communications, gigabytes of data could be securely uploaded in minutes, making for very efficient surveys. For sensor platforms operating near-shore, the technology would remove the huge expense and vulnerability of a cable connection back to shore, whilst for deep sea sensors, the time vessels and crews have to spend at sea recovering instruments to the surface, downloading data and then redeploying them would be dramatically reduced.

**Wherever there is a subsea application requiring control, monitoring or the point-to-point transmission of data, ‘going wireless’ is now a credible alternative.**

The unique combination of Sonardyne 6G acoustics and BlueComm optics have now been proven to enable ROV pilots to wireless control vehicles in close proximity to subsea structures without the need for a physical tether. Greater freedom of movement, the reduction in risk of tether entanglement and the receiving of real time video feeds all whilst maintaining human control is now something that everyone involved with operating subsea vehicles can look forward to.
The majority of survey-grade ROV navigation systems utilize an Attitude and Heading Reference System (AHRS) and Doppler Velocity Log (DVL) to provide a relative or dead reckoned position. These systems can only operate close to the seabed, within the operating altitude of the DVL, meaning mid-water operations are conducted via manual control so real world or relative coordinates cannot be easily used by the ROV pilot.

To address these limitations, Sonardyne and Oceaneering, a global oilfield provider of engineered services and products for the offshore oil industry, have developed a novel dynamic positioning and control system which has at its core Sonardyne’s acoustically-aided inertial navigation system SPRINT. Trials recently took place in the Gulf of Mexico using one of Oceaneering’s Maxximum ROVs operating in water depths of 3,057 metres (10,030 ft) and the results summarized here show that continuous hovering of the ROV in mid-water beyond DVL range was possible, as well as automatic navigation to waypoints.

Setting up the system
SPRINT comprises of a Lodestar subsea INS unit installed on the ROV which is interfaced using a single serial or Ethernet connection through the vehicle’s umbilical to a topside computer running the monitoring and display software. All navigation algorithms are processed subsea ensuring that Lodestar can maintain its dual inertial navigation (INS) and attitude/heading (AHRS) measurement capability even if there is a temporary loss of communications from the surface or vehicle-supplied power.

Sonardyne’s Sixth Generation (6G) vessel-based acoustic transceivers and subsea transponders maximise the performance of SPRINT by providing the most precise and reliable USBL aiding input. Whilst the use of systems such as Ranger 2 ensures a tightest possible acoustic/inertial integration, SPRINT can accept position aiding from any USBL system vendor that uses correctly time-stamped positions in an industry standard telegram.
OPERATING MODES

For the new system, two methods of ROV control were developed: ‘Navigation’ and ‘Passtru’. In ‘Navigation’ mode, the ROV uses INS positioning optimised for dynamic vehicle positioning with real-world position, velocity and attitude data at high output rates. This speeds up ROV operations by improving vehicle control precision, automating station keeping and delivering a unique ‘fly-by-wire’ capability. ‘Navigation’ mode is available continuously in all water depths when USBL data is available. If the INS solution degrades or is unavailable, the system automatically reverts to ‘Passtru’ mode. ‘Passtru’ mode is a dead reckoned solution using self contained AHRS data that is inherently robust and reliable when combined with DVL data.

SEA TRIALS AND RESULTS

Oceaneering designed 17 different scenarios to test the system with the main objectives being to demonstrate the ROV automatically hovering in mid-water without DVL; to test the ‘Passtru’ and ‘Navigation’ modes and mode switching and lastly; to automatically manoeuvre the ROV in straight lines between mid-water waypoints.

Tests were performed in 3,000 metres of water and within DVL range of the seabed so that a post processed reference trajectory could be produced using DVL/INS/USBL data. The DVL was used purely as a quality reference and not for aiding INS. The USBL/INS real time solution was then compared to the reference trajectory.

The results showed that indefinite mid-water hovering was possible with SPRINT, whilst the navigation data rate of 20Hz+ available to the ROV was significantly faster than standalone USBL or the 5Hz rate typical of many DVLs.

Waypoints were automatically registered in real world coordinates and the ROV navigated to those shown in Figure 1 with close agreement between the real-time USBL/INS and reference trajectories.

The ROV DP position error compared to the reference trajectory is shown in Figure 2 with a 2.5 metre 1DRMS position error estimated by the SPRINT Kalman filter equating to a precision of better than 0.1% water depth.

Mid-water, SPRINT is dependent on USBL data to curb INS drift. Should USBL aiding be unavailable, or the SPRINT navigation solution degraded beyond a set threshold, the control system will automatically disengage ‘Navigation’ mode and switch to ‘Passtru’. This will avoid the ROV driving off course and is automated so the pilot’s workload is not increased. Automatic switching between modes with the threshold set to 3 metres was successfully demonstrated with room for further performance improvements with tuning of the threshold.

