



**Homeland  
Security**

Science and Technology

**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), the SAVER Program conducts assessments and validations on commercially available equipment and systems, and develops knowledge products that provide relevant equipment information to the emergency responder community.

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 emergency 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 supported by a network of technical agents who perform assessment and validation activities. This summary provides an overview of such an assessment.

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

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# Summary

## Body-Worn Video Cameras for Law Enforcement

(AEL reference number 13LE-00-SURV)

Body-worn video camera systems typically consist of a camera, microphone, battery, and onboard storage, and are designed to be head-mounted or worn at various locations on the body, depending on the model. These cameras can be used by law enforcement personnel to record traffic stops, arrests, sobriety tests, and interviews.

In order to provide responders with information on currently available body-worn video camera systems, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic conducted a comparative assessment of these cameras for the System Assessment and Validation for Emergency Responders (SAVER) Program in January 2015. Detailed findings are provided in the *Body-Worn Camera Systems for Law Enforcement Assessment Report*, which is available at [www.firstresponder.gov/SAVER](http://www.firstresponder.gov/SAVER).

## Assessment Methodology

Prior to the assessment, seven responders were chosen from various jurisdictions to participate in a focus group. Participants possessed at least 11 years of law enforcement experience. The group recommended evaluation criteria, 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. The affordability and maintainability criteria were omitted from the assessment; to account for this, the weights of the remaining categories were changed to the standard weights.

Based on focus group recommendations and market research, these seven body-worn video cameras were selected for assessment:

- Prima Facie Body Camera, Safety Vision LLC
- AXON Flex, TASER International Inc.
- PR5, Pinnacle Response Ltd.



- BMPpro+, Black Mamba Protection LLC
- LE3, VIEVU LLC
- FirstVU HD, Digital Ally Inc.
- Wolfcom 3rd Eye Police Body Camera, Wolfcom Enterprises.

Five responders served as evaluators for this assessment. All evaluators had experience using body-worn video cameras.

During the assessment, evaluators rated the body-worn video cameras 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 served as the basis for the operational assessment.

## Assessment Results

Table 1 displays the composite assessment scores as well as the category scores for each body-worn video camera. Scores are based on a 1-to-5 scale with higher scores indicating a higher rating by evaluators. The advantages and disadvantages of each camera, as identified by evaluators, are listed in table 2. To view how each camera scored against the evaluation criteria assigned to the SAVER categories, see table 3. For specifications, see table 4.

Evaluators noted that body-worn cameras with exceptional low-light performance may be able to see better than the person wearing them, and that there are pluses and minuses that correlate with that. They also noted that, regardless of available attachment options, users will need to adapt how they typically position their body to be sure they are capturing what they intend to capture in the camera’s field of view (e.g., a bladed body position will not capture what the user is looking at on a chest mounted camera). In general, the more features on a camera (e.g., display screen), the heavier and bulkier it tends to be. Evaluators agreed that all of the assessed cameras had audio quality that met expectations.

Responder agencies that may be considering the purchase of body-worn video cameras should review the detailed findings in the *Body-Worn Video Cameras for Law Enforcement Assessment Report* and carefully consider each camera’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 FirstResponder.gov website, [www.firstresponder.gov/SAVER](http://www.firstresponder.gov/SAVER).

SAVER Category Definitions	
<b>Affordability</b>	groups criteria related to life-cycle costs of a piece of equipment or system.
<b>Capability</b>	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.
<b>Deployability</b>	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.
<b>Maintainability</b>	groups criteria related to the maintenance and restoration of a piece of equipment or system to operational condition by responders.
<b>Usability</b>	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.

