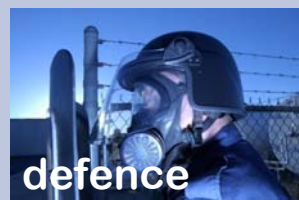




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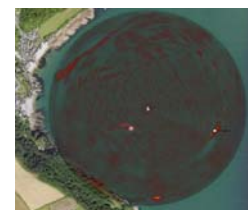


WG Marine Intruder Detection Sonar

The Westminster Marine Intruder Detection Sonar (WG MIDS) system is a single- or multi-head active sonar system designed to automatically detect and track underwater and surface threats, principally divers (scuba or closed-circuit, with or without propulsion aids), surface swimmers and un-manned underwater vehicles.



The system will track simultaneously multiple targets up to a range of 950 metres, with classification of targets such as divers occurring at 450 metres, the system will also provide upon classification the targets previous trail.

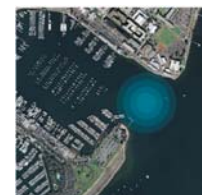


Applications

The practicality of the WG MIDS design makes the system a realistic option for protecting a wide range of maritime assets:-



- ▶ Expeditionary warfare units in overseas ports are widely recognised as the most visible and vulnerable of targets.
- ▶ Valuable oil and gas refineries, liquefied natural gas terminals and power stations. With many of these facilities already deploying conventional terrestrial security systems including: thermal imaging, CCTV, radar and ground sensing devices, the WG MIDS closes the defensive circle against intruders.
- ▶ The WG MIDS can be used to protect any sensitive fixed installation with a water perimeter, harbours, private moorings or individual passenger ships, luxury yachts etc.



The reliable detection of underwater targets and their discrimination from marine mammals is a notoriously difficult problem.

The WG MIDS system addresses this challenge by combining state-of-the-art sonar technology, commercial off-the-shelf (COTS) based processing units and automated detection, classification and tracking software which has been tested and proven in extensive trials.

The WG MIDS system will function in a wide a range of acoustically complex subsea environments and will only alert when genuine threats are detected.

This minimises potential false alarms and reduces the dangerous tension and operator fatigue that these can generate.

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WG Marine Intruder Detection Sonar

The user interface for the WG MIDS has been designed from the outset with ease of use in mind. This system can be easily operated by operators whom have not been trained to use conventional sonar systems.

Deployment

The system is designed for a wide range of installation configurations:-

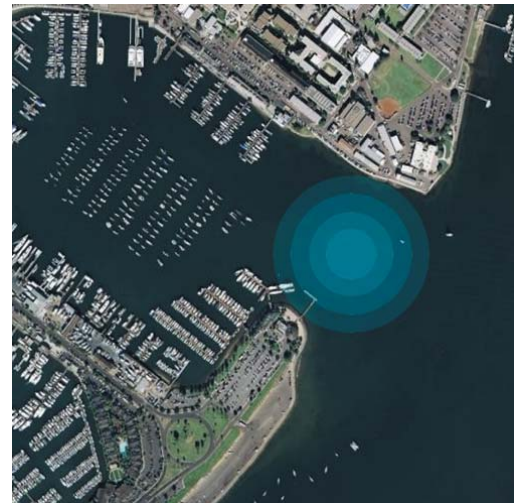
- ▶ Tripod seabed mounting;
- ▶ Jetty mounting;
- ▶ Pole mounting over the side of vessels;
- ▶ Freely suspended over the side of vessels;
- ▶ Through-hull deployment.

Harbour Entrance / Fixed Point Protection

The reliable detection of underwater targets in the acoustic environment of a harbour is a well known problem. Constant vessel traffic, noise from continually active depth sounders and a complex thermal structure typify this scenario.

WG MIDS has been specifically designed to cope with these adverse conditions and is capable of tracking thousands of targets in real time with only genuine threats causing an alarm that the operator or observer need react to.

Mounted in either a seabed frame looking upwards or on a permanent harbour wall mount looking across the entrance, Sentinel is easy to install and configure for autonomous operation from a remote monitoring station.



Networked Port Installation

Under the International Ship and Port Facility Code (ISPS code) it is vital to ensure protection against foreseeable events. The WG MIDS has been designed to operate in a stand-alone or networked mode with multiple sonar heads to enable complete protection of assets within the security zone.

The commercial off-the-shelf (COTS) based processing units can facilitate up to 10 sonar heads per command station, offering a cost-effective solution to large area coverage.



The overlay will increase the level of domain awareness in an estuary, coastal environment or complex port and can be totally integrated into a central command system with above water surveillance.