Commenting on the trials, Mark Philip, Oceaneering’s ROV Technology Manager said, “Autonomous flight control is an increasingly important feature for ROVs. Our FBW system has greatly enhanced the efficiency of the service we provide since its introduction several years ago. Integrating SPRINT further enhances this, providing hands-free hovering and navigation throughout the entire water column. We place high importance on operational ease and redundancy and are confident that our collaboration with Sonardyne satisfies this.”

SPRINT: BENEFITS FOR ROV DP

● Works in all water depths and beyond DVL operating altitude without affecting reliability or ease of use
● Improves operational efficiency compared to relative-only positioning methods
● Fast navigation updates provide greater vehicle control precision
● Speeds up ROV operations and ultimately saves vessel time
● Vendor-independent USBL aiding
Positioning, Navigation, Communication

Sonardyne’s capability for AUVs is based around low risk subsea vehicle navigation, wireless communications and sonar imaging. From lightweight vehicles tasked with surveying coastal zones through to fully autonomous vehicles engaged in mapping the deep ocean, Sonardyne’s family of acoustic and inertial sensors and instruments are engineered to make optimal use of the available payload space and onboard power.

Task: Wireless Communications

- **uComm + BlueComm**

  The uComm family of acoustic modems provide simple, easy to use and highly effective communication links for the point-to-point wireless transmission of data. Self-adaptive communications protocols ensure maximum data transfer speed and energy efficiency is maintained in all acoustic environments. To ensure minimal interference, uComm provides hundreds of unique addresses and multiple operating frequency bands depending on the model being used.

  BlueComm is a short range, through-water wireless optical communication system capable of broadband speed data transmission at a class-leading data rate of up to 20Mb per second at 100 metres. It efficiently extracts large data amounts and supports the transmission of camera imagery and HD video in real time.

Task: Seabed Imaging and Bathymetry

- **Solstice Side-scan Sonar**

  Solstice is a low power, multi functional sonar that provides pixel-perfect imaging, especially in acoustically challenging shallow water environments that can exhibit high levels of interference with limited platform stability. Capable of coverage rates that are significantly greater than previous generation side scans (±100 metres) Solstice’s onboard processing also delivers geo-coded side scan imagery which is available for automatic target recognition and post-mission analysis. Solstice also produces high quality bathymetry data from an ultra-compact hydrophone array on each flank. The data is registered onto the same pixel grid as the side scan imagery, producing stunning digital terrain maps with the side scan imagery accurately draped over the bottom topography.

Task: Inertial Navigation

- **Lodestar AINS**

  Lodestar is an Aided Inertial Navigation System (AINS) exploiting the long term precision of acoustic positioning with the continuous availability and high update rate of inertial sensors. A single navigation solution is computed and output to the vehicle’s control, navigation, acoustic and sonar systems.

  SPRINT can be aided by USBL, LBL and DVL inputs. USBL aiding is vendor independent but optimal performance is achieved when coupled with Ranger 2. LBL aiding can be from either a full or sparse transponder array.

  JANUS, Sonardyne’s INS post-processing software, complements SPRINT by refining the integrity of survey data and eliminating the effect of real-time problems such as a loss of aiding sensor data or system configuration errors.

Task: Motion Compensation

Motion Compensation

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**Task: Tracking**

- **Ranger 2 USBL + WMT**

Ranger 2 is a USBL acoustic positioning system designed for long range tracking (6,000 metres+) of subsea targets and simultaneous positioning referencing for dynamically positioned (DP) vessels.

Ranger 2 builds on the simplicity and reliability of Sonardyne’s original Ranger system but adds support for the latest 6G acoustic product range such as AvTrak 6 and the mini WMT transponder. The Wideband 5 signals used by 6G offer precise acoustic ranging, fast position updates, robust data telemetry and hardware that is easier to set up and operate even in the most challenging subsea environments.

These features improve the efficiency of AUV operations, reduce survey delays and generate cost savings for operators.

- **AvTrak 6**

AvTrak 6 combines the functions of a USBL transponder, LBL transceiver and wireless communications link into one low power unit. This capability is used to provide USBL absolute position reference data and LBL ranges to aid Lodestar AINS.

A comprehensive but easy to use command language allows the AUV to undertake simultaneous LBL ranging, USBL tracking via a surface vessel and robust telemetry for AUV-to-vessel or AUV-to-AUV communications.

Available in a variety of configurations including depth ratings to 7,000 metres and a remote transducer for optimum acoustic performance, AvTrak 6 also has an internal battery for providing power if the AUV main power should fail. This also supports the emergency transponder mode for vehicle relocation.

- **AvTrak Navigator**

AvTrak Navigator is designed to form part of an integrated AUV system, combining the functions of transponder, transceiver, USBL vehicle homing and acoustic telemetry link in one low power device. It is fully compatible with Sonardyne’s family of LBL and USBL navigation systems.

