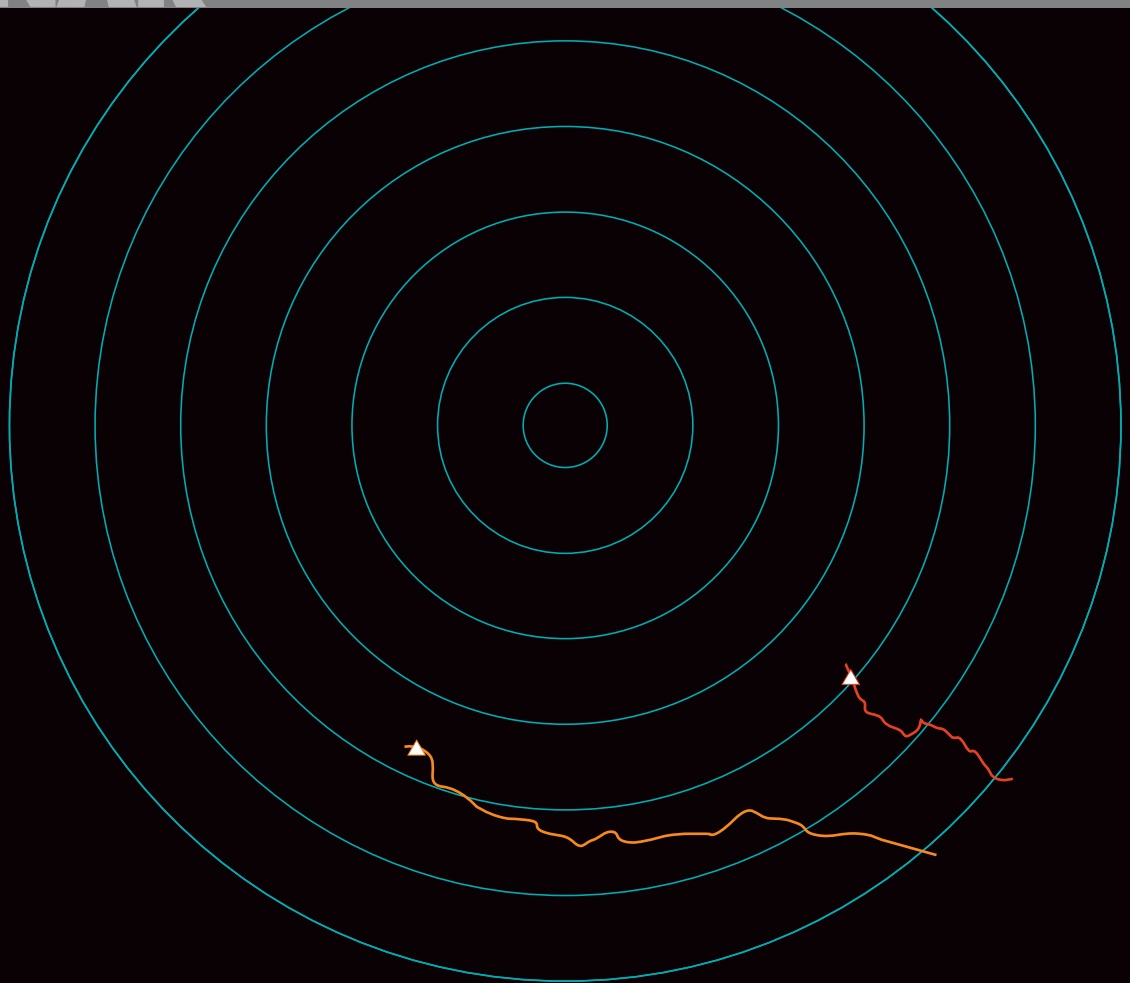


# **SENTINEL** **INTRUDER** **DETECTION** **SONAR**



**SENTINEL**

# DETECT, TRACK, CLASSIFY, DETER.

**CLOSE THE GAP IN YOUR SITUATIONAL AWARENESS BY SPECIFYING THE WORLD'S MOST WIDELY DEPLOYED UNDERWATER INTRUDER DETECTION SONAR, SENTINEL, TO HELP SAFEGUARD YOUR MARITIME ASSETS. WHETHER IT'S PROTECTING A COMMERCIAL HARBOUR, NAVAL VESSEL, PRIVATE YACHT, CRITICAL NATIONAL INFRASTRUCTURE (CNI) FACILITY OR WATERSIDE RESIDENCE FROM THE THREAT OF ATTACK, SENTINEL IS COST-EFFECTIVE, EASY TO OPERATE AND PROVEN IN ALL THEATRES OF OPERATION.**

## PERFORMANCE, COVERAGE AND PROTECTION

Sentinel detects, tracks and classifies divers and autonomous underwater vehicles (AUVs) approaching a protected asset from any direction and alerts security personnel to the threat. With the ability to identify targets at ranges of up to 1,200 metres\*, Sentinel takes reliable, long range underwater intruder detection to a new level and since its introduction, has been used in CNI, vessel and VIP protection duties around the world.

