



**Homeland
Security**

Science and Technology

Summary

U.S. Department of Homeland Security



System Assessment and Validation for Emergency Responders

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions.

Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts unbiased operational tests on commercial equipment and systems and provides those results along with other relevant equipment information to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL). The SAVER Program mission includes:

- Conducting impartial, practitioner relevant, and operationally oriented assessments and validations of emergency responder equipment;
- Providing information that enables decision makers and responders to better select, procure, use, and maintain emergency responder equipment.

Information provided by the SAVER Program will be shared nationally with the responder community, providing a life-saving and cost-saving asset to DHS, as well as to federal, state, and local responders.

The SAVER Program is supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

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Ports at Night, Seeing with Hand-Held Intensifiers

Given the growth in demand and importance of night vision in the law enforcement community, the Space and Naval Warfare Systems Center (SPAWARSYSCEN), Charleston assessed Image-Intensified (I²) Night Vision Devices (NVDs) with the assistance of the Texas A&M University Engineering Program Office. This assessment and validation project used the input and assistance of various emergency responders, law enforcement, and security organizations to examine hand-held products in a maritime port environment. The result of this assessment, intended for the emergency responder community, is equally applicable to other agencies and is built on extensive law enforcement experience and background on current hand-held I² technologies, capabilities, and limitations. The Ports at Night, Seeing With Hand-Held Intensifiers Assessment Findings Report presents the assessment results for these improved devices that can meet emergency responders' needs.

Background

SPAWARSYSCEN, Charleston conducted an assessment of hand-held I² NVDs to assist emergency responders interested in purchasing or evaluating these devices. As a starting point of the assessment, a focus group study was performed with emergency responders who concentrated on the use of intensifiers within maritime port applications. The emergency responders identified important criteria for night vision equipment in various port applications. This resulted in the selection of small hand-held I² NVDs known as "monoculars" or "pocketscopes" for an assessment.

Once the preferred configuration was selected, market research and a review of the latest technology were initiated. This research and review indicated that the performance of the intensifier tube, the main internal component of the device, varies with respect to cost. Based on the unique demands of the port environment, it was determined that an enhanced grade of the third generation (Gen-3) intensifier tube was necessary to satisfy the wide range of port security applications. The enhanced Gen-3 tube provided the ability to view dark areas adjacent to brightly lit areas with minimized blooming and haloing effects.

The demand for hand-held NVDs using I² technology continues to increase as their performance and versatility improves. I² devices have the ability to detect an object of interest in various lighting conditions, and to transition from an extremely dark location to an area with ample lighting. Newer I² devices have overcome the deficiencies of their predecessors, and are the focus of this report (Figures 1 and 2).

Assessment

The *Ports at Night, Seeing With Hand-Held Intensifiers Report* presents findings from an assessment of four Gen-3 I² hand-held intensifiers. The intensifiers were evaluated in field assessments in order to provide information to assist emergency responders interested in purchasing these devices. The overall assessment revealed the differences in hand-held intensifiers by comparing them using a set of functional and operational criteria.

The assessment process focused on commercial off-the-shelf (COTS) products with I² technology. The independent review and assessment included:

- Defining, within the port environment,

the operational criteria related to Gen-3 hand-held I² devices for emergency responders

- Conducting an analysis of the essential criteria and capabilities of components in a device
- Determining the configuration of components in a basic functional device
- Conducting a “hands-on” product assessment and validation in several port environments.

Assessment Participants

The I² devices in Table 1 were selected for this assessment based on the established criteria and specifications that apply to port applications. The description includes the image intensifier grade as specified by the manufacturer.

Assessment Criteria

The SAVER Program has established five categories to assist in the development of factors for comparison of emergency response



Figures 1 and 2. Use of Hand-Held I² NVD in a Port Environment

Table 1. Selected Gen-3 I² Devices

Company	Description
ITT Industries	PVS-14 Monocular Night Vision Device (Pinnacle Grade)
Northrop Grumman Corporation	M944 Night Vision Pocketscope (Omega Grade)
B.E. Meyers & Company Incorporated	Dark Invader–Ultra Owl Night Vision System (Pinnacle Grade)
Nivisys Industries	MUM–14 Mini-Monocular (Omni IV Grade)

equipment assessed by the Program. The categories are defined as follows:

- *Affordability* – This category groups criteria related to life cycle costs of a piece of equipment or system.
- *Capability* – This category groups criteria related to the power, capacity, or features available for a piece of equipment or system to perform one or more responder-relevant tasks.
- *Deployability* – This category groups criteria related to the movement, installation, or implementation of a piece of equipment or system by responders at the site of its intended use.
- *Maintainability* – This category groups criteria related to the maintenance and restoration of a piece of equipment or system to operational conditions by responders.
- *Usability* – This category groups criteria related to the quality of the responders’ experience with the operational employment of a piece of equipment or system. This includes the relative ease of use, efficiency, and

overall satisfaction of the responders with the equipment or system.

This assessment focused on the usability and capability of hand-held devices. The factors in the remaining three categories—maintainability, affordability, and deployability—were validated through vendor-supplied information; results are detailed in the report.

Assessment Findings

The results of this assessment are directed towards the performance of selected I² devices based on functional and operational criteria. The assessment was performed in two phases. Phase I included a functional validation to verify specific technical capabilities of each device. Phase II consisted of an actual performance assessment of each device in operational applications.