Depth rated to 1,500 metres, AvTrak Navigator can undertake simultaneous LBL ranging and USBL homing operations as well as high speed acoustic telemetry for AUV data exchange with other subsea assets. It also supports USBL tracking from a surface vessel.

With significantly lower power consumption than traditional cabled USBL systems, AvTrak Navigator reduces the energy drain on an AUV’s battery, resulting in improved operational endurance.

**Looking to the future...**

- **Integrated AUV navigation, comms and imaging platform**

A Lodestar high performance, low power (Non ITAR) AINS, an AvTrak 6 acoustic positioning and communications system plus a Solstice high definition, low power imaging sonar will be available in an OEM chassis measuring 190mm x 300mm designed to fit efficiently within a 9 inch diameter AUV pressure housing.
Technology

Delivering custom capability for electromagnetic surveys

TURNING SOUR

HEAD
RCETRACKING ON ITS
Recent trials in the Gulf of Mexico led by electromagnetic survey specialists EMGS ASA have been evaluating the use of Sonardyne’s inverted acoustic positioning and inertial navigation technology for the positioning of a deep-towed electromagnetic (EM) source. Baseline talks to Markus Skarø, VP Acquisition at EMGS ASA, and Trevor Barnes, Sonardyne’s Geophysical Business Manager, about the operational benefits for EM source tracking. >>

In conventional surveys using towfish, Ultra-Short Baseline (USBL) systems provide an efficient and accurate method of tracking the vehicle’s position. However, in deep water surveys where the vehicle is being towed on a long layback, the long slant ranges and poor signal-to-noise ratio often encountered can affect overall positioning accuracy. iUSBL is the natural evolution,” explains Trevor when we first sit down to talk. “Instead of the significant cost of employing a second vessel equipped with an additional USBL to sail above the towfish, we turned the technology on its head by swapping the positions of the acoustic transceiver and transponder, installing the former on the towed body and the latter on the main vessel. With EMGS ASA we took it one step further and applied the technique to the towfish so that the iUSBL could track the position of the antenna (dipole) relative to the source.”

Building on the success of Sonardyne’s first generation iUSBL system, the company’s latest 6G platform now incorporates Wideband 2 digital acoustic signal technology offering robust performance, simple user operability and compatibility with inertial navigation technologies. As the potential of 6G iUSBL became apparent, it caught the attention of EMGS ASA, specialists in Controlled-Source Electromagnetic Surveying (CSEM). Pioneers of applying electromagnetic energy to oil and gas reservoir surveying, EMGS ASA’s method involves towing a long horizontal dipole behind a towfish flying about 30 metres above the seafloor. Seabed receivers already deployed on the seabed measure the energy propagated through the sea and subsurface to produce hydrocarbon reservoir maps. CSEM relies on the difference in electrical resistivity between oil and water-bearing sediments; if the results show high resistivity, it’s a good indication of the presence of hydrocarbons.

As a technique, more than 650 CSEM surveys have taken place around the globe in water depths varying from approximately 40 to 4,000 metres with applications including the ranking and derisking of prospects prior to drilling decisions and the location of previously overlooked reservoirs. Statistical analysis of CSEM data has shown that, when used correctly, drilling success rates can be significantly increased.

EMGS ASA had been approached by a major industry group with a view to looking at how EM data and its use could be further refined, with towfish positioning accuracy being one of the key focus points. “Accurate subsea positioning of the source towfish, its long dipole and the seabed receivers is critical to the success of CSEM surveying as the more accurate the positioning, the better the quality of data,” says Markus. “This in turn leads to more accurate strata mapping, reduced risk when drilling and improved reservoir asset management.”

Looking up
EMGS ASA and Sonardyne have worked together successfully in the past, conducting positioning trials in the early days of EM surveys so it was a logical partnership to continue for this latest research. “EMGS
ASA’s vessel, the Boa Thalassa, already had our latest generation Ranger 2 USBL tracking system on board so we recommended interfacing that with our new SPRINT subsea inertial navigation system and an iUSBL transceiver, both of which were co-located on the source towfish,” says Trevor.

In normal operations, EMGS ASA uses its Ranger 2 to position the main body of the towfish relative to the Boa Thalassa in depths of up to 4,000 metres. However, when tracking subsea targets over long laybacks, USBL position scatter is often observed so, to improve precision in these operational scenarios, Sonardyne developed SPRINT.

The system exploits the long term accuracy and precision of acoustic positioning with the continuous availability and fast update rate of high-grade inertial navigation sensors. Aided also by Doppler Velocity Logs (DVL) and depth sensors, the use of SPRINT can result in more than 10 times improvement in positioning precision over USBL alone.

To track the position and shape of the 350 metre long towed electric dipole relative to the main towfish, a rearward facing iUSBL transceiver was fitted to the main body of the towfish. This was used in conjunction with four directional beamshape DPT6 mini transponders clamped onto the dipole at regular intervals down its entire length.

