



**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 (S&T) Directorate 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 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 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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Portable Wireless Surveillance Systems

(AEL reference numbers 04MD-01-VCAM and 04SN-01-XMIT)

In order to provide emergency responders with information on currently available portable wireless surveillance system technologies, capabilities, and limitations, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic conducted a comparative assessment of wireless surveillance systems for the System Assessment and Validation for Emergency Responders (SAVER) Program in June 2009. Detailed findings are provided in the Portable Wireless Surveillance Systems Assessment Report, which is available by request at <https://www.rkb.us/saver>.

Background

Wireless surveillance cameras capture live video and transmit it over specific radio frequency bands to a command center for viewing and/or recording. These cameras can be mounted in locations where cabled camera systems are not feasible due to construction or environmental barriers, excessive cost, and/or time constraints. For the purpose of this SAVER assessment, a portable wireless surveillance system consists of a command center, cameras, transmitters, receivers, and possibly data storage. The systems may be configured differently, depending on the specific application. When used to monitor an outdoor public event, the cameras are typically mounted temporarily to a structure and may operate from either battery or AC power. The system then provides a wireless video transmission to a command center that displays the video and controls the cameras.

Assessment

Prior to the assessment, SPAWARSYSCEN conducted a market survey in order to investigate currently available portable wireless surveillance camera systems used for law enforcement applications. A focus group consisting of law enforcement personnel from various regions of the country met to identify equipment selection criteria for the assessment, determine evaluation criteria, and recommend assessment scenarios. The focus group categorized 40 assessment criteria within the five SAVER categories and assigned a weight for each criterion's level of importance. Out of the 10 portable wireless surveillance systems considered, systems from six vendors were selected for the comparative assessment. Three of the vendors were not able to participate in the assessment due to scheduling conflicts. Therefore, the following systems were evaluated in the assessment:

- AgileMesh™ AV8000 Watchtower
- DTC Communications ArmorNet™ System
- Sur-Tec® XOA Series.

Five law enforcement personnel from various jurisdictions with experience in wireless video surveillance served as assessment evaluators.

Evaluators were selected based on their respective responder disciplines, geographic locations, and professional experience.

The assessment was conducted in two phases that focused on specific assessment criteria: (1) operational assessment and (2) specification assessment. During the operational assessment, evaluators assessed the systems based on their hands-on experience using the systems. Evaluators conducted the specification assessment by reviewing vendor-provided information.

Each day before the assessment, a vendor representative provided evaluators with a system overview and familiarization training. The evaluators assessed one product per day. After completing the assessment activities for a specific product, evaluators rated that product according to the assessment criteria on a scale from 1 (least favorable) to 5 (most favorable), and provided written and verbal feedback.

Assessment Results

Evaluators rated the portable wireless surveillance systems using the assessment criteria established by the portable wireless surveillance systems focus group. Each criterion was prioritized within the five SAVER categories and assigned a weight factor. The SAVER category and composite scores are shown in table 1. Higher scores indicate a higher rating by evaluators. To view how each portable wireless surveillance system scored against each of the evaluation criteria assigned to the SAVER program categories, see table 2. For product specifications, see table 3.

The following paragraphs provide a brief summary of the evaluator comments and feedback on each

SAVER Program Category Definitions

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 or assist the responder in performing 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.

assessed portable wireless surveillance system. The systems are listed from highest to lowest composite score. The full report includes a breakdown of evaluator comments by SAVER categories.

AgileMesh AV8000 Watchtower

The AgileMesh AV8000 Watchtower received the highest composite score. The system includes cameras, wireless networking nodes, and antenna mounting assemblies; however, a computer and screen display are not included. Evaluators commented that the system was easy to set up, had the ability to maintain preset settings for the camera, and could accommodate aftermarket products easily. The

Table 1. Portable Wireless Surveillance Systems Assessment Results¹

System	Composite Score	Affordability (8% Weighting)	Capability (39% Weighting)	Deployability (19% Weighting)	Maintainability (9% Weighting)	Usability (25% Weighting)
AgileMesh™ AV8000 Watchtower	80	70	80	88	80	78
DTC Communications ArmorNet™ System	73	66	72	82	76	70
Sur-Tec® XOA Series	69	84	68	66	82	64

Note:

¹ Scores contained in the assessment report may be displayed differently. For the purposes of the SAVER Summary, all SAVER category scores are normalized using a 100-point scale and rounded to the nearest whole number.

