



**Homeland
Security**

Science and Technology

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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 objective assessments and validations on commercial equipment and systems, and provides those results along with other relevant equipment information to the emergency responder 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 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?"

For more information on this and other technologies, contact the SAVER Program Support Office.

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Summary

Covert Wearable Camera Systems

(AEL reference number 13LE-00-SURV)

Covert wearable camera systems are used by law enforcement personnel to gather intelligence and record undercover transactions, such as drug deals. These systems can be worn discreetly on the body and typically include a camera, microphone, battery pack, and video storage capability.

To provide responders with information on currently available covert wearable camera systems, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic conducted a comparative assessment of these systems for the System Assessment and Validation for Emergency Responders (SAVER) Program in September 2012. The assessment focused on systems that include data security features for law enforcement applications. Detailed findings are provided in the *Covert Wearable Camera Systems Assessment Report*, which is available by request at <https://www.rkb.us/saver>.

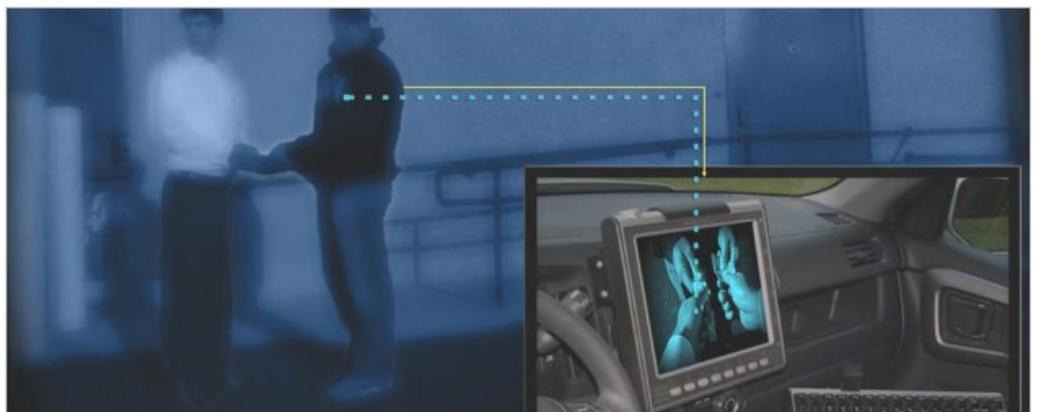
Assessment Methodology

Prior to the assessment, eight responders were chosen from various jurisdictions to participate in a focus group. Participants possessed strong backgrounds in law enforcement and had experience with covert wearable camera systems. The group identified evaluation criteria and recommended product selection criteria and possible scenarios for assessment.

After identifying evaluation criteria, the focus group assigned each criterion to one of five SAVER categories, and then assigned a weight for its level of importance. Once the criteria were weighted, the five SAVER categories were assigned a percentage value to represent the level of each category's importance relative to the other categories.

Based on the focus group's recommendations and market research, the following covert wearable camera systems were selected for assessment:

- Oculus[®] System, Covidence A/S;
- Freja System, Cobham Tactical Communications and Surveillance; and
- Raven System, Adaptive Digital Systems Inc.



Six law enforcement officers served as evaluators for this assessment. All evaluators had at least 6 years of experience using covert wearable camera systems.

During the assessment, evaluators rated the covert wearable camera systems based on evaluation criteria established by the focus group. The assessment was separated into two phases: the specification assessment and the operational assessment. Evaluators assessed the systems based on vendor-provided information during the specification assessment. Hands-on experience in the setup scenario and the transaction, transfer, and review scenario served as the basis for the operational assessment. During the setup scenario, evaluators were able to familiarize themselves with each system’s functions, features, and setup procedures. A simulated drug transaction was conducted during the transaction, transfer, and review scenario; the transaction was repeated in four different environments with varying lighting conditions and noise levels.

SAVER Category Definitions	
Affordability	groups criteria related to life-cycle costs of a piece of equipment or system.
Capability	groups criteria related to the power, capacity, or features available for a piece of equipment or system to perform or assist the responder in performing one or more relevant tasks.
Deployability	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	groups criteria related to the maintenance and restoration of a piece of equipment or system to operational condition by responders.
Usability	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.