All USBL transceivers require motion compensation and this was provided by the co-located SPRINT unit which has at its core, Sonardyne’s Lodestar Attitude and Heading Reference System (AHRS). The Lodestar provided inertial stabilisation of the towfish USBL position using accelerometer data combined with DVL and pressure data whilst the iUSBL obtained phase measurements to determine the range and direction of incoming acoustic signals from the transponders on the dipole. The iUSBL system was then interfaced into Ranger 2 USBL tracking software to amalgamate the raw information from the instruments to give a final positioning solution.

The first trials took place in the deep waters of the Gulf of Mexico over a period of approximately four weeks. “This was one of the most technically complex integrations of Sonardyne systems and techniques we have ever undertaken,” reflects Trevor. “Positioning all the different components of CSEM – the surface vessel, towfish, dipole and seabed receivers - presents unique challenges. There is nothing like it in either the geophysical or offshore industries. We worked very closely with EMGS ASA’s engineers throughout and are looking forward to working together in the future.”

“We already had considerable experience in using Sonardyne’s USBL tracking system so when we were presented with the idea of an integrated SPRINT, iUSBL and Ranger 2 solution, we were keen to trial it for our EM surveys,” continues Markus. “With the exact position of the source towfish known, the rear-facing iUSBL transceiver was able to provide relative positioning of the dipole. An unexpected benefit of using SPRINT has been the longer battery life we are getting out of the transponders on the towfish. They can be set to slower update rates which means we can stay operational for longer.”

Although the trials are still in their infancy and the data is still undergoing analysis, everyone involved in this challenging project believes that the final outcome is set to be positive and will benefit CSEM surveys by delivering improved towfish positioning accuracy.

(Right) Recovery of the EM source onboard the Boa Thalassa.
(Below) The source is fitted with a Lodestar co-located with a rearward facing iUSBL transceiver. Visible at the front are vessel-facing DPT6 transponders (red).

SPRINT (Subsea Precision Reference Inertial Navigation Technology) is an acoustically aided inertial navigation system for subsea vehicles.

The system extends the operating limits of USBL and can dramatically improve the operational efficiency of LBL, making optimal use of acoustic aiding data from acoustic positioning and other sensors. It improves position accuracy, precision and integrity in any water depth while reducing operational time and vessel costs.
Discovered in 1987, the Liuhua field (LH11-1) in the South China Sea lies in water depths of approximately 300 metres and is one of the largest and longest producing fields in the region. Liuhua is significant for the low-cost, technically innovative way it was developed which relied heavily on first-generation Remotely Operated Vehicles (ROVs), both during the subsea construction phase and as primary interface to the subsea control system. For Sonardyne, the significance of Liuhua lies in the fact the permanent field positioning system the company installed in the early 1990’s, remains in daily operation.

In 2012, after 15 years reliable production, the Floating Production System (FPS) at the heart of the operation was taken to dry dock for a maintenance overhaul.
Fugro Survey Pte Ltd and China Offshore Fugro Geosolutions (hereinafter referred to as “Fugro”) jointly provided the Phase II survey support services for a field-wide upgrade of the mooring chains, subsea structures and the installation of a new bridging manifold to the adjoining Liuhua 4-1 field. Phase I of the project saw the unhooking of the FPS and mooring system change whilst Phase II focussed on the preparation of the subsea installations including the laying of umbilical and power cables and acoustic metrology for the connecting subsea spools and jumpers.

Hybrid arrays

In order to achieve the highest accuracy positioning for the project, Fugro turned to Sonardyne for its Long BaseLine (LBL) acoustic positioning equipment. “With Sonardyne’s equipment having been used so successfully in the original development of the field, and still to this day, it made perfect sense to call upon their expertise,” said Kim Aitken, Positioning Business Line Manager at Fugro. “Based on our operational objectives and the many different tasks that were required for the field upgrade, they recommended a hybrid combination of fifth and new sixth generation (6G) technology.”

Sonardyne LBL acoustic positioning technology is composed of a seabed network, or array, of Compatt transponders moored in fixed and known locations on the seabed. Within this array, transponders installed on subsea structures – PLETs for example – can be included into the array to derive accurate positions for each of these structures as they are installed. For both LH11-1 and LH11-4, two arrays of six Compatt 5 transponders were deployed in frames, ready to position subsea structures and cables, along with general ROV positioning throughout construction.

Out with the old

Using the newly deployed LBL arrays, Fugro conducted a pre-installation survey using ROVs to ascertain the suitability of the seabed for the development. The existing jumpers connecting the LH11-1 manifold to the flexible risers were then removed so that the new bridging manifold could be installed and connected with new jumpers to the existing manifold, the end of the LH4-1 pipeline PLET and the existing flexible riser bases. This bridging manifold will allow well fluids from the new LH4-1 field and the existing LH11-1 field to be mixed before flowing through to the FPS. To assist with the positioning of the structure, a Compatt 5 transponder was installed on the crane wire attached to the bridging manifold rigging with two mini transponders secured to the wire to enhance position updates as it was lowered. A similar process was then used to install the production manifold on LH4-1 but instead used two Compatt 6 transponders on the hubs to assist with the structure’s positioning.

