Tactical Eyewear

Focus Group Report

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FOREWORD

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 objective assessments and validations on commercially available equipment and systems, and develops knowledge products that provide relevant equipment information to the emergency responder community. The SAVER Program mission includes:

- Conducting impartial, practitioner-relevant, operationally oriented assessments and validations of emergency response equipment.
- Providing information, in the form of knowledge products, that enables decision-makers and responders to better select, procure, use and maintain emergency response equipment.

SAVER Program knowledge products provide information on equipment that falls under the categories listed in the DHS Authorized Equipment List (AEL), focusing primarily on two main questions for the responder community: "What equipment is available?" and "How does it perform?" These knowledge products are shared nationally with the responder community, providing a life- and cost-saving asset to DHS, as well as to federal, state and local responders.

The SAVER Program is managed by the National Urban Security Technology Laboratory (NUSTL). NUSTL is responsible for all SAVER activities, including selecting and prioritizing program topics, developing SAVER knowledge products, coordinating with other organizations, and ensuring flexibility and responsiveness to first responder requirements.

NUSTL provides expertise and analysis on a wide range of key subject areas, including: chemical, biological, radiological, nuclear and explosive weapons detection; emergency response and recovery; and related equipment, instrumentation and technologies. In support of this tasking, NUSTL will conduct a tactical eyewear comparative assessment to provide emergency responders with information on currently available technologies. Tactical eyewear falls under AEL reference number 01ZA-03-EYEP titled Protection, Eye. As part of this project, assessment recommendations were gathered from a focus group and are documented in this report.

For more information on NUSTL's SAVER Program or to view additional reports on tactical eyewear or other technologies, visit www.dhs.gov/science-and-technology/SAVER.

U.S. Department of Homeland Security

SAVER

System Assessment and Validation for Emergency Responders

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EXECUTIVE SUMMARY

Tactical eyewear are used by police, firefighters, paramedics and other emergency response personnel to protect their eyes from hazards during field operations. Common hazards include bullet fragments, blunt objects, chemicals, blood and other biohazards. The scope of this project on tactical eyewear will be limited to spectacles and goggles; facemasks, respirators and other types of eye protection will not be assessed.

Through its System Assessment and Validation for Emergency Responders (SAVER) Program, the National Urban Security Technology Laboratory (NUSTL) will conduct a comparative assessment of tactical eyewear to provide emergency responders with information that will assist with making operational and procurement decisions.

As a part of the assessment process, NUSTL convened a focus group on November 7, 2017, at the U.S. Army National Soldier Research, Development and Engineering Center in Natick, Massachusetts, with the primary objectives of recommending evaluation criteria, product selection criteria, products and possible scenarios for the assessment of tactical eyewear. Seven emergency responders from various jurisdictions who collectively have expertise in policing, criminal investigation, firefighting, paramedics, special weapons and tactics, and bomb squads took part in the focus group. Their recommendations are documented in this report.

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1.0 INTRODUCTION

Tactical eyewear are used by police, firefighters, paramedics and other emergency response personnel to protect their eyes from hazards during field operations. Common hazards include bullet fragments, blunt objects, chemicals, blood and other biohazards. The scope of this project on tactical eyewear will be limited to spectacles and goggles; facemasks, respirators and other types of eye protection will not be assessed.

On November 7, 2017, the System Assessment and Validation for Emergency Responders (SAVER) Program conducted a focus group on tactical eyewear at the U.S. Army National Soldier Research, Development and Engineering Center (NSRDEC) facility in Natick, Massachusetts. The primary objectives of this focus group were to gather recommendations on evaluation criteria, product selection criteria, products and possible scenarios for the assessment of tactical eyewear.

1.1 PARTICIPANT INFORMATION

Seven emergency responders from various jurisdictions with at least one year of experience using tactical eyewear were selected to participate in the focus group. Practitioner information is listed in Table 1-1.

