An important aid to vessel navigation and collision avoidance, Sonardyne’s Navigation and Obstacle Avoidance Sonar (NOAS) images the seabed ahead of a vessel to detect potential underwater hazards. Using sophisticated bow-mounted transducers, NOAS displays water depth, sub-surface obstacles and features by creating an accurate 3D model of the underwater environment. The model is displayed relative to the vessel and overlaid on nautical charts in real-time, providing the crew with an easily interpreted image of the underwater topography the vessel is passing through.

SYSTEM OVERVIEW
NOAS is a low power, forward-looking sonar that can be operated as a standalone unit or be integrated into a vessel’s navigation and integrated bridge systems.

The sonar scans the water column and builds a 3D model of the seabed and submerged objects ahead of the vessel. The intuitive display informs the crew of the seabed terrain and any potential underwater hazards to a range of up to 600 metres over a 90 degree field of view in 2D and 3D depth modes and out to 1,500 metres in sonar mode. NOAS also has an operating mode for underwater intruder detection and can be used with Sonardyne’s diver detection sonar system, Sentinel.

NOAS can operate as an independent system or feed fully-processed sonar images into, and be controlled by, the vessel’s integrated navigation system. This allows the crew to customise the operator display to meet the specific needs of the vessel and its mode of operation. When installed on autonomous vessels, data on detected objects and potential collision hazards can be output to an auto-pilot or autonomous control system.

Consisting of two sonar arrays that are mounted in the bow of the vessel, NOAS is designed to be retro-fitted to existing vessels as well as new builds. Comprehensive engineering support and advice is available from Sonardyne to support installation and commissioning.
NOAS OPERATION

NOAS scans the water column ahead of the vessel in both vertical and horizontal planes to provide a 3D model of the seabed and objects in the water column. This is displayed in an intuitive user interface that can be manipulated by the operator to offer alternative views of the water column. The display is designed to be used to aid navigation, showing the water depth and potential underwater hazards overlaid in real-time with the vessel’s position and chart information. The screenshot above is representative of NOAS’ 3D operating mode, with the Main View (1) window illustrating how sonar data builds a model of the underwater environment. NOAS can also show a 2D display which is colour-coded to represent depth with blue being deepest and red for shallow water or objects.

Alerts can be configured to warn of potential collision hazards or shallow water. These can be based on depth, distance from the vessel and time to impact. Multiple alerts can be programmed and are displayed in the profile view and depth scale.

Sonar imagery and depth is temporarily retained on the display providing the operator with a recent history of the vessel’s passage. This feature can be particularly useful when manoeuvring, as the depth of the water and potential hazards are displayed even when outside of the sonar’s current field of view. The chart layers can be enabled and disabled. In addition, the operator can choose to display range rings or range markers as required by the vessel’s operator.

A window in the display shows a profile view of a slice through the depth data ahead of the vessel (3). The profile can be steered to port or starboard by the operator (4). The Overview Window (2) shows the current position and historical track of the vessel on a smaller scale North-up chart, along with the vessel’s current latitude, longitude and heading, as received from the ship’s navigation aids.

NOAS HARDWARE

The NOAS hardware consists of Projector and Receiver arrays which can be mounted together or separately. Sonardyne can also provide a mounting frame to enable NOAS to be easily installed in a ship’s bow. The arrays can be mounted behind acoustically transparent windows thereby preserving the existing hull design. Sonardyne’s highly experienced engineering team can work with owners to design bespoke mounting arrangements.

The Receiver array sends the sonar and depth data to the NOAS processor unit located inside the vessel, which provides the graphic user interface, interconnections and interfaces for integrating into the bridge console and ship systems.

NOAS User Interface

1. Main View Window
2. Overview Window
3. Profile Window
4. Profile Steering
5. Depth Scale
6. Display Modes
7. Alert Level
8. Range Settings

The way ahead for vessel navigation

When navigating poorly charted or unfamiliar areas, commercial ships, expedition cruise ships, private yachts and naval vessels remain vulnerable to groundings and collisions with submerged objects.

Integrated intruder detection

Uniquely, NOAS offers an intruder detection capability to warn of divers approaching the vessel.
NOAS PERFORMANCE SUMMARY

**FEATURES**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range / Field of View</td>
<td>75 m, 150 m, 300 m, 600 m, for 90° field of view in 3D Depth Mode</td>
</tr>
<tr>
<td></td>
<td>75 m, 150 m, 300 m, 600 m, for 90° field of view in 2D Depth Mode</td>
</tr>
<tr>
<td></td>
<td>75 m, 150 m, 300 m, 600 m, 900 m, 1,500 m for 90° field of view in Sonar Mode</td>
</tr>
<tr>
<td>Operational Speed</td>
<td>Up to 25 knots (Depending on installation)</td>
</tr>
<tr>
<td>Weight in Air</td>
<td>14 kg (Receiver), 7 kg (Projector)</td>
</tr>
<tr>
<td>Chart Overlay</td>
<td>ENCX. Supporting ENC (S57), ARCS and NOAA RNCs</td>
</tr>
<tr>
<td>Bottom Mapping Ratio</td>
<td>Up to 20x water depth</td>
</tr>
<tr>
<td>Maximum Depth Detection</td>
<td>100 metres below sonar</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>&lt;150 Watts</td>
</tr>
<tr>
<td>Operating Frequency</td>
<td>70 kHz with 20 kHz bandwidth</td>
</tr>
<tr>
<td>Roll/Pitch Stabilisation</td>
<td>+/- 20°</td>
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<tr>
<td>Angular Accuracy</td>
<td>~0.3°</td>
</tr>
<tr>
<td>In-Water Target Ping Stabilisation</td>
<td>Yes</td>
</tr>
<tr>
<td>User Defined Automated Alarms</td>
<td>Yes</td>
</tr>
<tr>
<td>Display of Ship’s Navigation Information</td>
<td>Latitude, Longitude and Heading</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows® 7 and 10</td>
</tr>
</tbody>
</table>

**Sonar mode**

In Sonar mode Computer Aided Detection (CAD) alerts are generated on objects at a distance of up to 1,500 metres.

**Sonar arrays**

The Projector array and Receiver array can be mounted together or separately in the bow of the vessel.