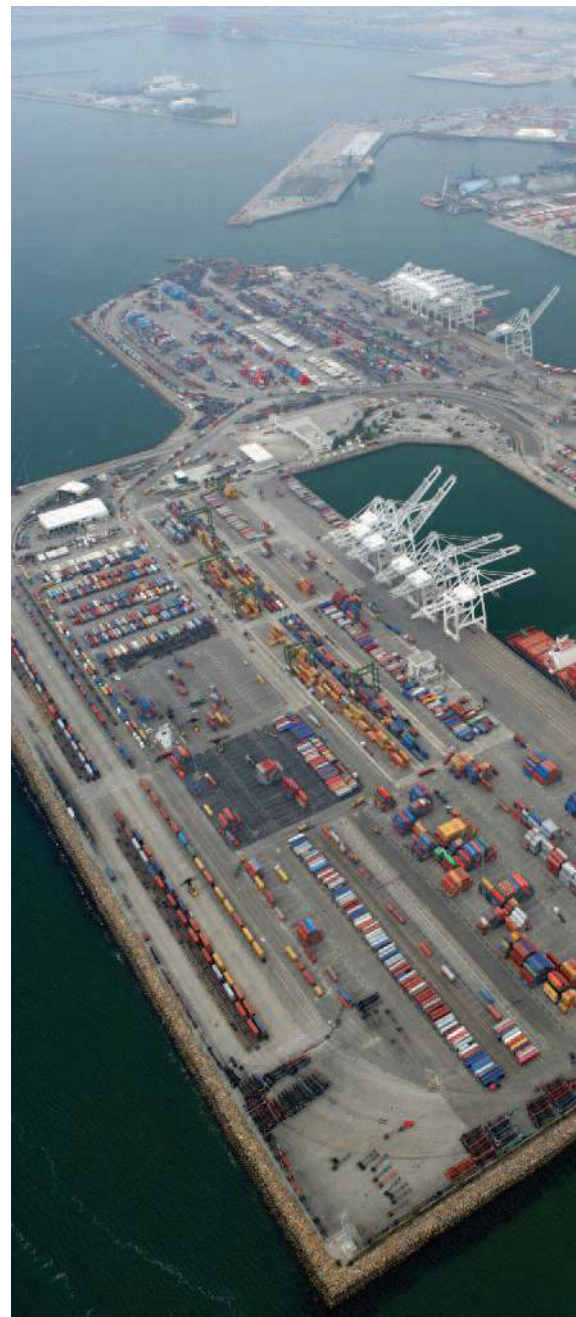
Sentinel is small and lightweight so is quick to deploy from a boat, install in a port or fix along a coastline - providing you with an instant underwater security shield. We've engineered all the complexity associated with configuring and operating advanced sonar technology into easy-to-use software meaning that your security personnel don't need to be sonar experts to use it. In fact, once it's set up, Sentinel can be left to run autonomously.

## CONFIGURABLE AND SCALABLE

The base system, Sentinel, is configured to meet the needs of commercial and infrastructure facility protection projects. It can be used as a standalone security sensor or integrated with third party C2 (Command and Control) security systems. Support for networked sonar is also offered, meaning that entire waterfronts can be protected using a single operator station.

Sentinel RD (Rapid Deployment) is the expeditionary variant configured for Portable Diver Detection Sonar (PDDS) duties. Its small topside footprint means it's perfect for short term operations using offshore patrol vessels (OPVs) and temporary sites on shore. Sentinel XF (Extended Features) is a military-only variant not available to private or commercial users.

\*Depending on environmental conditions and product variant. 900 metres range for divers.









## SENTINEL FOR PROTECTING

# PORTS AND HARBOURS

**THE INTERNATIONAL SHIP AND PORT FACILITY CODE (ISPS CODE) OUTLINES RESPONSIBILITIES TO GOVERNMENTS, SHIPPING COMPANIES, SHIPBOARD PERSONNEL, AND PORT/FACILITY PERSONNEL TO “DETECT SECURITY THREATS AND TAKE PREVENTATIVE MEASURES AGAINST SECURITY INCIDENTS AFFECTING SHIPS OR PORT FACILITIES USED IN INTERNATIONAL TRADE.” SENTINEL COMPLEMENTS YOUR EXISTING LAND-SIDE SECURITY INFRASTRUCTURE WITH AN EASY TO INTEGRATE AND SCALABLE UNDERWATER DIVER DETECTION CAPABILITY THAT HELPS TO KEEP YOUR FACILITY SAFE AND OPEN FOR BUSINESS.**

### SENTINEL DETECTS WHAT OTHERS CAN'T

The reliable detection of underwater targets in the acoustically hostile environment of a seaport, harbour or marine terminal using sonar is a notoriously difficult challenge to overcome. Constant vessel traffic, noise from active depth sounders and a complex thermal structure characterise the scene.