Table 1-1 Focus Group Participant Demographics

Practitioner	Years of Experience	State
Law Enforcement/Detective	20+	Massachusetts
Firefighter/Officer	20+	Virginia
Law Enforcement/Special Weapons and Tactics (SWAT) Team	20+	Washington
Law Enforcement/Bomb Squad	10-15	Arizona
Firefighter/Paramedic	10-15	Massachusetts
Firefighter/Paramedic	6-10	Massachusetts
Law Enforcement/Patrol	1-5	Massachusetts

2.0 FOCUS GROUP METHODOLOGY

The focus group opened with an overview of the SAVER Program, the tactical eyewear project, and the focus group goals and objectives. Once the background materials were covered, a facilitator led focus group discussions on four sets of recommendations:

1) Evaluation criteria recommendations—General criteria that are important to consider when making acquisition or operational decisions.
2) Assessment scenario recommendations—Operational scenarios in which the products should be assessed to evaluate their performance.

3) Product selection criteria recommendations—Criteria that identify specifications, attributes or characteristics a product should possess to be considered for the assessment.
4) Product recommendations—Products and vendors that are relevant to the emergency responder community and should be candidates for inclusion in the comparative assessment.

Figure 2-1 highlights the process followed to gather these recommendations.

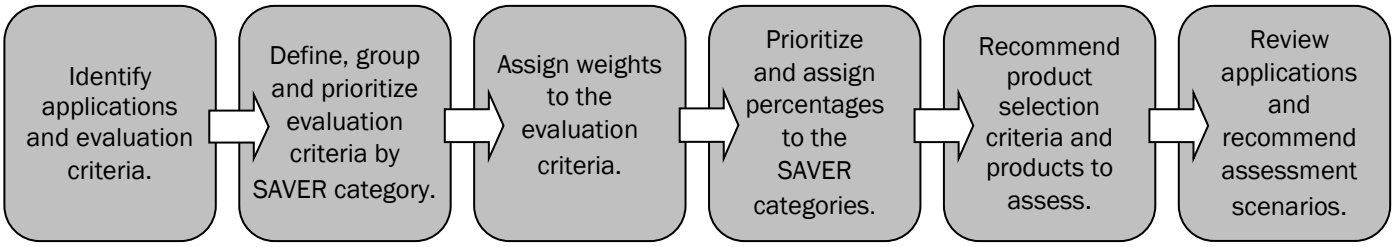

Figure 2-1 Focus Group Process

Focus group participants first identified applications in which tactical eyewear are commonly used. Next, the focus group participants identified and defined evaluation criteria, which were then grouped and prioritized in the SAVER categories: affordability, capability, deployability, maintainability and usability. The SAVER categories are defined as follows:

- **Affordability** groups criteria related to the total cost of ownership over the life of the product. This includes purchase price, training costs, warranty costs, recurring costs and maintenance costs.
- **Capability** groups criteria related to product features or functions needed to perform one or more responder relevant tasks.
- **Deployability** groups criteria related to preparing to use the product, including transport, setup, training and operational/deployment restrictions.
- **Maintainability** groups criteria related to the routine maintenance and minor repairs performed by responders, as well as included warranty terms, duration and coverage.
- **Usability** groups criteria related to ergonomics and the relative ease of use when performing one or more responder relevant tasks.

Once the evaluation criteria were prioritized within the SAVER categories, focus group participants assigned a weight for each criterion's level of importance on a 1-5 scale, where 5 is of utmost importance and 1 is of minor importance. The focus group identified several criteria that they specified as "information only."

These criteria were not assigned a weight because they will not be scored at the assessment. Instead, product specifications will be listed for them in the assessment report. Table 2-1 highlights the evaluation criteria weighting scale.

Table 2-1 Evaluation Criteria Weighting Scale

Weight	Definition
5	This evaluation criterion is ***of utmost importance:*** *"I **would never** consider purchasing a product that does not meet my expectations of this criterion or does not have this feature."*
4	This evaluation criterion is ***very important:*** *"I **would be hesitant** to purchase a product that does not meet my expectations of this criterion or does not have this feature."*
3	This evaluation criterion is ***important:*** *"Meeting my expectations of this criterion or having this feature **would strongly influence** my decision to purchase this product."*
2	This evaluation criterion is ***somewhat important:*** *"Meeting my expectations of this criterion or having this feature **would slightly influence** my decision to purchase this product."*
1	This evaluation criterion is ***of minor importance:*** *"Other things being equal, meeting my expectations of this criterion or having this feature **may influence** my decision to purchase this product."*

After the evaluation criteria were assigned a weight, the focus group participants recommended whether the criteria should be assessed operationally or according to vendor-provided specifications. Next, considering the evaluation criteria in each category, the focus group participants ranked the SAVER categories in order of importance. Based on the ranking, a percentage was assigned to each category to represent their levels of importance.