	 Pros	<ul style="list-style-type: none"> • Multiple views on monitor • Expandable to 16 cameras, digital capable, and accepts aftermarket cameras • Maintain pre-set settings • Easy to set up and use controls • Good operating temperature • Durable • Accommodates aftermarket products
	 Cons	<ul style="list-style-type: none"> • Video format • Warranty • No on-board camera storage, user-defined alarms, or remote power options
AgileMesh™ AV800 Watchtower		Composite Assessment Score: 80

evaluators found the AV8000 Watchtower’s durability and available power options to be particularly beneficial.

The majority of evaluator feedback regarding the capability of the system was positive. Evaluators commented favorably that the software included with the system can accommodate up to 16 cameras and the display could be configured to view all cameras in operation simultaneously. The evaluators also viewed the system’s ability to accommodate optional cameras and support both analog and digital cameras favorably. Evaluators agreed the AV8000 Watchtower suited their usability needs; the features of the system were easy to learn and the software controls were fairly simple.

Overall, the evaluators felt that the system met their deployability needs. The evaluators commented that setting up the camera deployment unit, cameras, and wireless network node was easy and wired connections from the camera to the node were minimal. The evaluators felt the camera’s operating temperature was sufficient for most weather environments and that the antennas are easily mounted by the user. There was agreement from the evaluators that the size of the system was acceptable.

Evaluators also felt that the system met their maintainability needs. The system included cases for storage and transportation for all components and the evaluators agreed the cases are rugged enough to protect the equipment and that the system could withstand inclement weather. The evaluators also noted favorably that external power could be applied to the camera easily.

Evaluators identified some disadvantages to the AV8000 Watchtower. They indicated the video captured in low-light conditions did not meet their expectations; the camera did not switch to black and white automatically as anticipated, and there were issues with iris or white balance that caused degradation in video clarity. Evaluators commented that the system does not provide onboard camera media storage, remote power options, or the ability to specify user-defined alarms. Finally, evaluators felt that the overall cost of the system may be a concern for smaller agencies.

DTC Communications ArmorNet System

The DTC Communications ArmorNet System had the second highest composite score. The system’s primary components are the camera and wireless transmitter assemblies and a command center. The evaluators highlighted that the ArmorNet system was easy to use and had a good transmission range. The evaluators also liked the pan-tilt-zoom (PTZ) controls.

The majority of evaluator feedback regarding the capability of the system was positive. The system uses an encryption standard, which the evaluators indicated should prevent interception of video by most unauthorized users. Evaluators felt that the transmission method should facilitate most uses of the system and commented favorably that there was no degradation of video at a transmission range of 1,000 feet; transmission of video was maintained when the line of sight was obstructed. The evaluators agreed that the ArmorNet System suited their usability needs. The system command center features a 12-inch main monitor and the portable PTZ control unit connected to the command center has a 5.6-inch monitor. The evaluators favored the display size of

	 Pros	<ul style="list-style-type: none"> • PTZ controls • Support multiple views on monitor • Transmission range • Easy to set up and use controls • Warranty
	 Cons	<ul style="list-style-type: none"> • No integrated media storage or on-board camera media storage • Does not maintain pre-sets • Limited to four cameras • Does not support aftermarket signal boosters
DTC Communications ArmorNet™ System		Composite Assessment Score: 73

each monitor and the ability to output images to an external monitor if needed. The evaluators stated that the PTZ functions were easy to operate and included all the necessary functions such as speeding up and slowing down the rate at which the camera moved.

Overall, the evaluators felt that the ArmorNet System met their deployability needs but agreed the system was better suited for long-term or fixed applications due to its size and weight. The evaluators indicated the system met their maintainability needs. The evaluators agreed the cases are rugged enough to protect the equipment during transportation and installation. With the exception of the camera transmitter, they indicated the components of the system seemed durable and would withstand use at a public event. Evaluators also indicated the warranty provided sufficient protection.

Some disadvantages were noted by evaluators. The system is limited to four cameras, which could be insufficient for certain applications. The camera/transmitter relies on an external power source and evaluators felt the high amperage draw of the system would make battery usage impractical for most event applications. Evaluators also commented unfavorably that the ArmorNet System does not include an integrated media recorder and does not have onboard camera media storage. They also noted that the available hours of technical support were not sufficient for law enforcement purposes. Evaluators further commented that the camera/transmitter system was heavy and may be difficult for one person to set up and that the system cannot support aftermarket signal boosters to integrate with the system.

Sur-Tec XOA Series

The Sur-Tec XOA Series includes a data control center, a PTZ camera, a fixed day/night imaging system camera, two bullet cameras, and a removable media storage unit. The evaluators commented that while the XOA Series was primarily designed for covert operations, it could be adapted for use at a public event.