Sentinel has been specifically designed to cope with these conditions, including 'brown' water, shallow water and tidal harbours where vessel activity results in a lot of disturbance in the water column. The system's unique detection, classification and tracking software has been proven to operate in all environmental conditions and is capable of tracking multiple targets in real-time.

### EASY TO DEPLOY, SCALABLE PROTECTION

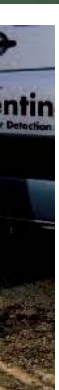
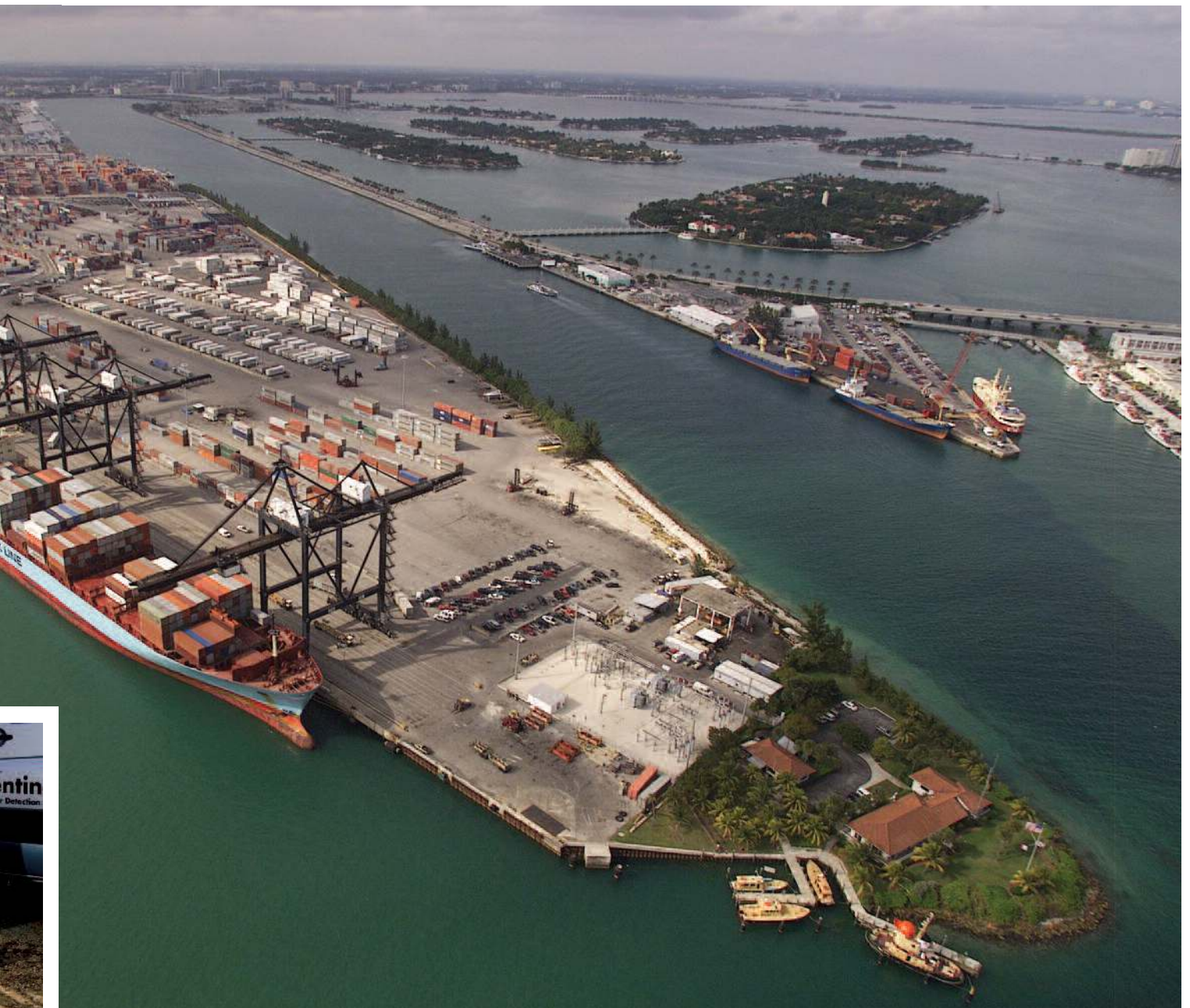
Mounted in either a frame on the seabed, against a harbour wall or deployed from a patrol boat, Sentinel is easy to install and configure for standalone operation or seamless integration with your facility's existing centralised security management system. Multiple sonar heads can be networked together offering a redundant, practical and cost-effective solution for protecting large sites where channel entrances, waterways and anchorages need to be remotely and simultaneously monitored.