After rating the SAVER categories, focus group participants identified product selection criteria. The focus group also identified products that should be considered for the assessment. Lastly, the focus group participants reviewed the applications identified at the beginning of the focus group session and recommended operational scenarios for the assessment.

In addition to the typical SAVER focus group process, focus group participants made recommendations for laboratory tests on tactical eyewear that will be conducted by the NSRDEC. These recommendations are discussed in Section 7.

3.0 EVALUATION CRITERIA RECOMMENDATIONS

The focus group identified 28 evaluation criteria and concluded that usability was the most important SAVER category, followed by capability, maintainability, deployability and affordability, respectively. The evaluators specified some criteria as "information only." Weights were not assigned to these criteria as they will not be scored; however, specifications will be noted in the assessment report. Table 3-1 presents the category weights, evaluation criteria and evaluation criteria weights.

Table 3-1 Evaluation Criteria

SAVER CATEGORIES				
Usability	**Capability**	**Maintainability**	**Deployability**	**Affordability**
Overall Weight 35%	Overall Weight 30%	Overall Weight 25%	Overall Weight 10%	Overall Weight 0%
Evaluation Criteria				
Compatibility with Hearing Protection Weight: 5	**Fit** Weight: 5	**Durability** Weight: 4	**Ease of Changing Lenses** Weight: 3	**Cost** Information only
Compatibility with Masks/Respirators Weight: 5	**Visual Acuity** Weight: 5	**Scratch Resistance** Weight: 4	**Carrying Case Quality** Weight: 3	**Replacement Lens Cost** Information only
Compatibility with Headgear Weight: 5	**Adaptability (Multi-Use)** Weight: 4	**Ease of Cleaning and Disinfecting** Weight: 4	**Stowability on the Head** Weight: 2	
Accommodates Vision Correction Weight: 5	**Lens Type Options** Weight: 3	**Resistance to Chemicals** Weight: 2	**Availability in Different Sizes** Information only	
Comfort Weight: 4	**Heat and Cold Resistance** Weight: 3	**Warranty** Information only	**Compatibility with Body Cameras** Information only	
Field of View Weight: 4	**Anti-fog** Weight: 3			
Use with Optical Aids Weight: 4	**Stylish** Weight: 2			
Retention System Weight: 2	**Frame Color** Weight: 1			

3.1 USABILITY

Eight usability criteria were identified and defined by the focus group.

Compatibility with Hearing Protection refers to the degree to which tactical eyewear is compatible with and can be worn with all types of hearing protection devices, including in-ear and over-the-ear devices.

Compatibility with Masks/Respirators refers to the degree to which tactical eyewear is compatible with respiratory devices, such as air-tight N95 masks and half-face air purifying respirators (APRs). Focus group members noted that eyewear has to be worn over most N95 masks and can push half-face APR filters down.

Compatibility with Headgear refers to the degree to which tactical eyewear interfaces and fits well with emergency response headgear, including fire helmets, ballistic helmets, face shields and hardhats.

Accommodates Vision Correction refers to the method of allowing prescription vision correction and its effectiveness. Focus group members stated that there should be a prescription insert or prescription lens, as tactical eyewear will likely fit poorly over prescription glasses. They also wanted vision correction to have extended width coverage.

Comfort refers to the degree of comfort provided by the tactical eyewear when worn. Focus group members stressed the need for long-term comfort, freedom from nausea, lack of pressure points and lack of sharp edges.

Field of View refers to the range of vision provided by the tactical eyewear, including peripheral and top-to-bottom range of vision. Focus group members stated that peripheral vision can be skewed with some eyewear products. They also stated that field of view is critical for maintaining situational awareness.

