



Yachting Matters Summer Edition 2008

Core Security Technology

Yacht security is of concern to the owners of all yachts, irrespective of their size. However, our small J80 8m regatta sailing boat is of considerably less interest to the modern day pirate, and, I have to say, even the passing tourist, than a large, gleaming super yacht.

Sadly 9/11 focused the attention of the world on international terrorism and more recently the massive increase in piracy has captured the attention of all of us involved in the yachting industry. The security risks to yachts are much more likely to come from piracy or the common thief rather than terrorist threats.

When it comes to security, size doesn't matter. Compulsory compliance is necessary with the International Ship and Port Security (ISPS) system only if a yacht is over 500 tons. As far as a pirate or thief is concerned, a super yacht is no less attractive if it is less than 500 gross. In the current climate, smaller yachts should take note of these guidelines for their own benefit.

There are an ever increasing number of security products and services available for yachts of all sizes. The only electronic products that have to be fitted on ISPS compliant vessels are Automatic Identification System (AIS) and the Ship Security Alert System (SSAS). There are a number of other great new security products available today in addition to those, but they have to be combined with trained crew who know how and when to use them.

We have selected a sample selection of technologies to illustrate what is currently available. The examples illustrated below cover surface and underwater detection, access control, non-lethal defence and tracking.

Surface Detection

Intruders can approach a yacht from above and below the water, day or night. The key point is to detect the intruder when it is approaching. The most conventional and traditional surface detection technology is radar. This provides the ability to detect a target approaching at a distance in an open sea way. The limitation with this is that you can only see the target in an open sea way. Radar will not detect or identify the target if it is behind another ship or an island. Thermal imaging is a more recent technology which can be interfaced with radar, providing it with eyes to enable identification.

Thermal Imaging

Thermal imagers in combination with Ultra Low Light and Daylight cameras are becoming more and more a "must have" technology for the modern super yacht. Prices for this technology have



dramatically reduced over the last couple of years and performance and reliability have increased, so thermal imagers are now regularly specified as an integral part of the security system of a yacht.

Mounted high on the mast they have a good chance of delivering a 360° vista around the boat and an inverted installation under the communications domes increases this possibility still further. With a vantage point like this, thermal imagers improve the security capability at both close range and long range. Today's products are now no longer stand alone devices. They are products easily integrated into the yacht's security system. The ability to interface with the yacht's radar and/or AIS and to lock onto an "unknown" MARPA/ARPA/AIS target and visually track day or night in most light conditions is a major enhancement to the security of the yacht and the captain and crew's ability to determine what actions to take to deter unwelcome intruders. Some products such as the Night Vision NVTi 6000 series have object tracking capability as well. This enables the Captain or the Officer of the Watch to "lock on" to high risk or sensitive guests out in the bay on a jet ski or a tender and to follow them visually.

Multiple controllers can be installed on the bridge, the security officer's cabin, on the wings, in the captain's cabin or owner's suite. The video can be distributed throughout the vessel as required. Many of the latest products have IP control which can also provide remote access to the camera via broadband connections from anywhere in the world. PELCO compatibility also offers additional integration into the ship's systems. With pre-programmed presets, the imager can be set to bear on any particular point on or around the yacht at the press of a button.

Using the thermal imager improves situational awareness when night time running or when approaching a harbour or docking at night. Similarly in poor visibility during daylight hours spotting and tracking "unidentified" boats or people is an invaluable benefit to the safety and security of the vessel whether at sea, on a mooring or at the dock.

Underwater Detection

The possibility of unauthorised, and potentially malicious, access from under the sea has up until recently been seen as an "optional extra" specified by only the most paranoid of customers, or, to protect the most sensitive of areas. Now, with more and more evidence appearing that terrorist groups such as al Qaeda have actively recruited and trained scuba divers, this attitude seems, at best, complacent.