6G measures up

With the successful deployment of the bridging and production manifolds, Fugro turned its attention to the metrology phases of the upgrade in order to fabricate the necessary jumpers for connecting to their respective manifolds and risers. Using the latest Sonardyne 6G hardware platform, including ROVNav 6, Dunker 6 and Compatt 8 transponders, Fugro measured the slant range distances and the inclination of the hubs. The DigiQuartz sensors within the transponders were also used as a check for the relative vertical difference between the hubs.

Once the metrology had been successfully conducted, a variety of fixed jumper apools and flying leads were installed on both fields. Two USBL transponders were attached to the crane hooks used to lower the apools, displaying their positioning information at all times throughout the process.

Lastly as part of the final cable lay operations, a set of three concrete mattresses were installed at LH4-1 over the existing multiphase pipeline from LH11-1. These allowed the power cables from LH4-1 to then be safely laid on top of the pipe.

James Hope, Project Surveyor at Sonardyne said, “Liuhua presented a very congested. However, Sonardyne’s LBL acoustic positioning and 6G technology has meant we have benefitted from incredibly precise, accurate positioning of the subsea structures – especially during the metrology phase where the results were well within the expected and achievable accuracies.”
FROM RANGEMETER TO SCOUT

In 1967, the wreck of King Henry VIII’s flagship, the Mary Rose, was discovered lying buried beneath the seabed in 12 metres of water, a mile south of the entrance to Portsmouth Harbour. Coinciding with the 30th anniversary of its salvage in 1982, and on the eve of the opening of a new museum, Baseline invited retired Sonardyne Operations Director Nigel Kelland and project member Peter Holt to tell the story of how several generations of the company’s acoustic technology made the recovery and ongoing study of this historic ship a reality.
Following its rediscovery in 1967, considerable effort was spent assessing the feasibility of salvaging the Mary Rose. With the vessel having sunk more than 15 metres into the mud, a plan of the exposed wooden frames on the seabed and trenching to study the ship’s sides was required.

This initial survey was carried out in 1975 using one of Sonardyne’s earliest products – Rangemeter. This diver-held unit was used to interrogate a network of four High Frequency (HF) transponders deployed in fixed seabed frames positioned around the wreck site, which also now included a diving platform that had sunk during gale conditions two years earlier.

With a diver positioned next to a transponder frame, Rangemeter interrogated each transponder on a unique frequency, receiving replies on a common one. The two-way travel time, measured in milliseconds, was presented on the Rangemeter’s four digit display. Each transponder reply incorporated a unique tone burst signal which was used to assist transponder recognition, whilst a compass unit mounted on top of the Rangemeter provided bearing information.

In those days, devices with internal memory did not exist so divers resorted to reading the measurements out loud, recording them to underwater tape recorders attached to their air cylinders. This time consuming procedure was repeated for each transponder location,
with all the data being processed manually after each dive to calculate baselines and relative positions.

The ranges measured from each frame were used to compute National Grid coordinates with an estimated relative position error better than +/- 10 mm. The results were used to correct the positions of previously surveyed and newly exposed frames which had been determined using traditional offset tape measurements (Figure 1).

1979 – Planning for the lift
In preparation for the planned raising of the Mary Rose, additional acoustic control positions were required. By now Sonardyne had developed its first vessel-based (and automated) LBL system – Rangemaster. A Medium Frequency (MF) system, it was used to supplement the original Rangemeter data and, from 1980, was used as the basis for a trilateration system using taped measurements from any four of the fixed datum points.

1982 – Recovery with PAN and Compatt
Recovery of the Mary Rose required the use of the giant floating crane vessel Tog Mor, a lifting frame and recovery cradle. The remains of the hull were wired to the lifting frame by bolts attached to the hull at critical locations. Hydraulic jacks operating on the legs of the frame raised the hull until it was free of the underlying silt before transferring it to the recovery cradle. Once safely in the cradle and supported from above and below, the hull was ready for the final lift out of the water.

A critical requirement in this part of the project was to provide the crane operator with the relative positioning information between the frame and cradle for safe guidance during the docking procedure. An LBL configuration using Sonardyne’s much-loved Programmable Acoustic Navigator (PAN) and Mk3 Compatt transponders was undertaken with data from the Compatts’ inbuilt sensors being used to monitor depth and sound speed.