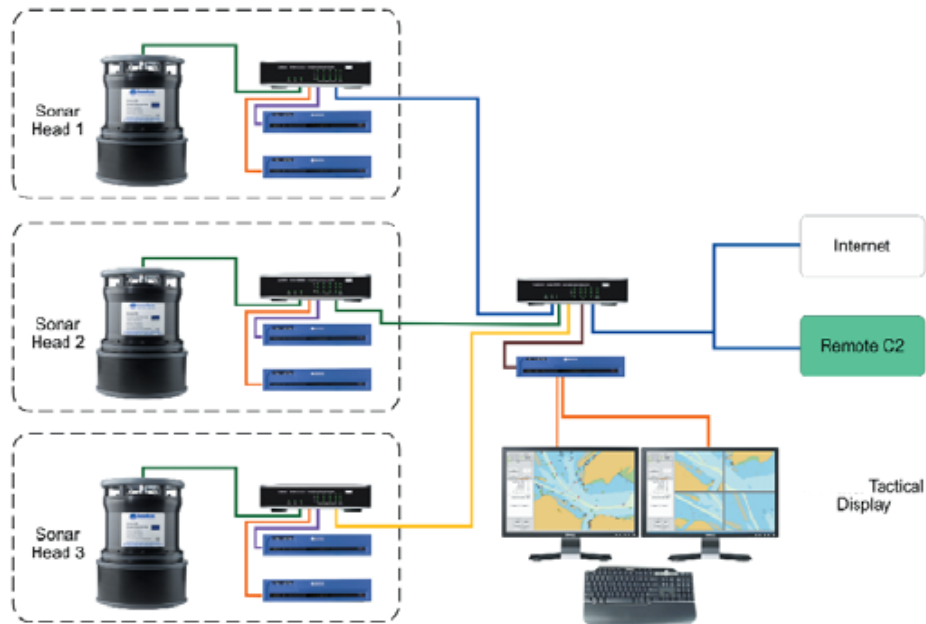
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Networked WG MIDS



A typical multi-head network - Up to 10 sonar heads can be integrated into a single command workstation, with each head requiring its own sonar processor

The WG MIDS unique detection, classification and tracking software has been proven to operate in the harshest environmental conditions including 'brown' water, noisy, shallow, tidal harbours where vessel activity results in a lot of disturbance in the water column.

Asset Protection

WG MIDS compact size and lightweight design make it a practical solution for rapid mobilisation to meet an evolving threat.

With minimum storage requirements, the Sentinel system can be carried on board as part of a mobile or expeditionary security unit, providing a secure underwater perimeter for high value assets.

With the sonar head weighing less than 35kg it can be deployed over the side of the vessel or from a jetty by one person using only minimal equipment.

Sonar processor and command workstation set-up is an equally simple task with the full system typically configured and online in less than 30 minutes.



Providing wide area coverage, the WG Sentinel is designed to provide secure underwater perimeters for both military and civilian assets. These include: naval vessels at anchor in overseas ports, cruise liners in harbour and super yachts moored off the coast.

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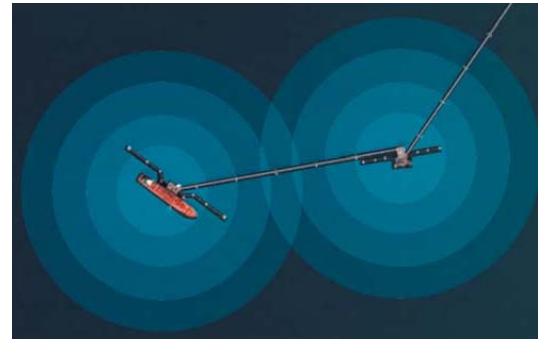
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Energy Infrastructure

The threat of insurgency, vandalism or criminal activity is not restricted to ports or military assets. Any oil and gas installation, whether coastal or offshore, is extremely vulnerable to attack from below and represents a significant threat to a region's energy supplies.



The WG MIDS open system architecture allows integration of the subsea security zone with conventional terrestrial security systems, including thermal imaging, radar and ground sensing devices.

The WG MIDS system has been developed from the outset with flexible deployment in mind. It can be mounted from a pole based deployment system, suspended from its combined signal and power cable or mounted on the seabed.

Considerations such as ease of installation by divers in low visibility have been taken into consideration in the WG MIDS from the very beginning. Westminster has a proven track record in deployment systems and can recommend the most appropriate solution

Sonar Head

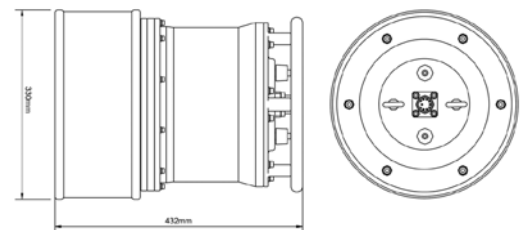
With a sonar head measuring just 44cm tall by 33cm diameter and weighing less than 35kg in air, the WG MIDS sonar array is considerably smaller than any other system currently available yet it provides a full 360 degrees of coverage and is capable of reliably detecting and tracking underwater targets up to 900 metres away.



The compact size of the sonar head makes it ideal for expeditionary operation as it is capable of being easily palletised and rapidly deployed.

The sonar head contains the electronics to control the transmitters and digitize and multiplex the received signals from the transducers.

The multiplexed data is transmitted to the topside equipment via a copper-based cable for cable lengths up to 100 metres, or via a fibre optic cable for up to 30 km lengths.