**Table 1. Body-Worn Video Camera Assessment Results**

Device	Composite Score	Capability (50% Weighting)	Deployability (17% Weighting)	Usability (33% Weighting)
Prima Facie Body Camera	3.9	4.1	3.8	3.7
AXON Flex	3.9	3.9	3.9	3.8
PR5	3.7	3.8	3.6	3.6
BMPpro+	3.7	3.9	3.7	3.3
LE3	3.7	3.5	4.0	3.8
FirstVu HD	3.7	3.6	4.1	3.5
Wolfcom 3rd Eye Police Body Camera	3.3	3.8	2.6	2.8

**Table 2. Body-Worn Video Camera Advantages and Disadvantages**

Product	Advantages	Disadvantages
 <p><b>Prima Facie Body Camera</b> Composite Score: 3.9</p>	<ul style="list-style-type: none"> <li>• Automatic IR illuminator</li> <li>• Option to record audio only</li> <li>• PTT feature to integrate with police radio</li> <li>• If used as a shoulder microphone with police radio, the camera is less obvious.</li> <li>• Audio can be muted on the camera while recording.</li> <li>• User-friendly and compact; a large number of features/options but not overly complicated or large</li> </ul>	<ul style="list-style-type: none"> <li>• Could accidentally start/stop recording since button only requires momentary press</li> </ul>
 <p><b>AXON Flex</b> Composite Score: 3.9</p>	<ul style="list-style-type: none"> <li>• Constant reminder that it is recording (camera beeps every 2 minutes)</li> <li>• Captures point of view (head mounted)</li> <li>• Video is viewable on mobile devices using Bluetooth via Axon Mobile Android or iOS mobile applications.</li> <li>• Dock and go capability; charges and transfers at end of shift</li> <li>• Extend operational time with use of additional controllers</li> <li>• Large button for camera activation results in 'no look' activation</li> </ul>	<ul style="list-style-type: none"> <li>• Cable between camera and controller is a bit cumbersome</li> </ul>
 <p><b>PR5</b> Composite Score: 3.7</p>	<ul style="list-style-type: none"> <li>• Easy on/off; recording when camera door is open</li> <li>• Easy to tell it is recording</li> <li>• Easily deployed; would require minimal/no training</li> <li>• Exceptional image quality, especially in good lighting conditions</li> <li>• Brightly colored CCTV marking on the camera makes it obvious to others that they are being recorded.</li> </ul>	<ul style="list-style-type: none"> <li>• No video tagging capability</li> <li>• Ball joint clip requires frequent adjustment</li> <li>• The green flashing LED cannot be turned off for covert operations.</li> <li>• Not very discreet (i.e., CCTV on front of camera)</li> <li>• No USB security (any computer will recognize device as external drive)</li> </ul>
 <p><b>BMPpro+</b> Composite Score: 3.7</p>	<ul style="list-style-type: none"> <li>• Has an IR illuminator</li> <li>• Option to record audio only</li> <li>• PTT feature to integrate with police radio</li> <li>• If used as a shoulder microphone with police radio, the camera is less obvious.</li> </ul>	<ul style="list-style-type: none"> <li>• IR illuminator is manually controlled; prefer automatic</li> <li>• Buttons are too small and close together</li> <li>• No USB security unless optional software is purchased (i.e., BMPNest or BMPNest Lite)</li> </ul>
 <p><b>LE3</b> Composite Score: 3.7</p>	<ul style="list-style-type: none"> <li>• Easy on/off; recording when camera door is open</li> <li>• Easy to tell it is recording</li> <li>• Easily deployed; would require minimal/no training</li> <li>• Audio can be disabled in the software during setup</li> <li>• Compact and lightweight</li> </ul>	<ul style="list-style-type: none"> <li>• Narrow field of view</li> <li>• Grainy image quality, especially in low-light conditions</li> <li>• Green tint noticeable on video when transitioning between lighting conditions</li> </ul>