After establishing the position of the cradle relative to the array, two ‘mobile’ Compatts were then removed from the cradle and redeployed on the lifting frame. The position, orientation and height of the frame was monitored relative to the recovery cradle (Figure 2) with the information radioed to the crane operator. Successful docking was achieved, and in front of a live television audience, the hull of the Mary Rose emerged from the Solent on 11th October 1982.

2003 – Digging deeper
In 2002, the UK’s Ministry of Defence considered widening and straightening the channel approach to Portsmouth to accommodate two new aircraft carriers. The dredging would have affected the Mary Rose site which still contained important timbers and artefacts left behind when the hull was recovered, while the remains of the bow castle had never been investigated.

So in 2003, a 30-day period of excavation work was undertaken

### Fig 1. Mary Rose timbers as mapped in 1971 (Top line) and in 1975 (Bottom line). (Left) The Mary Rose is lifted from the seabed using the recovery cradle.

### Fig 2. The position, orientation and height of the frame was monitored relative to the recovery cradle.
by the Mary Rose Trust from a dive support vessel using Fusion – Sonardyne’s most advanced LBL system yet. To provide the highest possible accuracy all equipment was configured to operate in the EHF frequency band – a band that today is redundant thanks to the advances made with MF wideband signal technology.

For the survey, an excavation ROV was fitted with a ROVNav5 LBL transceiver connected to two remote transducers mounted at each end of the vehicle’s dredge head. Four Mk4 Compatts were also deployed in rigid frames with one fitted with a precision depth sensor to monitor tidal variation. ‘Top-down’ and ‘Baseline’ calibrations were carried out to determine the Universal Transverse Mercator (UTM) positions of the Compatts and to obtain a higher accuracy relative calibration for the array, as seen in Figure 3.

Divers used a 2.5 metre survey staff fitted with a lightweight Mini-ROVNav transceiver to position new artefacts and features identified during the excavation, including the diving platform sunk in 1973. The platform’s position had also been determined during the 1975 Rangemeter survey. By correlating the platform position from each data set, the original in-water position of the Mary Rose frames on the seabed could be superimposed onto the 2003 plot (Figure 4).

Similar surveys were repeated in 2004 and 2005 with Sonardyne’s range and bearing USBL system, Scout, now being used to position and track targets out to 500 metres. The integrated motion sensor in the transceiver automatically compensated for the dynamic motion of the vessel and the output was combined with DGPS and gyro readings to derive positions.

Excavation of the trenches was carried out using divers working in a grid frame marked out with mini transponders and positioned using the Scout system at locations specified by the archaeologists. The results of the excavation included a digitised drawing of the hull timbers taken from measurements of the hull after it was recovered (Figure 5). The 9 metre long stern timber and 4.8 metre anchor were positioned and recovered at the end of the 2005, ready to be reunited with the hull in the new Mary Rose museum located in Portsmouth’s Historic Dockyard.

2013 – Her final resting place

The Mary Rose has been a project close to the heart of Sonardyne for many years. It was the first wreck site in England to use underwater acoustic positioning techniques and, after spanning 30+ years involving many generations of Sonardyne’s acoustic technology, it has been the longest running project since the company’s inception in 1971. With the ship having found her final resting place, displayed for future generations to enjoy, Sonardyne is proud to have been played a part in raising the Mary Rose and uncovering some of her many secrets. BL

The new Mary Rose Museum is due to open in early Spring 2013. visit www.maryrose.org for more information.
Lightweight Release Transponder

The Lightweight Release Transponder (LRT) is a low cost, ultra-reliable acoustic release whose versatility lends itself to a wide range of shallow water applications.

The LRT is depth rated to 500 metres making it the ideal choice for use in continental shelf waters. Field-replaceable alkaline or long-life lithium battery packs give a listening life of 18 months and 34 months respectively. A ‘screw-off’ release mechanism ensures a positive release action that overcomes any biological growth and all external parts are made of high strength plastics that provide excellent environmental corrosion resistance.

LRTs are set up and commanded from the surface using the low-cost Type 7967 deck unit which is supplied with a remote transducer and 10 metres of cable. The deck unit is initially used to program the acoustic identity of the LRT, test the transponder and load the release nut prior to deployment. Once deployed, the deck unit can measure ranges to the transponder and prior to sending a secure release command, relocate the transponder. The deck unit can be controlled via RS232 enabling raw data to be logged to a PC.

An optional attachment for the LRT is a rope canister that allows items left on the seabed, for example, tools, cables and salvage, to be quickly and easily hauled up. It works by mooring one end of the rope to the item on the seabed and the other to the LRT via the attached canister. As the transponder ascends to the surface, high strength rope is deployed and can be used to pull the item up directly or retrieve heavier tag lines.

LRTs can be supplied with ±15° or ±30° tilt sensors. This allows the user to acoustically check that the LRT and its mooring have been correctly deployed on the seabed.