Phase I – Functional Validation

The ability to detect, recognize, and identify a Point of Interest (POI) while referencing a resolution chart was demonstrated at the beginning of the assessment process (Figure 3). A critical capability of an I² device is the ability to resolve an object at various distances. This ability was investigated on land to determine at what distances detection,

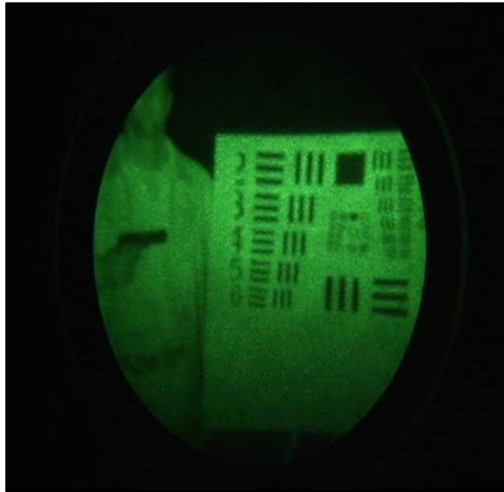


Figure 3. Utilization of Resolution Charts Relative to Handgun Observations

recognition, and identification occurred. While absolute identification of a handgun at 75 feet was difficult, I² devices possess sufficient resolution and contrast to alert a user to the potential presence of a handgun.

All selected I² devices were validated without magnification attachments. The resolution chart (Table 2) was used to determine how an object (such as a handgun) could be referenced to a specific distance. The Gen-3 I² devices were compared side-by-side through observations of an object in the field, or independently with a resolution chart. The devices were found to have very similar performance. The maximum resolution

distances in Table 2 apply to all the I² devices assessed.

Phase II – Performance Assessment

The capability and usability of the I² devices were measured in specific land and water applications in a port environment as outlined in the following:

- *Land Applications* – areas of confined spaces, dockside, under piers, and views towards the water
- *Water Applications* – areas of surrounding water, vegetative shoreline, piers/docks, canals, and bridges.

Throughout the assessment, a POI (person) would appear and disappear within the different locations.

The factors within each category were rated for the specific I² device based on its performance in the applications. A 1 to 5 scale was used to rate the performance, in which 1 represented poor performance and 5 represented excellent performance. Once the factor ratings for each category were established, they were multiplied by their assigned level of importance.

Figure 4 shows the combined capability and usability ratings for each device that are contained in the report. The remaining three SAVER categories—affordability,

Table 2. Resolution Distances

Johnson Criteria Term	Maximum Distance or Range	Explanation
Detection	700 feet	Ability to detect that something is out there
Recognition	300 feet	Ability to recognize a person walking about
Identification	75-100 feet	Ability to identify the person is holding a handgun

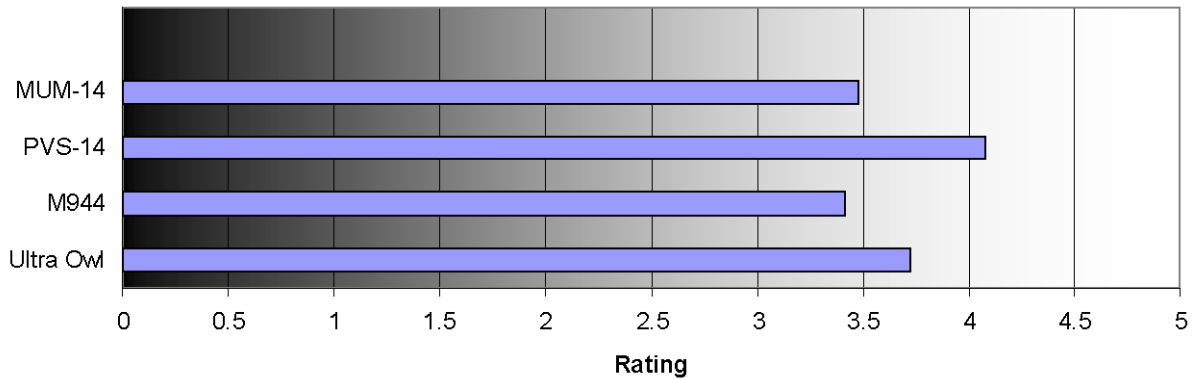


Figure 4. Overall Capability and Usability Ratings

deployability, and maintainability—were not assessed by the participants, but were validated through vendor specifications and are presented in a feature matrix contained in the report.

Conclusion

All four devices were judged, using the procedures documented in the report, to be useful in the port environment, with different applications within the port driving the desired operational features. All the devices provided a well-defined image, which allowed for recognition and identification of objects under extremely low-light conditions. Numerous users remarked that the NVD was no longer a desired or supplemental device, but a necessary component essential for the performance of their duties. The information presented in this report will aid emergency response agencies in selecting the appropriate I² NVD for law enforcement and security applications.

Overall, the emergency responders involved in the assessment were very impressed with the quality and sensitivity of the various devices.

They remarked that the hand-held I² NVDs should be considered a necessary tool for law enforcement and security applications in and around the port environment.

If your agency is considering purchasing I² NVD, this report and other reports in this series may provide important information that can provide greater mission and agency efficiencies. Documents are available on the SAVER Web site (<https://www.rkb.us/saver>). Reports on other technologies being assessed in the Saver Program can also be found on the Web site.