**Table 2. Body-Worn Video Camera Advantages and Disadvantages (Continued)**

Product	Advantages	Disadvantages
 <p><b>FirstVu HD</b> Composite Score: 3.7</p>	<ul style="list-style-type: none"> <li>• User-replaceable battery</li> <li>• Constant reminder that it is recording (vibrates every 15 seconds and red LED easily seen by wearer)</li> <li>• Red LED on camera can be turned off when in covert mode</li> <li>• Audio can be muted on the camera while recording</li> <li>• Optional application available for additional cost (VuVault Go) to view video and sync with in-car camera over Wi-Fi</li> <li>• Camera is discreet</li> </ul>	<ul style="list-style-type: none"> <li>• Cable between camera and DVR is a bit cumbersome</li> <li>• Accessory (extension cable and pouch) required for alternate mounting options for DVR; must wear in pocket</li> </ul>
 <p><b>Wolfcom 3rd Eye</b> <b>Police Body Camera</b> Composite Score: 3.3</p>	<ul style="list-style-type: none"> <li>• Has an IR illuminator</li> <li>• Option to record audio only</li> <li>• PTT feature to integrate with police radio</li> <li>• If used as a shoulder microphone with police radio, the camera is less obvious.</li> <li>• Audio can be disabled in the camera menu during setup</li> <li>• Exceptional image quality in all lighting conditions</li> <li>• Option to sync with in-car camera system for an additional cost</li> </ul>	<ul style="list-style-type: none"> <li>• IR illuminator is manually controlled; prefer automatic</li> <li>• Clip is prone to breakage because it projects out so far</li> <li>• Control buttons are overly complicated</li> <li>• Plastic threaded epaulette clip has questionable durability</li> <li>• Small red LED recording indicator is located on side of camera so unable to see while wearing</li> <li>• Did not stay in place while running</li> </ul>

Notes:

CCTV = closed circuit television  
DVR = digital video recorder  
IR = infrared

LED = light emitting diode  
PTT = push to talk  
USB = universal serial bus

**Table 3. Body-Worn Video Camera Criteria Ratings<sup>1</sup>**

KEY							
	Prima Facie Body Camera	AXON Flex	PR5	BMPpro+	LE3	FirstVu HD	Wolfcom 3rd Eye Police Body Camera
Lowest Rating  Highest Rating							
							
<b>Capability</b>							
Image quality							
Low-light capability							
Field of view							
System indicators							
Audio quality							
Video tagging							
Microphone options							
Data transfer							
Illumination control		Not applicable <sup>2</sup>	Not applicable <sup>2</sup>		Not applicable <sup>2</sup>	Not applicable <sup>2</sup>	
<b>Deployability</b>							
Attachment options							
Durability							
Interference							
<b>Usability</b>							
Physical characteristics							
Camera activation							
Instant video playback							
Point of view							

Notes:  
<sup>1</sup> Averaged criteria ratings for each assessed product are graphically represented by colored and shaded circles. Highest ratings are represented by full green circles.  
<sup>2</sup> Camera does not feature an illuminator.