### WHY IT'S GOOD FOR PORTS AND HARBOURS

- Provides reliable detection, tracking and classification of underwater intruders
- Up to 2,400 metre diameter protection zone using a single sonar head
- Identifies divers at up to 900 metres; underwater vehicles at up to 1,200 metres
- Scalable coverage to protect very large, complex seaports
- Wide range of deployment options; temporary, permanent, portable
- No specialist sonar knowledge required to operate









## SENTINEL FOR PROTECTING

# CRITICAL NATIONAL INFRASTRUCTURE

**DUE TO THEIR STRATEGIC AND ECONOMIC IMPORTANCE, CRITICAL NATIONAL INFRASTRUCTURE FACILITIES SUCH AS NUCLEAR POWER PLANTS, DAMS, LNG TERMINALS AND OFFSHORE OIL PLATFORMS REPRESENT ATTRACTIVE TARGETS FOR SABOTAGE. WHILST THESE CNI INSTALLATIONS HAVE STRINGENT ABOVE-THE-WATER SECURITY MEASURES, INCLUDING PHYSICAL BARRIERS, ACCESS CONTROL RADAR AND LONG RANGE OPTO-ELECTRICAL SENSORS, THEY ARE NOT GENERALLY EQUIPPED TO DETECT INTRUSIONS FROM BELOW THE WATER. THAT'S WHY CONSTANT, REAL-TIME UNDERWATER MONITORING USING SENTINEL WILL HELP ENSURE YOUR FACILITY IS FULLY PROTECTED.**

### MINIMIZE YOUR RISK. MAXIMIZE YOUR RESILIENCE

Sentinel helps you to prevent unauthorised persons from gaining access to critical equipment or approaching close enough to harm the facility from the water by detecting divers at up to 900 metres away from the sonar, depending on local environmental conditions. Even in the difficult conditions, Sentinel's minimum detection range performance ensures that your security teams will have sufficient time to verify the existence of a threat, and plan and implement their response in a controlled manner.

### LOW FALSE ALARM RATES

It's essential that an industrial alarm system such as Sentinel does not cause unnecessary workload by falsely reporting the presence of an intruder. Continuous false alarms can also lead to operator fatigue, whereby alarms are mostly ignored knowing that each time it will probably be false.

Sentinel's advanced algorithms can intelligently and reliably discriminate a real threat from fauna and flora removing false alarms. This means security personnel are free to monitor other critical systems safe in the knowledge that Sentinel is keeping watch.

### SEAMLESS INTEGRATION

Sentinel has been developed to seamlessly integrate with the multi-layered security surveillance systems that most sites already have. Our organisation is highly experienced in working alongside prime contractors to ensure the deployment and integration of Sentinel at your site is completed on time and on budget.

### WHY IT'S GOOD FOR CNI

- Closes the surveillance gap in your existing, ground-based security sensors
- Provides long range warning of approaching intruders
- Only displays genuine tracks with threatening intent
- Suitable for small and large waterside sites
- Can be remotely monitored from anywhere in the world









# SENTINEL FOR PROTECTING NAVAL SHIPS

**NAVAL SHIPS ANCHORED OFF THE COAST OR BERTHED IN PORTS AND DOCKYARDS ARE DIFFICULT ASSETS TO PROTECT BECAUSE OF THEIR SIZE AND PROXIMITY TO COMMERCIAL SHIPPING TRAFFIC, OPEN SHIPPING LANES AND LEISURE USERS. WHILST PHYSICAL MEASURES SUCH AS FLOATING BARRIERS OFFER SHIPS PROTECTION AGAINST SURFACE ATTACK USING FAST BOATS, DIVERS USING EASILY ACQUIRED SCUBA EQUIPMENT REMAIN A SIGNIFICANT, YET HARD TO DETECT THREAT.**

## TIME IS OF THE ESSENCE

Sentinel is commercial-off-the-shelf (COTS) underwater security technology that is now in service with several navies around the world. It delivers a rapidly deployable force-protection capability with high probability detection, solid tracking performance, very low false alarm rates and long range performance – even in challenging environments like ports.

## RAPID DEPLOYMENT

The ability to reliably detect underwater intruders and AUVs in real-time at long range is essential to providing ample time for ship security officers to react to a security breach. Vital minutes can make the difference between successful threat interception and divers and vehicles being able to deliver their attack.

Sentinel's compact size and lightweight design make it a practical solution for force protection in support of military ships visiting overseas ports, as well as homeland expeditionary roles securing naval bases and ports of embarkation/debarkation. With both temporary and permanent installation options catered for, Sentinel's compact sonar can be deployed using its own cable over the side of small craft patrolling inland waterways, through the hull of a naval vessel (e.g. Offshore Patrol Vessels) or lowered on a lightweight frame directly onto the seabed.