Evaluator feedback regarding the capability of the XOA Series was positive. Evaluators commented that the PTZ camera provided a clear image of the scene at close and long distances. The evaluators commented that the day/night cameras provided good quality video during daylight and low-light conditions. They were also very positive about the system's ability to accommodate optional cameras and support both analog and digital camera technology. Evaluators also

	<p>Pros</p> <ul style="list-style-type: none"> • Multiple views on monitor • Supports analog/digital cameras • Quality images in day and low-light conditions • Video compression • Good operating temperature • Durable • Warranty • Cost
	<p>Cons</p> <ul style="list-style-type: none"> • Unable to expand the number of cameras or maintain pre-set settings • User-defined alarms • User-friendly • Display size • Setup • No camera media storage
<p>Sur-Tec® XOA Series</p>	<p>Composite Assessment Score: 69</p>

commented favorably on multiple user access to Wi-Fi™ and cellular transmissions, as well as the system being compatible with older versions of the system.

The evaluators agreed the XOA Series suited their usability needs. They noted that interoperability, allowing other agencies to view the video feed from their systems, can be accomplished via an Internet connection and they liked that the system used a non-proprietary video compression format. They also felt that distribution of video files to other users could be accomplished easily with this system. The evaluators liked that the antennas were attached to the transmitter and receiver units and did not require assembly or installation. They felt that the XOA Series met their maintainability needs and agreed the equipment storage cases were rugged enough to protect the equipment during transportation and installation. Evaluators also stated that the complete system price seems reasonable and they rated the aftermarket products criterion favorably.

Some disadvantages were noted by evaluators. They commented that the system was physically limited to four cameras maximum and that the 64-gigabyte maximum storage was limiting. The evaluators would have preferred the XOA Series to have the ability to preset the cameras and they commented that the XOA Series does not provide onboard camera media storage. Evaluators had trouble viewing the display screen because of its small size, and commented that the human interface controls were easy to use, but the icons in the software were not intuitive. The

evaluators also indicated that the control panel was too small, which made it difficult to operate the controls. The evaluators also commented that setting up the cameras and making necessary adjustments required a lot of steps.

Conclusion

Evaluators from the law enforcement community assessed three different portable wireless surveillance systems possessing features judged to be important for use at a public event setting. Overall, the evaluators felt that each of the systems could be used or adapted to provide surveillance at a public event. Throughout the assessment, evaluators stated that a portable wireless surveillance system used to monitor a public event should:

- Be easy to transport and set up
- Provide clear, identifiable images
- Have a user interface that is easy to use
- Be durable and able to withstand different types of weather conditions
- Provide versatile power and mounting options.

Evaluator feedback highlighted the following recommendations for law enforcement agencies interested in procuring a portable wireless surveillance system:

- Compare various systems on the market
- Contact law enforcement agencies currently using portable wireless surveillance systems to draw on their experiences with the system and the manufacturer
- Determine the vendor’s ability and willingness to support purchased systems
- Identify what is and is not included in the standard package price.

Emergency responder agencies that may be considering the purchase of a portable wireless surveillance system should 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 by request at <https://www.rkb.us/saver>.

Table 2. Portable Wireless Surveillance Systems Criteria Ratings¹

KEY			
Least Favorable	➔	Most Favorable	
AgileMesh™ AV8000 Watchtower	DTC Communications ArmorNet™ System	Sur-Tec® XOA Series	
Assessment Criteria			
Affordability			
Warranty			
Cost			
Aftermarket Products			
Capability			
Camera Expandability			
Security Features			
Image Clarity			
Pan-Tilt-Zoom			
Multiple Views on Monitor			
Media Storage			
Day/Night Cameras			
Power Options			
Camera Battery			
Image Stabilization			
Transmission Methods			

Table 2. Portable Wireless Surveillance Systems Criteria Ratings¹ (Continued)

KEY				
Least Favorable		Most Favorable		
				
		AgileMesh™ AV8000 Watchtower	DTC Communications ArmorNet™ System	Sur-Tec® XOA Series
Assessment Criteria				
Capability (Continued)				
Input/Output Ports				
Transmission Range				
Optional Cameras				
Backward Compatibility				
Multiple User Access				
Standard Video Format				
Maintain Preset Settings				
User-Defined Alarms				
Remote Power Options				
Digital Camera Technology				
Camera Media Storage				
Deployability				
Easy Setup				
Mounting Options				
Size				
Operating Temperature				
Antenna Type				
Maintainability				
Durable				
Weather Resistance				
Easy Battery Swap				
Usability				
User-Friendly				
Easy to Use Controls				
Technical Support				
Interoperability				
Display Size		²		
Video Compression				

NOTES:

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

² A computer/screen display is not included with the AV8000 Watchtower, and this criterion was not included in the AV8000 scoring calculation. During the assessment, a laptop with a standard-sized display screen was used with the AV8000 Watchtower.