LRT Facts & Figures

- Depth rated to 500 metres
- Safe working load of 125 kg
- Up to 34 months deployment with long-life lithium battery pack
- Rugged, compact design
- Hundreds of secure identities; field programmable with deck unit
- Compatible with Scout USBL, ROV-Homer, Homer-Pro and Prospector positioning/relocation systems

See for yourself
See how easy it is to set up and use an LRT by watching our ‘How To’ videos. Just head to our website or YouTube channel.
Lodestar Feature Plans – Buy or PAYG

Choose the depth rating of your Lodestar then add the feature plan to suit your application – subsea AHRS through to acoustically aided navigation. Upgrade capability at any time.

AHRS: A premium grade all-in-one gyrocompass and motion sensor. Developed for subsea vehicle applications that require the precise measurement of heading, heave, roll, and pitch in a highly dynamic environment. Back-up battery and onboard memory ensures that motion sensing is maintained during vehicle brown-outs. Upgradeable to SPRINT inertial navigation plans.

Features of the plan:
- Purchase only
- Subsea Lodestar | Vehicle installation kit | Utility software
- Standard: Phone and email support | Installation Advice
- 1,000m | 3,000m | 5,000m depth rating | Operator training | Offshore support
- Upgradeable to SPRINT S5 and S10 plans

SPRINT S5: The perfect complement to your USBL system, improving speed and efficiency. Uses USBL, LBL and DVL aiding to create a tightly coupled navigation solution.

Features of the plan:
- Purchase OR Pay-As-You-Go
- Subsea Lodestar | Vehicle installation kit | Vessel hardware | Software and dongle
- Essential: Phone and email support | Installation Advice | Operator training
- 1,000m | 3,000m | 5,000m depth rating | Offshore support | Operational planning
- Upgradeable to SPRINT S10 plan

SPRINT S10: Uses USBL, LBL and DVL aiding to improve the speed and efficiency of subsea vehicle operations with high quality SPRINT inertial measurements aided by your USBL. Position targets in any water depth, over long laybacks and during challenging acoustic conditions. High update rate allows greater vehicle control and is suitable as an ROV station keeping input. USBL vendor independent.

Features of the plan:
- Purchase OR Pay-As-You-Go
- Subsea Lodestar | Vehicle installation kit | Vessel hardware | Software and dongle
- Ultimate: Phone and email support | Installation Advice | Operator training | Operational planning | Offshore support
- 1,000m | 3,000m | 5,000m depth rating

Upgrade to SPRINT S10 and enjoy the time and cost saving benefits of our most advanced subsea INS. Improves LBL efficiency by using sparse seabed arrays without sacrificing precision. Aiding from vehicle-mounted sensors further improves precision, accuracy and the reliability of the navigation solution. Our ultimate support package includes everything you need.
International

News from around the World

SE Asia – Singapore
Nick Smedley
Senior Vice President

Growth all round
Asia has seen some impressive growth over the past 12 months with 6G firmly establishing itself as an industry favourite. Sales of LBL and USBL systems – GyroUSBL in particular – have reached a record high over the past year and this trend looks to continue throughout 2013 as new fields come online. If you would like to try out the benefits of GyroUSBL, we now have a system available for offshore evaluation.

Training in-house and onsite
With the increased interest in USBL and LBL training requests for these have also been on the rise; we’re now running at least one ‘open’ LBL and USBL training course every month throughout the year alongside our regular workshops and client training. We’ve also had great success with onsite operator training meaning that we can now bring the course to you, wherever you are. If you’re interested in any of our training sessions, please do get in touch.

As a result of the increased workload we’ve strengthened our customer support engineering team, supporting clients both in the workshop and offshore.

USA – Houston
Simon Reeves
Senior Vice President

6G goes from strength to strength
6G upgrades are the topic of focus in the offshore drilling market at the moment – we’re seeing many customers asking about upgrading their legacy Dimona USBL systems to our latest Marksman 6G technology.

Lodestar – the right attitude
Applications of Lodestar are also on the increase with recent installations of DP-INS and GyroUSBL systems in the region. We also have planned demonstrations of SPRINT for ROV tracking and mid-water station keeping in the coming months (see page 14). The functionality and capabilities of Lodestar have given us a system with optimised reliability and robustness whether the task is a quick, single transponder operation or long term drilling.

Leak detection of the future
As mentioned in the previous issue ofBaseline, our new Automatic Leak Detection Sonar is now undergoing final deepwater performance trials. The team behind the technology has returned to the Gulf of Mexico for real time gas leak testing, the results of which will be available later this year.

UK – Aberdeen
Barry Cairns
VP Europe and Africa

Markets old and new
2012/13 has been another year of significant growth within the regional markets. 6G kit has been flying off our shelves, proving that the technology is being fully adopted as the industry standard for the majority of subsea positioning requirements. We’ve also seen exciting new markets outside of our traditional oil and gas industries develop, creating opportunities for our AMT monitoring equipment.