The reliable detection of underwater intruders – and discrimination from marine fauna – is a notoriously difficult problem. Any intruder detection system must work in the most challenging acoustic environments – for example, a commercial shipping port – where

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many large vessels come and go; depth sounders may be continually active and relatively still water creates a complex thermal structure. In addition to the environmental factors that increase the difficulty of detection, once a target has been detected, it must also be classified. Determining whether a detected object is a harbour seal or a terrorist diver is a difficult task, and one which must deliver the correct answer.

Marine Intruder Detection Sonar

A solution is the new state of the art, small, lightweight, low power and easy to use Intruder Detection Sonar called Sentinel. It has been designed and developed in the UK by Sonardyne International, an independent British company. It has a 360° detection range up to 900m with a mud bottom.

It has been designed to automatically detect and track a number of underwater threats; including open- (Scuba) and closed- circuit (rebreather) divers and Swimmer Delivery Vehicles.

A typical system is composed of a sonar head, a signal processor and an Automatic Detection and Tracking (ADT) processor connected to a command workstation on board the yacht by cable.

The 35kg sonar head is deployed underwater by lowering it over the side of the yacht from a davit or crane, or it can be deployed in an unmanned underwater vehicle. The sonar head contains the electronics to control the transmitters and digitise and multiplex the received signals from the transducers. The multiplexed data is transmitted to the yacht equipment via a cable.

The Automatic Detection and Tracking (ADT) Processor on board the yacht detects highlights and creates parallel extended Kalman filters for any moving targets. The resulting tracks are then subject to a multi-stage filtering process, after which only diver-like threatening tracks are passed on to the command workstation.

The user interface has been designed to be as simple to operate as possible, so that operators with no sonar knowledge are able to man the system with confidence.

Apart from being able to detect underwater targets up to 900m away with almost zero false alerts, the manufacturer is developing individual "friendly diver" transponders with unique IDs plus a panic facility, so that the system can also be used to track your own divers.

Access Control

An access control system can be implemented on a yacht during build or refit. All the users and doors on the yacht are recorded and controlled, allowing user's access only through certain doors at pre determined time and/or based on security levels.



Last year Secure Yacht Ltd won the Marine Electronics Category DAME award at the METS Marine Trade Show in Amsterdam, for their innovative NET2 Marine Reader. The Marine Reader is the world's only dedicated Marine Access Control Reader.

What struck us about this product is that it is an access control system with a difference. It has a host of features which make the product exceptionally quick and easy to learn and operate. It is network or IP based. IP based technology solutions are the future as they reduce the amount of cabling by connecting to the core data network around the yacht.

Access Control Units (ACUs) at every controlled door store all the details of authorised users at the entry point. The ACU records all events locally and also sends this information back to the Central Control PC. This type of system gives autonomy to each ACU and has two major advantages over the central computer or central decision making units as to whether access will be allowed or not.

The first advantage is that the decision is made locally by the ACU. It does not rely on remote processors that have other tasks to perform or on the speed of a busy data line.

The second advantage is that there is no single point of failure. The ACUs are low voltage units fitted with back-up batteries. Should there be a failure of the Central PC, or the data link between the ACU and the Central PC is interrupted for any reason, the ACUs will continue to operate the system off-line. Users will not be aware of any breakdown and will be permitted or denied access in the usual way. The ACUs will then each record up to 2,300 separate events in an on-board buffer until the communications with the Central PC are restored. Events from the ACUs are then automatically sent to the Central PC to complete the audit trail.

Secure Yacht won the DAME Award 2007 for their Marine Reader. It operates by presenting a proximity token (card, key ring token etc.) to the reader which will then allow or deny access through the controlled door.

Non Lethal Defence

Attacks on shipping, though more often around the coasts of Indonesia and aimed at cargo vessels, have become all too common around the world. In recent months, attacks have increased around the Horn of Africa where yachts are transiting on a regular basis to and from the Indian Ocean. Beating off such attacks and deterring assailants is not easy without proper training and the right equipment. One such non-lethal device is a long range acoustic device.

