Fugro has upgraded its fixed-frame gradiometer solution to a 3D steering system. The 3D Geowing is attached to a remotely operated towed vehicle (ROTV) capable of horizontal and vertical control. It enables magnetic objects to be detected through detailed surveys of the seabed.

In 2015, Fugro developed the Geowing – a fixed gradiometer frame used in combination with an ROTV. It performs high-resolution gradiometer surveys, coupled with advanced processing and determination of three-axis gradient data.

We upgraded Geowing to a 3D steering system in Q2 2017. It can now track a survey line similar to the course followed by the vessel’s autopilot. It can also consistently position itself a few metres above seabed at the required altitude.

The new 3D Geowing system provides two main benefits:

- Improves positioning accuracy and infill requirements
- Discriminates unexploded ordnance (UXO) targets from local geology and background noise, and reduces the number of false positives.

**THE SYSTEM**

We specifically designed the 3D Geowing to collect high-resolution data. Its fixed gradiometer frame is 5 metres wide and mounted on the EIVA Scanfish Katria.

The 3D Geowing can be equipped with 5, 6 or 8 caesium vapour magnetometers (Geometrics G-882) in a two-row configuration, so that the data can be processed as gradients. Number of magnetometers will be project specific, based on the client’s requirements and complexity of the project. We have developed advanced processing techniques for use with the 3D Geowing gradiometer set-up.
Conventional magnometer surveys rely on algorithms to compute the X, Y and Z gradients based on heavy assumptions. However, a gradiometer system like the 3D Geowing allows the geophysicist to measure the X, Y and Z gradients manually – this approach minimises background noise and reduces the number of false positives.

The Geowing has completed high-resolution UXO surveys covering more than 4,000-line kilometres in the European sector. We can also deploy it in a dual fish configuration from our survey vessels, to double the swathe covered in one pass.

The Geowing system has proved particularly useful to LMB mine projects in European waters. Aluminium WWII mines have a very low magnetic signature, which causes problems for detection. The use of gradiometer data helped with the detection of the LMB and the reduction of false positives, providing the client a higher confidence on the identification of the LMB.

SURVEY METHODOLOGY
Depth of object detection depends on the type of object we are looking to detect and survey configuration.

The 3D Geowing can detect anything with a ferrous content, provided that the line spacing and the altitude above the object are correct.

We use desktop studies carried out by UXO consultants to determine UXO risk, type and ferrous weight. Once these details are known, the survey parameters are set.

The 3D Geowing accurately tracks flight over the seabed at a set altitude. This allows us to safely fly the 3D Geowing a few meters above the seabed, ensuring a greater magnetic signature to be received from ferrous objects. This is also aided by the number of magnetometers and their arrangement within the 5 m wing.

KEY FEATURES
- Gradiometer frame mounted on an ROTV
- 3D steering capabilities – vertical and horizontal control
- Seabed tracking accurate to 0.2m – maintains optimal altitude
- Reduces the requirement for vertical and horizontal infill (and operation time)
- Safe and controlled deployment and recovery
- Can be deployed in a dual fish configuration, doubling the swathe covered in one pass
- Real-time measurement of the vertical and transverse gradient
- Minimises the effect of underlying geology and motion noise
- Reduces false positives, which in turn reduces the need for further investigation.