

Night Vision Technology

Technology Overview

Night vision technology has been a common component of military applications requiring object identification in daylight and dark or near-dark conditions. This technology has been widely adopted and applied to surface and air applications, with growing use by the law enforcement community for surveillance activities. Night vision systems can be characterized according to the technology utilized; thermal imager, amplified charge-coupled, or image intensification. The suitability of different technologies for different operational scenarios may be affected by target characteristics (e.g., stationary or moving) or by the method in which the systems are mounted to a vehicle or vessel.



Intensifier Technology

Photo courtesy of Pyser-SGI Limited



Three technologies, one video output

Photo courtesy of Pyser-SGI Limited

Information Gathering

A team consisting of personnel from the Space and Naval Warfare Systems Center (SPAWAR) in Charleston, SC and the Texas A&M University Systems, Engineering Program Office (TAMUS-EPO), both SAVER partners, created a brief survey process to solicit information from ports and associated security/law enforcement agencies regarding their need for night vision technology. Subject Matter Experts (SMEs) at several U.S. ports provided input on their security mission and organization, night vision requirements, and the relative priority of night vision technologies. These ports included: Charleston, South Carolina, Miami, Florida, Houston, Texas, Beaumont, Texas, and Corpus Christi, Texas. The purpose for surveying the varying port entities was to validate night vision technology requirements and the relative priority of night vision devices versus other needs as applied to their mission. Missions included surveillance for counter-terrorism, search and rescue operations, fire response, and intrusion detection and response.

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Results

The scope of the survey involved a personal visit to the agency or conversation by telephone or email, with the SME's to ascertain the relative acquisition priority for a night vision capability in the port setting. The interviewers discussed the elements of the survey that included mission, equipment use and characteristics, and the priority of the capabilities desired. The results of the analysis indicate that:

- Night vision will complement and support patrol operations afloat and ashore to protect critical infrastructure, vessels, and canals, as well as observe and evaluate port and harbor operations.
- In those ports that have previously acquired night vision technology, it has proven to be invaluable in past operations.
- Port security officers, both ashore and afloat, require night vision enhancement and new technology applied to their existing equipment.
- There is a need for night vision technology for prevention (surveillance) and response (patrol car or boat) aspects of port security, as well as for enhancing fire response capabilities in limited lighting situations.
- Night vision is considered a medium-high priority, depending on the critical requirements for each port.

In a few cases, not only were port security officers unfamiliar with the new generation of night vision devices, they were generally not aware of the technologies that identify these systems. These technologies include amplified charge-coupled devices (CCD), image intensifiers (I²), or thermal imagers. To enhance the night vision capability in the port setting, rugged, weather-resistant, and gyro-stabilized night vision equipment is required. Additionally, binoculars, illuminators, archiving equipment, as well as floodlighting, spotlights, and flashlights with long range and endurance will facilitate the needs for object identification in this environment.

A recommended short list of issues with proposed technologies in night vision capabilities for the port setting is defined below:

- Port locations in occluded and bright lighting can cause temporary flash interruptions to cameras viewing the crossover planes from darkness to light. The proposed technical solution would be high performance CCD monochrome cameras with sophisticated dynamic range that can look seamlessly from well lit to extremely dark conditions. These types of cameras also make the transition easily from daylight to night, and have a much longer operating life than thermal imagers and intensifiers.
- Port areas with residual heat and bright and dark areas can confuse thermal imagery. If a high performance camera is not available, a combination of the three technologies-CCD, image intensifiers, and thermal imaging-can be overlapped in varying degrees to provide a suitable image.
- Long-range optics, such as zoom, or telephoto lenses, need to be used during the day and at night. Closed Circuit Television (CCTV) cameras with built-in intensifiers that can rotate into place can resolve this

technology gap, as well as pocket scopes with adapters which can be fitted to camcorders and single lens reflex cameras.

- I² night vision technology is the most widely used for law enforcement activities. Third generation (Gen-3) I² night vision equipment is available in hand-held viewers (monocular or binocular) and provides the first responder the best performance in rural environments where the ambient illumination is extremely low.
- Different thermal imagers need to be selected for different circumstances. Low cost, pan/tilt units are available, as well as self-contained, portable, hand-held thermal imagers. Higher end camcorder style units and gyro-stabilized pan/tilt/zoom units are also available.
- Dark areas, such as under a pier, need to be illuminated for intensifiers to work. Compact high-powered lights with different filters providing various infrared illuminations are available. In addition, small hand-held precision spot beam illuminators can also be used in patrol situations.
- Centralized command locations need the ability to integrate night vision enhancement technology output (data/image) and distribute the output to other agencies charged with ensuring port security. A removable and wireless digital hard drive recorder currently used by the highway patrol may supplement this requirement.



Thermal Imager Technology Photo

Courtesy of ITT Industries