Assessment Results

Table 1 displays the composite assessment scores as well as the category scores for each covert wearable camera system. Higher scores indicate a more favorable rating by evaluators. The advantages and disadvantages of each system, as identified by evaluators, are listed in table 2. To view how each system scored against the evaluation criteria assigned to the SAVER categories, see table 3. For specifications, see table 4.

According to evaluators, all of the assessed systems are comfortable to wear and easy to conceal for a variety of applications, and most components appear to be durable. The video quality of all three systems was negatively impacted in low-light environments; however, evaluators noted that vendors offer other cameras that might be better suited to low-light environments. Each system features more than adequate data security features for protecting data integrity for evidentiary uses. In addition, video can be saved in an audio video interleave (AVI) format and played back on standard media players. It is also advantageous that all of the systems have internal and external stereo microphones, are powered by commonly available AAA batteries, and have an optional wireless remote switch available for an additional cost.

Responder agencies that may be considering the purchase of a covert wearable camera system should review the detailed findings in the *Covert Wearable Camera Systems Assessment Report* and carefully consider each system’s overall capabilities and limitations in relation to their jurisdiction’s operational needs. All reports in this series, as well as reports on other technologies, are available in the SAVER section of the Responder Knowledge Base (RKB) website, <https://www.rkb.us/saver>.

Table 1. Covert Wearable Camera System Assessment Results

System	Composite Score	Affordability (7% Weighting)	Capability (30% Weighting)	Deployability (25% Weighting)	Maintainability (13% Weighting)	Usability (25% Weighting)
Oculus® System	4.6	3.2	4.4	4.8	4.3	5.0
Freja System	4.3	2.5	4.4	4.2	4.5	4.6
Raven System	3.8	5.0	3.7	4.1	3.5	3.4

Table 2. Covert Wearable Camera System Advantages and Disadvantages

System	Advantages	Disadvantages
 <p>Oculus® System Composite Score: 4.6</p>	<ul style="list-style-type: none"> • Color camera produces great quality video in well-lit indoor/outdoor environments • Heavy-duty cables • Easy video transfer and playback (no proprietary software required) • Wired remote switch provides visual and tactile feedback to indicate operational status • 24/7 product support • Easy-to-understand user manual • Digital video recorder (DVR) has a slide on/off switch • User friendly software interface 	<ul style="list-style-type: none"> • Difficult to tell the difference between the power and streaming switches • DVR does not provide tactile feedback
 <p>Freja System Composite Score: 4.3</p>	<ul style="list-style-type: none"> • Excellent audio quality • Color high definition camera produces very nice video in well-lit outdoor environments • Easy video transfer and playback (no proprietary software required) • DVR provides visual and tactile feedback to indicate operational status • 24/7 product support • Easy-to-understand user manual • Many available software configuration settings/options 	<ul style="list-style-type: none"> • Clips on end of camera cables do not appear to be durable • Minimum operating temperature is high
 <p>Raven System Composite Score: 3.8</p>	<ul style="list-style-type: none"> • 12-hour DVR battery runtime • Lifetime warranty • DVR operational status indicators are well labeled • DVR has a slide on/off switch • Proprietary software protects the data from being transferred and viewed by unauthorized users, which enhances data security 	<ul style="list-style-type: none"> • Once video is transferred from the DVR, it must be deleted from the DVR before the DVR can be used again • Small screwdriver is required to connect cameras to the DVR • Loud voices easily overloaded and clipped the audio • No 24/7 product support • Proprietary playback software is not user friendly • Difficult to understand user manual

Table 3. Covert Wearable Camera System Criteria Ratings¹

KEY	  		
	Oculus® System	Freja System	Raven System
Least Favorable → Most Favorable			
    			
Affordability			
Warranty			
Capability			
Video quality			
Audio quality			
Day/Night capability			
Power			
Data storage			
Data security			

Table 3. Covert Wearable Camera System Criteria Ratings (Continued)¹

KEY	    				
					Oculus System
Deployability					
Covertness					
Initial setup					
Durability					
Operating/Storage temperatures					
Maintainability					
Product support					
Usability					
Operational ease of use					
Data transfer					
Playback					
Comfort					

Note:

¹ Averaged criteria ratings for each assessed product are graphically represented by colored and shaded circles. Highest ratings are represented by full green circles.