**Table 4. Body-Worn Video Camera Specifications<sup>1</sup>**

Specification	Prima Facie Body Camera	AXON Flex	PR5	BMPpro+	LE3	FirstVu HD	Wolfcom 3rd Eye Police Body Camera
MSRP	\$579	\$848 <sup>2</sup>	\$895	\$650	\$899	\$795	\$475
Proprietary software required	Yes; Prima Facie Transfer Agent	Yes; Evidence Sync or EVIDENCE.com	No	Optional	Yes; VERIPATROL	Yes; VuVault	Optional
Software cost	Included in camera MSRP	Evidence Sync included with purchase; \$285/year with 70GB online storage <sup>3</sup> on EVIDENCE.com	Not applicable; no proprietary software offered	\$575 for a 1-year license <sup>3</sup> and \$20/10GB or \$40/25GB per camera (BMPNest); \$375 (BMPNest Lite)	Included in camera MSRP	Included in camera MSRP	\$200 (Wolfcom Management Software)
Warranty duration	1 year	2 years on camera; 90 days on other components	1 year	1 year	90 days	1 year	1 year
Dimensions	3.7 x 2.3 x 1.7 inches	Camera: 3.2 x 0.8 x 0.7 inches Controller: 3.3 x 2.6 x 0.8 inches	3.6 x 2.3 x 1.2 inches	2.9 x 1.8 x 0.9 inches	3.0 x 2.1 x 0.85 inches	Camera: 1.5 x 1.1 x 1.0 inches DVR: 4.0 x 2.6 x 0.6 inches	3.8 x 2.4 x 1.3 inches
Weight	5.3 ounces	Camera: 0.5 ounces Controller: 3.3 ounces	4.2 ounces	5.2 ounces	2.8 ounces	Camera: 0.8 ounces DVR: 3.1 ounces	5.5 ounces
Camera lux rating	0.08	<1.0	0.2	0.01	1.0	0.08	1.0
IR illuminator	Automatic IR <sup>4</sup>	None	None	Manual IR	None	None	Manual IR
Minimum video resolution	720 x 480	VGA (640 x 480)	720p (1280 x 720)	848 x 480	848 x 480	VGA (640 x 480)	848 x 480
Maximum video resolution	1080p (1920 x 1080)	VGA (640 x 480)	720p (1280 x 720)	1080p (1920 x 1080)	720p (1280 x 720)	720p (1280 x 720)	1080p (1920 x 1080)
Onboard storage capacity	32GB	8GB	16GB	32GB	16GB	32GB	32GB
Hours of video stored	6 to 35 hours	4 to 14 hours	5 hours, 10 minutes	8.5 hours at maximum video resolution	12 hours in SD; 6 hours in HD	8 to 100+ hours	8.5 to 17 hours
Pre-event record	Yes; 10 seconds	Yes; up to 30 seconds	No	Yes; up to 15 seconds	No	Yes; up to 60 seconds	No
Horizontal field of view	120°	75°	120°	140°	68°	95°	120°
Display screen for playback	2.0-inch color LCD	None <sup>5</sup>	None	2.0-inch color LCD	None	None <sup>6</sup>	2.0-inch color LCD
Video streaming		✓ <sup>7</sup>				✓ <sup>8</sup>	
Audio mute capability	✓				✓ <sup>9</sup>	✓ <sup>10</sup>	✓ <sup>11</sup>
Record audio only	✓			✓			✓

**Table 4. Body-Worn Video Camera Specifications<sup>1</sup> (Continued)**

Specification	Prima Facie Body Camera	AXON Flex	PR5	BMPpro+	LE3	FirstVu HD	Wolfcom 3rd Eye Police Body Camera
Low-battery indicator	Battery meter on display screen turns from green to red when low	Press battery button and battery indicator shows the remaining battery capacity; optional audible indicator	Flashing red LED when camera lens window is open	Battery meter on display screen and flashing red LED	Flashing red LED	Flashing blue LED flashes twice every 5 seconds and vibrates two pulses every 5 seconds	Battery meter on display screen
Power on indicator	Solid green LED	Red on/off indicator (exposed when power switch is in 'on' position), beep	Flashing green LED when camera lens window is open	Vibrate and chime at startup with solid green LED	Flashing green LED when camera lens window is open	Blue and orange LEDs on DVR alternate flashing for 10 seconds and DVR vibrates at startup	Chimes and LCD turns on
Video recording indicator	Power on indicator turns off and flashing red dot on display	Flashing red LED and two beeps every 2 minutes	Flashing green LED when camera lens window is open	Two short vibrations and a beep when initiated, flashing red LED, and flashing red dot on LCD	Flashing green LED when camera lens window is open	Solid red LED on camera and DVR vibrates every 15 seconds	Solid red LED and flashing red dot on the display
Covert mode	LEDs, display, and IR illuminator are turned off	LEDs and audible indicators are turned off	Not available	LEDs and the display are turned off	Not available	Camera LED is turned off	Display is turned off
Police radio interface	✓			✓			✓
GPS	Optional	✓ <sup>7</sup>		Optional		✓ <sup>8</sup>	✓
Security features	Device is password protected, user audit logs automatically updated, video authentication via file properties and digital signature	Audit trail for EVIDENCE.com includes information such as viewed by, downloaded by, and deleted by, with source Internet Protocol address of the person who made the change. Communication to and from EVIDENCE.com is secured using 256-bit AES encryption and FIPS 140-2 compliant ciphers.	None	Audit trail/activity log	FIPS 140-2 digital signature process used to prove authenticity	May be configured so only designated computers can access recordings	Camera has admin and user passwords. Password protection in software to access video (software is optional).
User-replaceable battery						✓ <sup>12</sup>	
Battery runtime (continuous use)	6 hours	12 hours	5 hours, 10 minutes	10 hours	5 hours in SD; 3 hours in HD	4.5 hours with pre-event enabled	6.5 hours