Training takes off
Training is still integral to our commitment to providing excellent service and many customers have taken part; our Life of Field, Errors and Maintenance workshops have been proving most popular. We’ll be holding LBL and USBL training sessions in our classroom throughout the year so get in touch if you’d like to come along.

Brazil – Rio das Ostras
Paul Smith
Operations Director

Return on investment
We’re now settled in our new HQ and already reaping the rewards of its impressive facilities. Stock holding is on the rise with two 3,000 metre SPRINT systems being the most recent arrivals. This equipment has been ear-marked for offshore evaluation trials so if you have an upcoming project that would benefit from this time-saving technology get in touch.

With new technology comes the need for hands-on training; our 2013 schedule includes courses for Marksman, Ranger 2 and SPRINT.

DP reference
Sticking with the inertial theme, the number of DP-INS systems operating in Brazilian waters is steadily growing. Petrobras is installing one on the P23 and Transocean has purchased systems for the Sedco 706 and Cajun Express rigs.

Changing roles
Andre Moura, one of our most experienced field engineers, has made the transition to our commercial team. His in-depth knowledge of our technology and subsea operations, means we are now even better equipped to support our local customers and their projects.
Ask Darren

Customer Services Manager, Darren Taylor and his team are the front line of Sonardyne’s customer support network. If you have a question, they can give you the answer.

Q I have recently noticed on a 6G product datasheet there is a TEE value in the spec table. What does this figure mean?

A TEE value is a Sonardyne term that stands for Tone Equivalent Energy and provides the user with an approximation of the operational performance when comparing wideband and tone systems. Signal detection performance is directly proportional to acoustic signal energy. For example, WBv2+ signals are four times the duration of Sonardyne tone signals hence four times the energy for the same power (source level), whilst WBv2 and WBv1 are twice the duration, hence double the energy. In the graph below, all of the signals have the same energy; the green 100W signal will give the same detection performance as the blue 25W signal with four times the duration.

Q I have a noisy ROV without responder capability and am having difficulty tracking my mini beacon. What do you suggest to overcome this?

A Responder mode is the best way to overcome this, however as you stated, this option is not available. We therefore recommend using a Type 8190 Wideband Mini Transponder which is a full two-way Wideband 2 mini transponder/responder. WMTs have a greater immunity to noise and multipath interference, enabling reliable ROV tracking to begin. See page 9 for more information.

Q How do I correctly configure Time of Day in Fusion? I have ZDA and 1PPS fed into the system but Fusion will not accept it.

A Having the right time stamping is critical to the performance of your LBL system. You must ensure that the ZDA (time and date) and 1PPS pulse are fed into the Navigation Controller Unit (NCU). If the ZDA string is fed into the NavPC, there may be a problem with the software accepting it as the difference between the internal clocks of both units may cause a discrepancy between timings. It is also important to ensure that the cross over cable that connects the NCU and NavPC is the Sonardyne supplied cable.

If you are still unable to configure Time of Day, an engineer will contact you for further support.

Q Do I have to open the GyroCompatt 6 and disconnect the batteries prior to shipping?

A No – the LGC6 is fitted with latching relays that are controlled by the mains charger unit. Simply plug the charger into the GyroCompatt and rotate the in-line switch to the Transport Safe position. This will isolate the internal Li-ion batteries so it is safe to transport the unit.

Q Hi Darren. Please can you tell me the recommended transponders for a Marksman LUSBL system? I currently have Compatt 5 MF directional units, will they be compatible? Will I experience any system limitations with this configuration?

A Yes, you can use your Compatt 5s with Marksman and I can see from our records that you are also using a GDT transceiver. The only limitation you’ll experience when using this configuration is that you will be restricted to Wideband 1 operating modes. For full Wideband 2 functionality, you would need to upgrade to 6G transponder and vessel hardware.
GyroUSBL. Impressive performance in the water and on your balance sheet.

Setting up a USBL tracking system can be a time consuming exercise, often requiring many hours of transceiver calibration checks before you and your vessel can get to work. But thanks to our new GyroUSBL, you can now be survey-ready in less than 60 minutes.

Inside, we’ve integrated our high grade attitude and heading reference/INS sensor, Lodestar, with a Sonardyne sixth generation HPT transceiver. This combination eliminates the alignment errors seen in conventional USBL systems and is proven to deliver unrivalled levels of accuracy and precision – even when installed on vessels-of-opportunity using temporary deployment poles.

So if you’re looking for a USBL that will help cut the costs of your subsea positioning operations without cutting performance, take a look at GyroUSBL.

The figures speak for themselves.

- Class leading positioning performance
- Acoustic transceiver with built-in INS
- Rapid mobilisation < 1 hour
- Unbox, install, start working
- Integrated high speed communications
- Fit on any type of vessel-of-opportunity
- Low cost of ownership; no hidden extras
- Backed by Sonardyne’s global support network