The sonar head also contains an attitude and heading reference sensor which monitors the orientation of the head and allows the topside processor to automatically compensate for any motion.

This enables the system to be suspended by its own cable from moving platforms such as drifting patrol boats or ships on single point moorings.

The head is also small enough to be mounted on an unmanned underwater vehicle.



WG MIDS mounted on sea bed deployment frame.

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WG Marine Intruder Detection Sonar

Command Workstation

The Command Workstation configures and controls all Sonar Processors in the WG MIDS system. It takes in beam-formed, normalised sonar data and track data from each Sonar Processor.



The combined outputs from all the Sonar's are shown on one screen, and a zoom image from one Sonar on the other. (A single Head system may have only one display).

Processor and Software Pulse compression, beam forming and automatic detection and tracking (ADT) are carried out in two high performance PCs installed in a rugged case.

The case also contains the power distribution unit for the sonar head.

The command workstation, a third PC, provides a tactical-style display for the system. This shows the sonar data, track data and alerts overlaid on a chart. If multiple sonar heads are deployed, they are all interfaced to the command workstation via an Ethernet LAN, and the tactical display shows all the sonar coverage in the correct geographical locations on the chart.

The WG MIDS software has been written using the latest software techniques, allowing full network connectivity. The command workstation supports track export to an external Command and Control system and can be configured for remote internet access to allow system status reporting from anywhere in the world.

System Performance

Typical Detection Range

- ▶ Through Sand Bottom (10 metre depth) 400 metres;
- ▶ Sand Bottom (20 metre depth) 600 metres;
- ▶ Mud Bottom (10 metre depth) 900 metres.

Sonar Head

- ▶ Through Type Number Type 8160-000-01;
- ▶ Dimensions 330mm x 432mm;
- ▶ Centre Frequency 70kHz;
- ▶ Bandwidth 20kHz;
- ▶ Number of Beams 256;
- ▶ 3dB Azimuthal Receive Beamwidth 3.5°;
- ▶ 3dB Vertical Receive and Transmit Beam width 11°;
- ▶ Source Level 206 dB re 1µPa @ 1 metre;
- ▶ Pulse Length 40ms;
- ▶ Maximum Operating Depth 50 metres;
- ▶ Weight in Air / Water (Depending on configuration) 35kg / 6kg;
- ▶ Maximum Distance Between Sonar Head and Processor 10km, Fibre optic cable 30km;
- ▶ Options Seabed frames, through hull deployment machine, over the side mount.

Sonar Processor

- ▶ Through Interface Industry standard TCP/IP protocols;
- ▶ Wireless network options available;
- ▶ Maximum Sonar Heads Per Command Station 10;
- ▶ Options Command Control Unit, wireless remote display, Sonardyne tracking systems.

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WG Marine Intruder Detection Sonar

System Presentation



An aerial photograph, nautical chart or any other bitmap may be configured to be used as the background display.

The sonar and track data will be displayed as semi-transparent layers over the background image. The normal orientation of the display is North up, though other orientations may be configured. The range of each sonar head defaults to 600 metres, with range rings spaced at 200 metres.

Once an intruder has been identified; the intruder's previous track will also be shown.

The following information is presented to the operator:-

Head ID	The Sonar Head number producing the track. An automatically assigned ID number. Track IDs are monotonic, starting at 1, followed by the device ID and System Enumerator.
Age	Total number of seconds that the track has been alive, s
SNR	Youngest-weighted average signal to noise ratio of the contact, dB
Bearing	Sonar relative track bearing, degrees
Range	Current range of the contact from the sonar head, metres
Speed	Current speed of the track, m/s
Heading	Current heading of the contact, relative to True North, degrees
Trail Length	Total scalar distance covered by the track, meters
Longitude	Current longitude of the contact
Latitude	Current latitude of the contact
Track State	Born, active, predicting, abandoned, lagged or dead
Quality	Weighted ratio of hits to pings, %
Aggression	Ratio of distance from the track origin to its current position to the cumulative length of the track's trail.
Alert State	Current alert level of this track – moderate, substantial, severe or critical
Classification	Current classification as determined by the ASC (if available) SCUBA, closed-circuit, machine or none

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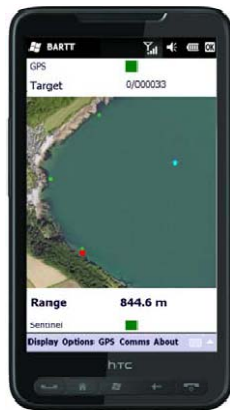
WG Marine Intruder Detection Sonar

Hand Held Sonar Diver Location Device

The Hand Held Sonar Diver Detection Device provides the security response personnel with the ability to track the sonar located underwater intrusion object / person from their craft i.e. RIB boat.

It will provide:-

- ▶ Mobile device interface;
- ▶ Gives Bearing And Range To Target (BARTT);
- ▶ Displays own ship's position, range & bearing to target;
- ▶ Control room displays devices location;
- ▶ Receives data via a GPRS connection;
- ▶ Updates every sonar ping during tracking.



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