Table 3. Portable Wireless Surveillance Systems Specifications

Specification	AgileMesh™ AV8000 Watchtower	DTC Communications ArmorNet™ System	Sur-Tec® XOA Series
System Components	Camera Deployment Unit (CDU-tripod) Wireless Node Four Camera System Antenna Mounting Assembly Two Antennas	Command/Control Receiver Attached PTZ Controller Four Cameras/Transmitters Four Transmit/Receive Antenna	Command Center Cellular/Wi-Fi Data Pack Four Camera System Media Storage Unit
Cameras	Four PTZ Cameras Low Light: 0.2 lux 23X Optical Zoom 12X Digital Zoom	Four PTZ Cameras Low Light: <1 lux 18X Optical Zoom 12X Digital Zoom	One PTZ Camera Low Light: 0.2 lux (PTZ) 35X Optical Zoom 15X Digital Zoom One Fixed Day/Night Camera Two Bullet Short Range Cameras
Encryption/Security	128/256-bit AES 40/104-bit WEP	128-bit AES 256-bit AES optional	128-bit WPA SSL: 24-character password
Power (for cameras)	12 VDC Battery w/Integrated Charger External 12 VDC Input 110 VAC	90-240 VAC (auto sensing) 12-24 VDC	110 VAC 12 VDC
Wireless Interface	2.4 GHz Spectrum 4.9 GHz Spectrum 5 GHz Spectrum	COFDM RF Output	Wi-Fi (802.11g) Cellular (450Kbs)
Video Output Format	NTSC/PAL	NTSC	NTSC/PAL
Technical Support	Phone Support Weekdays (8-5) Emergency Service 24/7	Phone Support Weekdays (8-5)	Phone Support 24/7
Monitor Size	Monitor Not Included	12-in Main Monitor 5.6-in Portable Monitor	8-in LCD Touch Screen
Recording Capability	Not Included Requires Laptop/Computer Compression—MJPEG	Not Included External Video Recorders Supported Compression—MPEG2	64-GB Removable Storage Unit Compression—MPEG, Can Convert to AVI
Size	PTZ Camera: 7.3 x 5.6 in, 5.1 lbs CDU: 54 x 16 x 14 in, 75 lbs Wireless Node: 19 x 16 x 10 in, 22 lbs	Command Center/Receiver: 2.5 x 1 x 2 ft, 45 lbs Camera/Transmitter Assembly: 12 x 17 x 20 in, 22 lbs	PTZ Camera: 7 x 8 in, 12 lbs Fixed Camera: 3 x 3 x 5 in, 2.6 lbs Command Center: ~11 x 10 x 7 in, 20 lbs Cellular/Wi-Fi Data Pack (Cell-COM): ~5 x 11 x 12 in, 6 lbs
Operating Temperature	Camera: 20° to 70°C	Camera: 10° to 40°C Receiver: 10° to 60°C	PTZ Camera: 20° to 70°C Fixed/Bullet Camera: 0° to 50°C Receiver: 0° to 50°C
Weather Resistance	CDU—Weatherproof Cameras—Environmentally Hardened Components Not Ingress Protection Rated	Command Center—Pelican™ Case Camera/Transmitter—Protective Composite Dome, Ingress Protection: 52	Command Center—Pelican™ Case Cell-COM—Pelican™ Case (Case Ingress Protection: 66)
Warranty	1-year: Standard 2-year: \$6,219 3-year: \$13,819	2-year: Standard	1-year: Standard 2-year Extended: 7% of TPP 3-year Extended: 11% of TPP 4-year Extended: 18% of TPP
Cost	\$69,095	\$168,850	\$32,290

Notes:

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|-------|---|--|-----|---|--------------------------|
| AES | = | Advanced Encryption Standard | SSL | = | Secure Socket Layer |
| AVI | = | Audio Video Interleaved | WEP | = | Wired Equivalent Privacy |
| COFDM | = | Coded Orthogonal Frequency Division Multiplexing (digital) | WPA | = | Wi-Fi Protected Access |