

## SHIP BASED ANTIPIRACY SURVEILLANCE



### OVERVIEW

**Customer:** Marine Nationale (French Navy): Frigates deployed in the Gulf of Aden.

**Challenge:** • Detect and track small, asymmetrical threats: wooden or improvised watercrafts, rubber boats, swimmers, pirate activities. • Provide all weather, 24/7 imagery used for navigation as well as actionable threat intelligence. • Maintain system performance in harsh, corrosive environment.

**Solution:** Equipped with a gyro-stabilization platform, Electro Optical Industries' Spynel provides a powerful and rugged solution for ship based wide area surveillance missions, detecting what conventional short range radar cannot while providing high definition all weather, day/night thermal imaging.

**Results:** • Fast (1-2 sec) on the move detection of small, asymmetrical threats within a 12 km radius in hot climate, night or day. • Small hardware footprint with easy installation and integration, low total cost of ownership.

### CUSTOMER

Electro Optical Industries provided multiple Spynel systems to the Marine Nationale for ship based surveillance. Specifically, pirates' skiffs and improvised watercrafts posed an immediate threat to ships engaged in commercial or touristic activities off the coast of Somalia. Conventional radar and/or sonar surveillance was ineffective and the active nature of each technology remained vulnerable to jamming attacks.

The French Navy was ultimately interested in a solution that provided superior performance but was affordable and ruggedized. The end solution would need to be able to withstand harsh weather to operate 24/7 consistently over extended deployments.

### CHALLENGE

Ship based perimeter surveillance can be difficult to successfully accomplish, especially with a single compact, easy to use system. Traditionally maritime threat detection was done with medium range radar and sonar. Radars would struggle to detect and track small crafts and wooden or improvised vessels in a wave ridden environment. Many navy operations involved pirate activity deterrence and prevention missions. The surveillance systems that were originally installed did not take into account this type of enemy and their tactics.

Threats could come from all directions. Classification by radar was often inefficient and unreliable. Without imagery and actionable intelligence, threat interception was delayed, causing increased risk to the ship and its crew.

Onboard surveillance equipment would also be subject to constant wind, temperature changes, moisture and corrosive sea water exposure. The seas' forceful movement created structure vibrations which could be harmful to delicate surveillance technologies.

Ships' security systems were mostly built for operation at sea. While docked or anchored, ships were becoming large and attractive targets. Persistent surveillance became of the utmost importance as attack avoidance was impossible: threat detection needed to be immediate in order to ensure proper response measures.

Lastly, adding technology to already cramped space and an overloaded infrastructure was challenging. Ship crews needed to rely on simple, easy to use and low maintenance systems to ensure mission success.

## SOLUTION

EOI's Spynel panoramic infrared security system was an ideal solution for the Marine Nationale's ship based surveillance needs. The system uses a continuously rotating line scan sensor to produce a 360 degree image and detect and track intrusions in real time; essentially the Spynel camera operates like a "High Definition Optical Radar." This comprehensive 24/7 surveillance immediately provided a passive, long range threat detection system with HD imaging.

The Spynel provides a real-time panoramic image with unlimited threat detection capabilities. Each threat, once detected, can be automatically followed in a different zoom window, as if it were tracked by multiple PTZ cameras. Algorithms were optimized to distinguish small boats from far-off waves. Maintaining a high detection rate with few false positives was one key selection criteria for the French Navy when choosing the new technology. The Spynel successfully met all the false alarms thresholds objectives during evaluation. During tests, long wave infrared proved not to be susceptible to solar reflection, which was also a major performance factor.

The ruggedized MIL SPEC system could withstand the harsh sea environment and violent nature of ship operations. The sensor had to be able to resist all the vibrations that affect ships, from engines, winds and wave shocks to the hull. EOI manufactures the Spynel Maritime to STD IEC standards, to ensure performance and sustained operation in severe conditions. All connections are made to be airtight and anti-corrosive coatings are applied along with a lens washing system for hands free maintenance.

The Spynel was mounted on a custom gyro-stabilized platform to compensate for the rough seas and ship movement it would face. It was successfully stabilized at sea state level five, rough with 2.5- to 4-meter waves, and level six, very rough with 4 to 6-meter waves. In addition to mechanical stabilization, a specific image processing stabilization algorithm ensures optimized detection at sea. With integration to the ships' inertial navigation system, the EOI solution could properly keep users aware of where threats were located as well as accurately track even as the ship swiftly maneuvered.

The Spynel delivers a day and night, all weather navigation tool as well. Most ships rely on radar and the use of night vision goggles and operators can be visually impaired in inclement weather and in the black of night. The Spynel provides high resolution imaging no matter the fog and precipitation levels.

## RESULTS

The Marine Nationale chose the Spynel as their solution and installed it on multiple war frigates. These ships were patrol vessels focused in on anti-piracy missions and were frequently harbored in volatile foreign ports where terror cells seek maritime targets. The system was thoroughly tested and proved it could effectively detect small wooden watercraft in open sea, choppy conditions and could efficiently monitor the entire 360 degree perimeter while docked.

## CONCLUSION

EOI's Spynel infrared system provides maritime assets a highly effective and rugged surveillance tool. With a simple user interface and small hardware footprint, the Spynel can be a reliable standalone perimeter security solution as well as an added layer of capability to systems already in place.

The Spynel can be integrated with AIS and radar systems. Built up to military standards, the EOI solution can easily provide the same superior functionality within law enforcement, narco-traffic, commercial shipping and private yachting applications. Combined with its navigation uses, the Spynel will be unmatched within maritime perimeter surveillance operations for the foreseeable future and ship crews can rest assured of their persistent protection.

Founded in 1964, Electro Optical Industries designs, develops, assembles and sells complete optronic systems for security, industrial and civil applications. EOI established itself as an international reference for infrared technology innovation through the development of its award-winning real-time 360 degree infrared camera, the Spynel (2008 Product of the year from Photonics Tech Briefs, 2010 Innovation Prize from the EuroNaval Committee, 2011 Kummerman award from the French Academy of Marine, 2012 GovSec Platinum Award). Tested by NSSA