If required, track data can also be exported via an open, industry standard interface to the vessel's Combat Management System or integrated bridge.

## WHY IT'S GOOD FOR NAVAL SHIPS

- Expeditionary ready for deployment from force protection boats
- Through-hull deployment option provides easy operation and high levels of performance for larger military vessels
- Small, lightweight sonar head; man-portable
- Classifies threats as scuba, closed circuit diver or underwater vehicle
- Can be used with Scylla loudhailer to warn away intruders









**SENTINEL FOR PROTECTING**

# **RESIDENCES, PRIVATE YACHTS AND CRUISE SHIPS**

**HEADS OF STATE, POLITICAL LEADERS AND VIPS SPENDING TIME AT THEIR PRIVATE RESIDENCES OR ON THEIR SUPERYACHTS FACE THE THREAT OF INTRUSION, KIDNAPPING AND ASSASSINATION. AND WHILST CRUISE SHIPS OFFER THE PROMISE OF THE PERFECT VACATION, THEY CAN OFTEN BE FOUND VISITING REGIONS WITH RECOGNISABLE SECURITY CONCERNS.**

## **THE PERFECT DEFENCE**

Sentinel provides reliable, effective and affordable security for properties and vessels considered to be vulnerable to unauthorised access from the water. The moment an intruder enters a monitored underwater exclusion zone, the alarm is raised and the threat is tracked. Sentinel's advance warning of an attack gives security personnel time to assess the threat, intercept it, or simply move the protected vessel away from it – ensuring the safety of owners, guests and crew always comes first.

## **SCALABLE PROTECTION, INVISIBLE INSTALLATION**

The system's flexible architecture allows any size of vessel or property to be comprehensively protected. Our clients include owners of beach front properties stretching hundreds of metres of coastline, 120 metre-plus luxury yachts and cruise line companies operating ships carrying more than 5,000 passengers.

Sentinel is designed to work either on its own or in combination with existing security systems, such as CCTV and motion detectors. Our experienced team will survey your site or vessel to define the optimum configuration of equipment including; sonar locations (single or multiple), deployment arrangements (fixed or retrievable), cabling and control room hardware. And once it's installed, your owners and guests will never know that Sentinel is on duty protecting them.

### **WHY IT'S GOOD FOR PROPERTY, YACHTS AND SHIPS**

- Reliably detects underwater perimeter security breaches
- Works with existing security sensors to provide 360° monitoring
- Long range detection provides maximum reaction time
- Fully autonomous; alerts you only in an emergency
- Can be remotely monitored when a property or vessel is unoccupied