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The Long Range Acoustic Device

The Long Range Acoustic Device™ (LRAD®) has a proven track record in providing effective long range hailing and sonic sound deterrent. Its accurate, long range directional array gives a clear, intelligible hailing, notification and an unmistakable warning. It is used to communicate from a safe, standoff distance to gain compliance and determine intent, and has the capability of following up with powerful attention getting and highly irritating deterrent tones to influence behaviour to support any appropriate response.

Until recently, LRAD's have been mainly used for military applications, such as on warships, at military checkpoints and by civil authorities for riot control.

American Technology Corporation (ATC) pioneered a new category of long-range hailing and communications solutions with LRAD's high intelligible 15-30° directed acoustic beam. LRAD can issue verbal instructions in excess of 500 meters. Over 450 LRADs are currently deployed worldwide in a variety of government, military and commercial applications, including deployments on-board commercial marine vessels and international cruise lines.

Conventional high output acoustic devices have semi-spherical propagation patterns making users and anyone located behind the unit subject to excessive Sound Pressure Levels (SPL). With large inductive loads, they consume high levels of power due to low efficiencies. They are heavy, bulky, and make it almost impossible to place sound exactly where you need it. Their reflections and secondary sounds cause lack of clarity, high distortion, and low intelligibility.

To achieve its unique direct and focused acoustic output, the LRAD utilises highly efficient, customised capacitive transducers and requires modest power requirements- less than 200 to 400 watts to achieve full output. The high directivity of the LRAD device reduces the risk of exposing nearby personnel or peripheral bystanders to excessive audio levels. Sound behind the LRAD unit is over 40 dB less than the on-axis forward output. The LRAD also incorporates multiple highly efficient switch-mode power conversion systems.

It is a light weight and weatherproof system that could be permanently installed on the mast head.

Tracking

Even if the yacht has not been threatened or does not have to comply with ISPS regulations there is no harm in knowing where it is. So what not install a Ship Security Alert System (SSAS) anyway?

Also, if in a case where the detection and deterrent systems have not worked the SSAS system can be used to covertly send an alert

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message requesting help which will allow the yacht to be tracked wherever it is taken worldwide.

The purpose of a Ship Security Alert System is to send a covert signal from a ship which is not obvious to anyone on the ship who is not aware of the alert mechanism. It is to be used when the ship wishes to inform a party ashore of a problem with a minimum number of people on board being aware of the action.

It is also a very simple, small and inexpensive method of tracking a vessel or fleet via satellite (Inmarsat D+) and the Internet. The unit, the size of a side plate, is installed simply and discreetly with any number of Security Alert buttons.

Using an Internet connection you can instantly view the real time position, speed and heading information of the vessel overlaid on an electronic chart. It displays a record of your vessel's track and past voyages.

If a Security Alert button is activated an alarm is sent to the host system. The alarm can then be communicated by text to a mobile phone or pager, and /or to an email address, and/or to a fax machine of the company/persons responsible.

Unlike AIS, the system is secure and anonymous. Only the host system and the selected persons or company designated by the owner are able to receive the information. Only a code for a vessel is transmitted. The host system translates this to the appropriate parties.

A compliant SSAS also has battery backup should all power be lost or cut on the vessel. The host system can poll the unit for an immediate update and increase or decrease the frequency of the transmissions.

There are many other devices I have been unable to mention here. It is very important to state that all these devices will be much more effective with good crew training and a security procedures' plan. It's a misconception that simply investing in the equipment is all that is needed.

Roger Horner is Group Managing Director of the E3 Systems Group. The E3 Group specialise in providing solutions and solving problems in every aspect of electronics on today's most sophisticated yachts. Together with Andy Gifford of Telemar Yachting he founded the Ocean Wide Network with service and support offices around the western Mediterranean with a worldwide new build service and consultancy.

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