**Table 4. Body-Worn Video Camera Specifications<sup>1</sup> (Continued)**

Specification	Prima Facie Body Camera	AXON Flex	PR5	BMPpro+	LE3	FirstVu HD	Wolfcom 3rd Eye Police Body Camera
Recharge time	4 hours	6 hours	2.5 hours	3 hours	3 hours	4 hours	4 hours
Recharge method	USB, dock	USB, dock	USB	USB (docking options available)	USB, AC charger (docking options available)	USB, battery charger (docking options available)	USB
Approximate battery life	500 charge cycles	300 charge cycles or 2 years	300 charge cycles or 4 years	1,500 charge cycles	4 years	3 to 5 years	300 charge cycles
IP rating	IP55	IPX2	IP45	IP67	IPX5	IPX5	IP53
Drop test information	9.8 feet to a hard surface	6 feet to concrete	9 feet to concrete	6.5 feet to concrete	10 feet to a hard surface	6 feet to concrete	6 feet to concrete
Operating temperature	-13°F to 140°F	-4°F to 122°F	-4°F to 120°F	-40°F to 140°F	-4°F to 122°F	-4°F to 158°F	-22°F to 131°F
Storage temperature	-25°F to 155°F	-4°F to 95°F	-4°F to 120°F	-40°F to 151°F	68°F	-40°F to 176°F	-18°F to 127°F

Notes:

- 1 Information was provided by manufacturers and has not been independently verified by the SAVER Program.
- 2 Includes single-bay docking station for use with uploading to EVIDENCE.com (\$249).
- 3 Cost varies with terms and storage requirements.
- 4 IR illuminator can be disabled for 'stealth' mode (i.e., covert mode).
- 5 Viewable on mobile devices using Bluetooth via AXON Mobile Android or iOS mobile application (no cost option).
- 6 Viewable on in-car camera over Wi-Fi with VuVault Go (additional cost).
- 7 Available via mobile devices with AXON Mobile Android or iOS mobile application.
- 8 Available via mobile devices with VuVault Go mobile application.
- 9 Audio recording is disabled in the software during setup/configuration, not on the camera unit.
- 10 There is a no-charge option to order the camera with the audio always on.
- 11 Audio recording is disabled in the camera settings during setup/configuration.
- 12 Proprietary battery that does not require tools to replace.

AC = alternating current  
 AES = Advanced Encryption Standard  
 DVR = digital video recorder  
 F = Fahrenheit  
 FIPS = Federal Information Processing Standards  
 GB = gigabyte  
 GPS = Global Positioning System  
 HD = high definition  
 IP = ingress protection

IR = infrared  
 LCD = liquid crystal display  
 LED = light emitting diode  
 MSRP = manufacturer's suggested retail price  
 SAVER = System Assessment and Validation for Emergency Responders  
 SD = standard definition  
 USB = universal serial bus  
 VGA = video graphics array  
 VDC = volts direct current