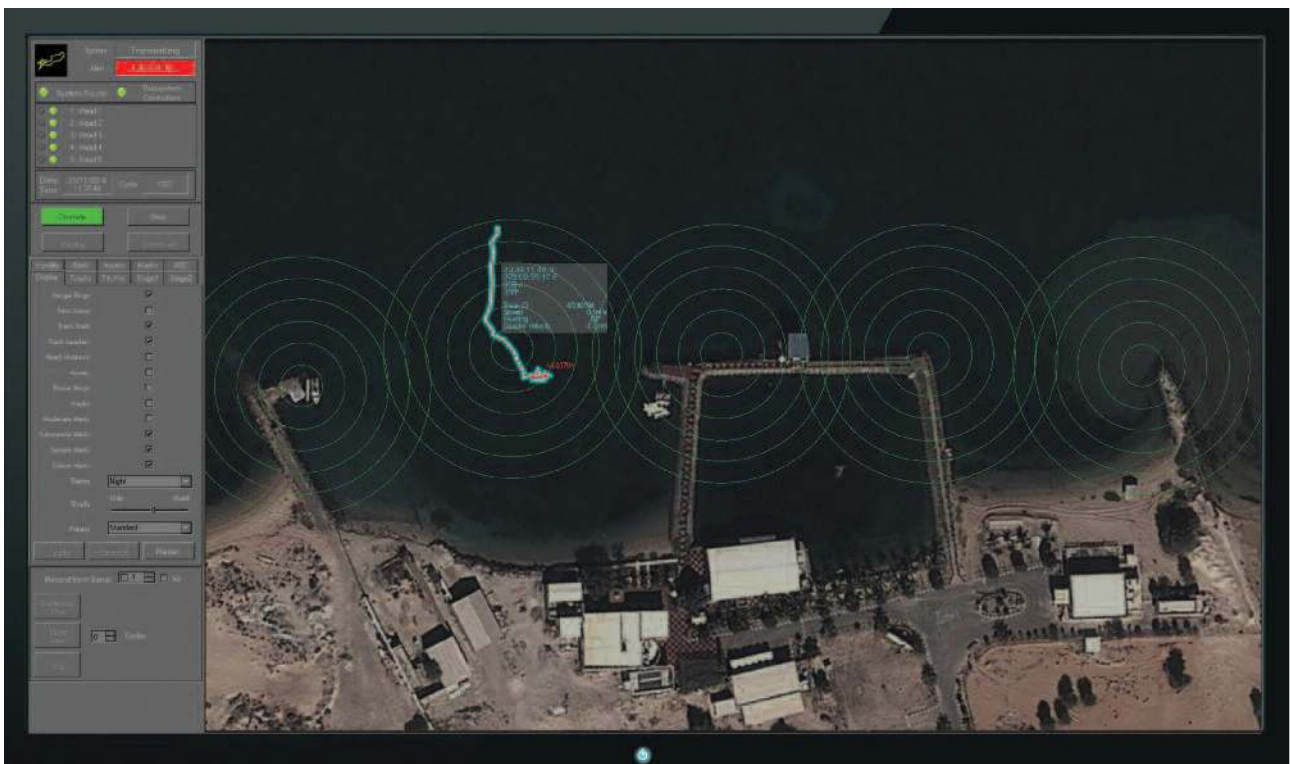




## VESSEL/ONSHORE EQUIPMENT

# SECURITY SUITE SOFTWARE

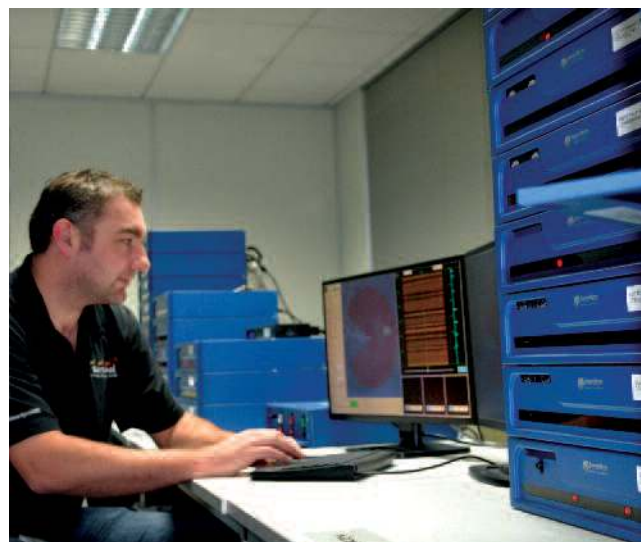
**SENTINEL'S WINDOWS-BASED SOFTWARE MAKES USE OF POWERFUL ALGORITHMS TO INTELLIGENTLY DETECT, TRACK AND CLASSIFY UNDERWATER SECURITY EVENTS. ITS SYSTEM ARCHITECTURE ENABLES SEAMLESS INTEGRATION WITH YOUR EXISTING SECURITY SYSTEMS AND AFTER JUST A FEW HOURS OF EXPERT TRAINING, YOUR OPERATORS WILL BE CONFIDENT USING IT. COMPLEX SECURITY SOFTWARE DOESN'T NEED TO BE COMPLICATED.**



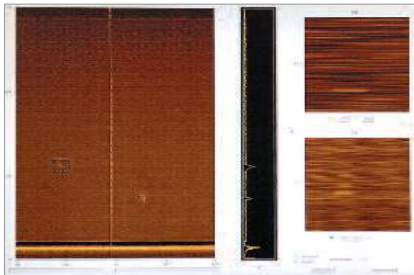
### AUTOMATIC DETECTION AND TRACKING

The Sentinel software application features an intuitive Automatic Detection and Tracking algorithm that only displays genuine tracks with threatening intent. At any point the software will be analysing, in real-time, potentially thousands of sonar returns that present no threat, such as objects on the seabed, fauna, cetaceans, fish and flotsam. The software will only alert operators to objects that present a real threat to the asset being protected.

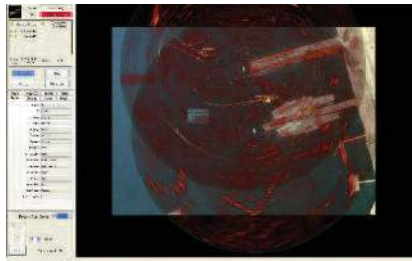
- User friendly interface; easy to setup and operate
- Configurable views; sonar, chart and satellite
- Autonomous; no need to monitor the system
- Only genuine threats create an alarm condition
- Elevated threat warnings, including aggression status of intruder
- Remote monitoring ability



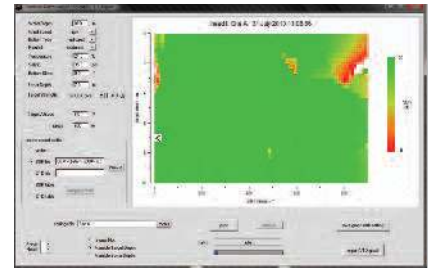




**A-scan, B-scan, zoom and track manipulation tools for military users**



**The UI can be configured to display only threat data or raw sonar data**



**Software tool for predicting performance in current conditions**



## ACOUSTIC SIGNATURE CLASSIFICATION

Sentinel can determine to a high degree of probability the type of threat that has been detected using a passive method of Acoustic Signature Classification. The system can provide confirmation that the threat is a scuba or closed circuit diver or a machine, which could be a surface craft, Autonomous Underwater Vehicle (AUV) or assisted diver.