Use with Optical Aids refers to the degree to which the tactical eyewear is compatible with and can be used effectively with optical aids, including binoculars, night vision goggles, thermal imagers, gunsights and other weapons optics.

Retention System refers to the presence of a retention strap or some other method of keeping tactical eyewear in place on the head. This applies more to spectacles than goggles.

3.2 Capability

Eight capability criteria were identified and defined by the focus group.

Fit refers to how well the tactical eyewear stays positioned on the face, ensuring that it provides protection during emergency response activities from hazards from top to bottom and along the sides.

Visual Acuity refers to the optical quality of the tactical eyewear, including the ability to resolve objects from a distance, the presence or lack of distortion, and the ability to read maps and cell phones while looking straight ahead.

Adaptability (Multi-Use) refers to the ability to use one tactical eyewear product for different emergency response operations, such as auto extrication, emergency medical services work, firefighting, weapons use, etc.

Lens Type Options refers to the types of lenses that are available and can be used with the tactical eyewear product. Focus group members stated that they would like to have clear, sunglass, polarized and yellow (for shooting) lens options at a minimum.

Heat and Cold Resistance refers to the ability to withstand high and low temperatures during operational use and storage. The requirements would vary depending on the emergency response discipline. Firefighters in the focus group would like to see an operational and storage temperature range from -60°F to 200°F.

Anti-fog refers to the quality of anti-fog coating in the tactical eyewear and the degree to which it provides protection from fogging. Focus group members would be open to evaluating other solutions, such as fans in goggles, but they caution that this would require electronics that may interfere with other operations, such as defusing a bomb.

Stylish refers to the aesthetic appearance of the tactical eyewear, specifically as to whether or not responders would choose to buy it for off-duty usage based upon aesthetics. The product should also conform to department policy and not be too flashy, according to focus group members.

Frame Color refers to the colors that tactical eyewear frames are available in. Focus group members stated that they want colors that can match other gear and that certain departments prefer certain colors. For instance, SWAT team members stated that they prefer tan eyewear products.

3.3 Maintainability

Five maintainability criteria were identified and defined by the focus group.

Durability refers to the ability of the tactical eyewear to remain in good condition over a long period of time and withstand heavy usage, wear and tear, drops, bumps, and rough handling.

Scratch Resistance refers to how well the tactical eyewear resists scratching on the lenses in normal use, including cleaning the lenses with a shirt.

Ease of Cleaning and Disinfecting refers to the ease with which the tactical eyewear can be cleaned with a liquid cleaner and a cloth or paper towel, and the ease with which it can be disinfected by wiping it with, or soaking it in, a chemical disinfecting agent. Focus group members stated that eyewear with many crevices and parts, such as rubber foam, are difficult to clean and disinfect.

Resistance to Chemicals refers to the resistance to damage from chemical cleaning and disinfecting agents, including chemical wipes, liquids and sprays.

Warranty refers to the amount of time in which the vendor promises to repair or replace equipment that is not functioning properly, and the terms of such agreement. Focus group members would like to see a breakdown in warranty coverage for frames and lenses.

3.4 Deployability

Five deployability criteria were identified and defined by the focus group.

Ease of Changing Lenses refers to the ease with which lenses can be changed on the tactical eyewear. Speed, simplicity and not having the lenses break or tear were listed as important considerations.

Carrying Case Quality refers to the overall quality of the tactical eyewear carrying case, whether or not it provides adequate protection, and whether or not it allows easy deployment. Focus group members stated a preference for hard compact-size cases that can be worn on a gear belt and handled with gloves.

Stowability on the Head refers to the ability to wear tactical eyewear so that the lenses are positioned on top of the head in a stable manner and will remain in place. Focus group members stated that it is desirable at times to uncover their eyes and stow the eyewear on their head until they need it again.

Availability in Different Sizes refers to the size options (e.g., small, medium, large) available when choosing tactical eyewear. Focus group members stated that gender-based size options (e.g., men's large, women's large) are preferable. They emphasized that sizing is important because poorly fitting eyewear often bends and results in poor optics.