Table 4. Covert Wearable Camera System Specifications¹

Specifications	Oculus® System	Freja System	Raven System
Cost as assessed	\$14,330	\$12,401	\$8,800
Warranty (all components)	2 years	1 year	Lifetime
DVR battery runtime ²	3 hours 5 minutes	3 hours 55 minutes	12 hours
Internal storage capacity	64GB	32GB	16GB
Maximum storage capacity (if expandable)	1TB via external hard drive that attaches to the DVR (available for an additional cost)	Not expandable	32GB
Video resolution ³ (pixels)	320 x 240 640 x 480	640 x 480 1280 x 1024 (up to 10 fps)	640 x 480
Data security	<ul style="list-style-type: none"> Digital watermark using SHA-1 and Advance Encryption Standard File encryption with user-defined key Integrity-check utility (chain of custody records) 	<ul style="list-style-type: none"> Digital watermarking using SHA-1 and proprietary encryption coding WaveChecker II evidence verification (indicates if file has been modified) Chain of custody records 	<ul style="list-style-type: none"> Internal CRC-16, SHA-256 encryption coding Vendor proprietary data formats and protocols Time stamped and numbered data blocks User is required to download all data prior to erasing from the DVR Chain of custody procedure for archiving evidence
Supported video formats ⁴	AVI	AVI	Standard is a protected vendor proprietary format that can be converted to AVI using the system's software

Table 4. Covert Wearable Camera System Specifications (Continued)¹

Specifications	Oculus System	Freja System	Raven System
Camera one ⁵ specifications	Color low-light camera 10 x 10 mm 53° field of view 0.02 lux	Color HD camera 58° field of view 0.1 lux	Color Nano2-Versa camera 56° field of view Unknown lux rating
Camera two ⁵ specifications	Black-and-white low-light camera 13 x 13 mm 57° field of view 0.005 lux	Color low-light camera 43° field of view 0.02 lux	Black-and-white Nano2-Versa camera 56° field of view Unknown lux rating
Shock resistant (all components)	Yes	Unknown	Yes
Water resistance	Waterproof cameras (other components are water resistant)	Unknown for all components	All components are water resistant
System operating temperature range	5°F to 140°F	32°F to 140°F	Cameras: -4°F to 176°F DVR with transmitter: -4°F to 158°F
System storage temperature range	-4°F to 176°F	-4°F to 158°F	-40°F to 185°F
Product support availability	24/7	24/7	6 a.m. to 6 p.m. Pacific time, Monday through Friday; 6 a.m. to 12 p.m. Pacific time, Saturday and Sunday
Training included	1 to 2 days of training; agency is responsible for travel costs (flight and hotel)	1 to 2 days of training; purchase also includes enhanced user manual software	1 to 3 days of training
Quick-start guide included	Yes	Yes	Available upon request

Notes:

- ¹ Information was provided by manufacturers and has not been independently verified by the SAVER Program.
- ² All runtimes are for recording one color camera at VGA resolution (640 x 480 pixels) and 30 fps.
- ³ At 30 fps, unless otherwise indicated.
- ⁴ Viewable with any media player that supports AVI playback.
- ⁵ All cameras are pinhole cameras with a buttonhole lens that permits the attachment of a button concealment.

AVI	= audio video interleave	mm	= millimeter
CRC	= cyclic redundancy check	SAVER	= System Assessment and Validation for Emergency Responders
DVR	= digital video recorder	SHA	= secure hash algorithm
F	= Fahrenheit	TB	= terabyte
fps	= frames per second	VGA	= video graphics array
GB	= gigabyte		
HD	= high definition		