The user interface can be configured to display only threat data or the complete sonar picture as a transparent overlay onto a satellite image or electronic chart background.

Threat alerts are displayed in a colour/icon coded elevating format depending on their intent and range to the protected asset. Target information including; range, history, speed, bearing and position is displayed automatically.

## COMMAND WORKSTATION AND SONAR PROCESSOR

The Command Workstation (CWS) and Sonar Processor are designed to meet the complete topside requirements of any Sentinel installation. The CWS is a powerful PC custom-built to run the Sentinel software application. Up to 10 sonar heads can be operated from a single CWS. The Sonar Processor is used to perform signal and data processing on the raw sonar data received from the in-water sonars. One is required for each sonar head and is typically located with the CWS in a control or server room.

- 19" rack-mountable
- Suitable for bridge, control room or expeditionary (portable) use

- Topside redundancy option
- Supplied with marine-grade display

# INWATER EQUIPMENT

# SONARS

## MISSION READY, MAN-PORTABLE

The man-portable Sentinel sonar head is renowned for its wide area, long range underwater intruder detection and identification capabilities.

Measuring just 330mm in diameter, and weighing less than 36kg in air, it has been engineered to support any concept of operations (ConOps) including; deployment by expeditionary forces, cable suspended over-the-side of a patrol vessel and permanently on the seafloor.

The sonar's array creates a 360 degree zone of detection whereby intruders coming from any direction can be reliably identified. It can also be configured to monitor specific sectors, so you only monitor what you need to monitor.

When protecting large sites such as a port, multiple sonar heads can be networked together, with all data being displayed and controlled by a single Command Workstation.



## BUILT FOR ANY ENVIRONMENT

The sonar head is available in different materials to suit any operating environment and length of deployment. The aluminium version (above) is recommended for expeditionary missions where weight is an important operational requirement. For permanent, long immersion deployments, the super duplex stainless steel version (right) offers an excellent combination of strength and corrosion resistance.

- Man-portable, easy and quick to deploy
- Up to 900 metres diver detection range
- Up to 1,200 metres vehicle detection range
- Flexible installation options
- Easy to clean and maintain





## SCYLLA LOUDHAILER

Scylla is an optional accessory for the Sentinel sonar head which adds an audible, non-lethal warning and deterrent capability.

If a diver enters a restricted zone, Scylla broadcasts a pre-record audio message that can be heard by the diver at up to 600 metres away. The message can be used to instruct the diver to alter course or surface.

The user also has the option of using Scylla to broadcast live messages if specific instructions need to be communicated to the diver.

Scylla comprises an underwater speaker and a surface Loudhailer Drive Unit (LDU). The speaker is typically co-located and directly connected to the sonar head. The LDU is interfaced to the Command Workstation.

- Automatically broadcasts pre-recorded warning messages
- Disorients but doesn't harm divers
- Hailing range of up to 600 metres
- No additional cabling needed
- Easy to retrofit to existing systems



## CABLING, JUNCTION BOXES, SHELTERS

The proximity of the Sentinel sonar head in relation to the location of the Sonar Processor onshore or on your vessel will dictate the type of subsea cabling used. For distances of less than 65 metres (e.g. on a vessel or against a harbour wall) high specification CAT 6 copper cable is supplied. For longer distances (e.g. in open water) armoured fibre optic cable is specified.

As required, we can supply junction boxes and air conditioned shelters at locations where underwater cabling comes ashore.



**TIP** Boat anchors and abrasion from rocks and coral can damage marine cables so it's important to fully protect the underwater cabling at your site.



## INWATER EQUIPMENT

# DEPLOYMENT OPTIONS

### PORTABLE SEABED FRAME

For expeditionary and temporary installations, Sentinel sonar heads can be mounted on tripod frames which offer a high level of stability – particularly when the sea bottom is considered soft.

Available in standard and lightweight versions, the frames are constructed of high-grade aluminium and have user replaceable sacrificial zinc anodes attached to prevent corrosion.

For ease of transportation and storage, the frames break down into manageable pieces – each weighing less than 8kg. Onsite, they can be easily and quickly readied for deployment, with the lightweight frame using only one, hand tightened bolt per leg.

**TIP** Optional mud plates help prevent the frame assembly sinking into the seabed if the sea bottom is soft.



### SEABED STAND

A seabed stand provides the optimum sonar deployment method for permanently protecting open areas of water. Available in 1.5 and 3 metre heights to suit the local terrain, the stand ensures that the sonar has an uninterrupted 360 degree field of view.