Compatibility with Body Cameras refers to any features in the tactical eyewear that allow it to activate body cameras or be used as a body camera or with a body camera.

3.5 AFFORDABILITY

Two affordability criteria were identified and defined by the focus group.

Initial Cost refers to the price of the eyewear when purchased, including the base cost and the cost of kits and accessories that are part of the eyewear.

Replacement Lens Cost refers to the cost of replacement lenses for the tactical eyewear quantified in dollars and in percentage of initial cost. Focus group members stated that they usually replace lenses every year or two and that the percentage of initial cost is important to them.

4.0 EVALUATION CRITERIA ASSESSMENT RECOMMENDATIONS

The focus group made recommendations on whether the evaluation criteria should be assessed operationally or according to vendor-provided specifications. In an operational assessment, evaluators assess criteria based on their hands-on experience using the product. In a specification assessment, evaluators assess criteria based on product information provided by the vendor. In some cases, criteria may be assessed operationally and according to vendor-provided specifications.

In addition, evaluators recommended that some evaluation criteria should be assessed by undergoing laboratory testing. Other evaluation criteria should be categorized as information only. Information only criteria will not be scored by evaluators at the assessment, but their specifications will be listed in the assessment report.

Table 4-1 presents the focus group's assessment recommendations for the evaluation criteria.

Table 4-1 Evaluation Criteria Assessment Recommendations

Category	Criteria	Operational	Specification	Lab Testing	Information Only
Usability	Compatibility with Hearing Protection	✓			
	Compatibility with Masks/Respirators	✓			
	Compatibility with Headgear	✓			
	Accommodates Vision Correction	✓			
	Comfort	✓			
	Field of View	✓			
	Use with Optical Aids	✓			
	Retention System	✓			
Capability	Fit	✓			
	Visual Acuity	✓			
	Adaptability (Multi-Use)	✓	✓		
	Lens Type Options	✓	✓		
	Heat and Cold Resistance		✓	✓	
	Anti-fog	✓		✓	
	Stylish	✓			
	Frame Color	✓	✓		
Maintainability	Durability	✓			
	Scratch Resistance	✓			
	Ease of Cleaning and Resistance to Chemicals	✓			
	Warranty			✓	
					✓
Deployability	Ease of Changing Lenses	✓			
	Carrying Case Quality	✓			
	Stowability on the Head	✓			
	Availability in Different Sizes				✓
	Compatibility with Body Cameras				✓
Affordability	Cost				✓
	Replacement Lens Cost				✓

5.0 ASSESSMENT SCENARIO RECOMMENDATIONS

The focus group identified firefighting, emergency medical response, firearms training, policing, bomb squads and SWAT team work as the main applications for tactical eyewear. Based on these applications, the focus group recommended seven scenarios in which products could be assessed using the evaluation criteria recommended for an operational assessment (Table 4-1).

5.1 Deployment Preparation (Tabletop Assessment)

Evaluators will be presented with all tactical eyewear to be assessed. They will try on each pair, read the product manual and evaluate the criteria listed below. Vision correction features will be tested by having evaluators read different sized text from a distance and/or identify objects from a distance.

Evaluation criteria scored during this scenario will include: accommodates vision correction, comfort, lens type options, stylish, carrying case quality and frame color.

5.2 Emergency Medical Response

Evaluators wearing tactical eyewear will respond to a simulated medical incident and perform medical related tasks while wearing tactical eyewear and an N95 mask. During the scenario, they will be sprayed with water or some other suitable liquid to simulate a medical hazard (blood, bodily fluids, chemicals, etc.). They will then go through a procedure to clean/disinfect the eyewear. Only spectacles will be assessed during this scenario.

Evaluation criteria scored during this scenario will include: compatibility with masks/respirators, fit, and ease of cleaning and disinfecting.

5.3 Helicopter Proximity

Evaluators wearing tactical eyewear will enter a high-wind simulated environment similar to the draft received from being near the rotors of a helicopter. They will wear different types of headgear during this exercise.

Evaluation criteria scored during this scenario will include: compatibility with headgear and fit.

