White Paper

INTELLIGENT MARITIME DEFENSE SYSTEM
Defense Against Modern-Day Piracy

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WHITE PAPER

BY

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Born in Milan, Italy, Gianni Arca was educated in Germany, Switzerland, and Austria. After holding executive positions in companies throughout Europe, he was appointed to the executive committee of Robex International, a joint venture of Royal Volker Stevin, Royal Bijenkorf, and the Westland Utrecht Bank. Arca became its president and CEO and subsequently expanded its operations to the United States. Arca acquired the company in a management buyout. In 1984, Mr. Arca sold the company’s European operations and immigrated with his family to the United States. He founded and later sold Strategic Planning Group, Inc. (SPG) a broad-based economic and strategic planning, research and international permitting firm. In the early 1990s, Arca formed Environmental Capital Holdings, also known as ECH, and then Duos Technologies, Inc. Mr. Arca is a prolific writer having authored numerous articles and papers for both the security and intelligence community marketplaces. He appears regularly as a featured lecturer at universities, industry events and on discussion panels and is a respected authority on international and domestic security issues. Mr. Arca holds several security and industrial patents.

Duos Technologies Inc., headquartered in Jacksonville, Florida, provides a broad range of sophisticated technology solutions with an emphasis on Homeland Security. Its systems are based on its proprietary object detection and behavioral analysis software, managed by the company’s multi-layer control platform that allows seamless integration of a myriad of sensing technologies into a unified command and control interface. Its comprehensive automated systems also play a meaningful role in the transportation, petrochemical, healthcare, and critical infrastructure sectors.
Modern-day piracy is taking on epidemic proportions. With over 100 attacks worldwide in the first quarter of 2009, the number of incidents is almost twice that of just a year ago. In the Gulf of Aden and off the East Coast of Somalia alone, the number of incidents has already surpassed the number for all of 2008 according to the ICC International Maritime Bureau\(^1\), which monitors commercial crime at sea and recently established a Piracy Reporting Center in Kuala Lumpur.

The increase in piracy off eastern Somalia threatens maritime trade in general and the East African shipping routes in particular.

A growing concern is the pirates’ increasingly sophisticated use of modern technologies to prepare and execute their attacks, and there is reason to believe that they receive advance intelligence about vessel layouts, routes, timetables, and cargo from individuals with access to this detailed information.

In a typical scenario, armed pirates in a small vessel (often as small as a Zodiac inflatable boat) approach a cargo ship or cruise liner at sea and attack, board, and hijack the vessel for ransom. Vessels have also been attacked and boarded while at anchor.

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\(^1\) The ICC International Maritime Bureau is a division of ICC Commercial Crime Services, the anti-crime arm of the International Chamber of Commerce.
CHALLENGES

In a typical attack scenario, hostile personnel remain undetected until they are within sufficient range of their target to commence an attack, using automatic weapons or rocket-propelled grenade launchers (RPG). They are sometimes able to reach their target and board a cargo ship undetected, by which time the ship’s crew usually surrenders to avoid bodily harm.

OBJECTIVE

The objective of a defense solution is to provide ship operators with an intelligent and automated early warning system that detects approaching traffic at sufficient distance to allow time to assess and prepare for a potentially hostile encounter. The system described below meets this objective and adds assessment, deterrent, and defensive options. In addition to the logistics aspect, the proposed solution can be controlled from a safe, remote location, sparing crew members from the direct line of fire.

SOLUTION OVERVIEW

Our proposed solution consists of four components: (1) Detection, (2) Assessment, (3) Deterrence, and (4) Defense, each using best-of-breed technologies to achieve its objective. We recommend engaging all four components as an integrated “smart” system.

Similar intelligent systems have been successfully applied in many other industries and are based on detection algorithms driven by artificial intelligence. These systems automatically differentiate between actionable events representing user-defined “potential threat scenarios” and events without security implications. For example, if the system detects a vessel traveling away from a ship, it will classify this “detection” as a non-threat and will not generate an alarm. Conversely, if a small or midsize vessel is moving towards the ship, the system will calculate the approach speed and plot the vessel’s anticipated direction. When the ship is anchored, the system creates a “virtual fence” around the ship that will alert crew members to approaching objects.
Step 1 – Early Detection System

At sea, we recommend using and integrating the existing ship’s radar to create a virtual security buffer for early detection of approaching vessels. The radar will identify maritime traffic within the established security zone at a distance of interest, e.g., 15 nm. Speed and directional data from the radar is used to plot the object’s path and, if it is headed toward the ship, calculate the estimated time of arrival. The system will send an alert to the ship’s crew and helm and put all systems on standby for further assessment or potential response measures. Vessels traveling away from the ship will not trigger an alert.

Step 2 – Assessment

Once an approaching vessel has closed to a distance of 3 km, a specialized long-range pan-tilt-zoom (LRPTZ) camera will automatically zoom into the scene to identify the type of vessel and assess its apparent intent. The image quality will allow full assessment, even under “0” light conditions, by using a long-range laser illumination device that is synchronized with the LRPTZ.

The images, and all other data, can be viewed at an integrated workstation located at the helm or another secure location on the ship. If the ship is equipped with a satellite uplink, the images can also be automatically uploaded and simultaneously viewed at any other remote location, such as at a Navy, Coast Guard, law enforcement, or operational headquarters.
Step 3 – Deterrent

If a small vessel is approaching a ship (particularly at high speed), there is a high risk of hostile intentions. To deter a closer approach, we propose the deployment of an escalating acoustic warning/deterrent system that provides the ability to hail, warn, and deter approaching vessels from a safe range.

The initial acoustic engagement delivers a warning (a prerecorded message in local language) and establishes the intent to follow up with force (discussed in the next section). Once the vessel closes to a distance of 750 meters, a high-frequency acoustic deterrent is deployed, which aims to change behavior by broadcasting an intense directional aversion sound at levels of up to 150dB. Such very intense directional sound alone acts as a strong deterrent.²

The high-frequency acoustic deterrent will be integrated into the central command interface, and controlled remotely, in conjunction with the long-range PTZ camera, from a safe location on the ship.

Operation of a high-frequency acoustic deterrent is directional and will not expose the operator on deck to dangerous noise levels.

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3 - 13dB Threshold of hearing (depending upon age and sex)
• 20dB Leaves rustling
• 60dB Normal conversation
• 70dB Busy street traffic
• 80dB Vacuum cleaner
• 85dB OSHA requires protection based on exposure over 8 hours
• 98dB Large orchestra
• 100dB Jackhammer
• 110dB Front row of rock concert
• 120dB Threshold of pain
• 140dB Military jet takeoff
• 160dB Instantaneous hearing damage
As a last resort to thwart a hijack attempt, we propose the engagement of a remotely controlled automatic weapon. The weapon specification will include a clear range advantage over weapons typically used in piracy attacks (i.e., AK-47 and RPGs) and will be synchronized with a high-definition day/night camera system with infrared (IR) illumination. The intent is to definitively stop any attack by controlling the weapon from the central command station located at a safe position on the ship.

The legal implication of bringing a cargo ship into port with active weapons was the subject of a recent U.S. Senate hearing. Several senior Senators strongly support the addition of lethal defense systems to cargo ships, even if it will require a multinational agreement. In the interim, however, the proposed system can be outfitted without the lethal weapons component, which can be added at a later time.