The sonar locates into a keyed 'bucket' that ensures correct alignment during installation and following removal for scheduled maintenance.

**TIP** The stability of the sonar is fundamental to its performance, so always ensure the stand is installed on a firm base to prevent any movement.



### RAIL AND TROLLEY MOUNT

We recommend a rail and trolley mount when operating Sentinel from a fixed, shore side location such as from the side of a jetty or harbour wall.

The one-piece rail design allows the trolley-mounted sonar head to be lowered into the water using a winch mechanism until it reaches a pre-determined depth. The sonar can be easily raised up out of the water for scheduled maintenance to prevent bio-fouling.



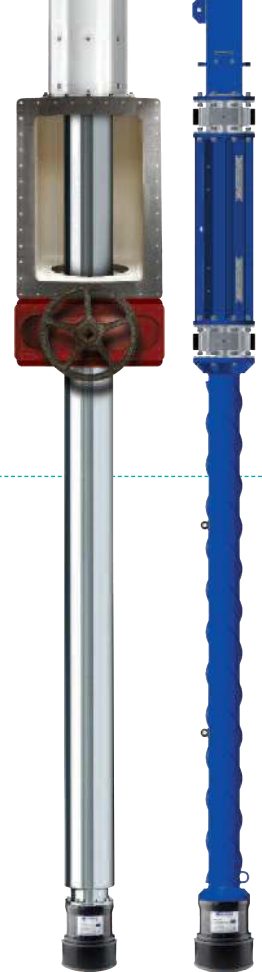


## VESSEL THROUGH HULL / OVER THE SIDE

Installed on hundreds of vessels, our through-hull sonar deployment machine is ideal for permanent installation of naval vessels, cruise liners and private vessels. For short term projects using a vessel of opportunity, our modular over-the-side deployment pole provides a cost-effective and practical solution.

Pole lengths can be adjusted by adding or removing sections and once the assembled pole is lowered and locked into position, a high degree of stability is assured.

**TIP** Interface Sentinel with your vessel's navigation aids to ensure it has the best possible heading reference data.



## CABLE SUSPENSION

When your maritime security situation demands speed and simplicity, there's no easier or faster way to deploy Sentinel than suspended by its own heavy duty power and communications cable.

Using a small davit, or even hand-deployed by crew members from the bow or swim platform, for example, Sentinel can be in the water and providing protection within minutes. Internal motion sensors and automatic sonar stabilisation compensates for movement created by the vessel and currents.

**TIP** Always make sure the Kellems strain relief grip is attached to the mounting points on the top of the sonar to prevent damage and possible loss.



## FIXED BRACKET

Perfect for attaching to the legs of jetties and anti-intrusion underwater barriers, the Sentinel fixed bracket provides a simple yet effective method for long term sonar deployment scenarios.

The assembly has been designed in two pieces for easy installation, fast and simple recovery and re-deployment by a diver after servicing. The plate that the sonar head attaches to comes supplied with mounting holes for a Scylla loudhailer.

**TIP** A site survey will determine the correct height off the seafloor for your fixed bracket installation.



## SUPPORT

# WE SURVEY, WE INSTALL, WE MAINTAIN.

**WE PROVIDE AROUND THE CLOCK CUSTOMER SUPPORT VIA A NETWORK OF WHOLLY OWNED INTERNATIONAL OPERATING SUBSIDIARIES AROUND THE WORLD. AS A SENTINEL USER, YOU'LL HAVE ACCESS TO OUR IN-HOUSE ENGINEERING TEAMS, BESPOKE MANUFACTURING CAPABILITIES, OPERATOR TRAINING AND GLOBAL PRODUCT ASSISTANCE.**

### TAILOR MADE SECURITY

With different threat scenarios, different environments and different deployment requirements, no two Sentinel projects are ever exactly the same. But with assignments carried out around the world, on all types of facility and on all types of vessel, we have the experience to work side-by-side with your security forces, C2 integrator, marine contractor and crew to make the process of investing in Sentinel diver detection technology, problem-free and low-risk.

### OPERATOR TRAINING

Making sure that you get the very best out of your Sentinel system once it is installed and commissioned is the goal of our operator training programme. From standard courses run at our worldwide centres to bespoke courses held on your facility or on board your vessel, our training is comprehensive and flexible.

### HELP WHEN YOU NEED IT

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

### ANNUAL SERVICE VISITS

Sentinel has been designed with 100% line replaceable units to minimise downtime using locally held spares. Of course, the best way to ensure your equipment always performs as it should is to service it regularly. Book an annual service visit, and one of our field engineers will inspect the health of your Sentinel system including updating software and firmware and working with your marine contractor to inspect deployment arrangements to make sure regular checks are being carried out.

It's all part of the service that helps you stay protected and close the gap in your maritime surveillance capabilities.







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