5.4 Firearms Usage

Evaluators wearing tactical eyewear will simulate firearms usage by being in a room with loud music and flashbangs. They will test the tactical eyewear with a ballistic helmet, different kinds of hearing protection devices and optical aids.

Evaluation criteria scored during this scenario will include: compatibility with hearing protection, compatibility with headgear, use with optical aids, fit and visual acuity.

5.5 Search

Evaluators wearing tactical eyewear will search for objects in different environments ranging from outdoor sunlight to indoor areas with varying degrees of light and darkness. They will be asked to find and identify several objects. Evaluators will repeat the course using different lenses (sunglasses, polarized, ballistic, etc.) available on the tactical eyewear. Objects shall be inter-changed and positioned slightly differently in each rotation and may blend into the background for an additional challenge. If a thermal imager is available for the assessment, evaluators will be asked to use it to find objects in a dark room.

Evaluation criteria scored during this scenario will include: field of view, use with optical aids, visual acuity, adaptability (multi-use) and ease of changing lenses.

5.6 Physical Training

Evaluators wearing tactical eyewear will perform a set of physical activities, such as climbing stairs, chasing a suspect, jumping over objects, crawling, going through an obstacle course and using hand tools. They will wear a half-face APR for parts of these exercises.

Evaluation criteria scored during this scenario will include: compatibility with masks/respirators, field of view, retention system, anti-fog, carrying case quality and stowability on the head.

5.7 Destructive Testing

On the last day of the assessment, there will be a group session in which evaluators will perform destructive tests on the tactical eyewear, such as dropping them, banging them into hard surfaces, rubbing them with abrasive objects and cleaning them with various chemical cleaners.

Evaluation criteria scored during this scenario will include: durability, scratch resistance, and ease of cleaning and disinfecting.

6.0 PRODUCT SELECTION RECOMMENDATIONS

The focus group identified three product selection criteria that may be used to select products for the tactical eyewear assessment. Table 6-1 presents the product selection criteria in priority order.

Table 6-1 Product Selection Criteria

Product Selection Criteria	Description
ANSI Z87.1 Compliance[i]	Tactical eyewear must meet the ANSI Z87.1 standard for protection from impact, ionizing radiation and liquid splash hazards.
Interchangeable Lenses	Tactical eyewear must have two or more lens types that are interchangeable and can be replaced.
Ballistic Rating	The ballistic rating of the tactical eyewear must exceed ANSI Z87.1 standards.

The focus group did not recommend specific products to assess, but stated that they used eyewear from the following vendors that should be considered for the assessment:

- Eye Safety Systems, Inc.
- Honeywell Safety Products, SAS
- Oakley, Inc.
- Revision Military, Inc.
- Smith Optics, Inc.
- Wiley-X, Inc.

7.0 LABORATORY TESTING RECOMMENDATIONS

The focus group members listed heat and cold resistance, anti-fog, and resistance to chemicals as evaluation criteria for which laboratory testing should be completed for each tactical eyewear product selected for the assessment. NSRDEC has laboratory facilities that include a temperature chamber and fog chamber. The National Urban Security Transportation Laboratory (NUSTL) has contracted with NSRDEC to perform these tests on all eyewear products selected for the assessment.

[i] This standard is officially known as ANSI/ISEA Z87.1-2015 https://safetyequipment.org/isea-standards/ansiisea-z87-accredited-standards-committee/ansiisea-z87-1-2015-standard/

8.0 FUTURE ACTIONS

The focus group recommendations documented in this report will be used to guide the development of a tactical eyewear assessment plan and the selection of products to assess. A SAVER Program assessment of tactical eyewear will take place at NSRDEC in the autumn of 2018 over the course of 3 to 5 days. Once the assessment is complete, the results will be published to the SAVER website, www.dhs.gov/science-and-technology/SAVER.

9.0 ACKNOWLEDGEMENTS

NUSTL thanks the focus group participants for their valuable time and expertise. Their insights and recommendations will guide the planning and execution of the assessment, as well as future SAVER projects. Appreciation is also extended to the home jurisdictions of the participants for allowing them to participate in the focus group.