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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 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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Summary

Automatic Vehicle Locating Systems

(AEL reference number 04AP-02-AVLS)

In order to provide emergency responders with information on currently available automatic vehicle locating (AVL) system technologies, capabilities, and limitations, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic conducted a comparative assessment of AVL systems for law enforcement applications for the System Assessment and Validation for Emergency Responders (SAVER) Program in August 2009. Detailed findings are provided in the Automatic Vehicle Locating Systems Assessment Report, which is available by request at <https://www.rkb.us/saver>.

Background

AVL systems designed for surveillance operations enable law enforcement to discreetly track and monitor vehicles.

There are two types of AVL systems: passive and active. Passive AVL systems store location information and other relevant data to an onboard storage device for later retrieval. Active AVL systems can report vehicle information, such as location, speed, and stops, to investigators by obtaining data from global positioning system (GPS) satellites and can report events in near real-time (live) through cellular, radio, or satellite communication modems.

This SAVER assessment focused on active AVL systems that use cellular communications for live data transmission and may be covertly mounted to the undercarriage of a vehicle in a matter of seconds (quick-mount).

Assessment

Prior to the assessment, SPAWARSYSCEN conducted a market survey in order to investigate currently available AVL 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 participants identified, defined, and categorized 32 evaluation criteria within the five SAVER categories. They also discussed AVL system technologies and capabilities and selected four active AVL systems for the comparative assessment. Although four products were selected for the assessment, only three were evaluated by the practitioners. The one product not evaluated was inoperable upon receipt and was not repaired in time for the assessment. The following models were assessed as representative of the current marketplace of AVL systems:

- All-in-One AGenT, Coleman Technologies, Inc.
- RAPiD Tracker, Datong Electronics, Inc.
- GPS-212G, Griffcomm, Inc.

Six law enforcement personnel served as evaluators for this assessment. All evaluators had firsthand experience using covert, quick-mount AVL systems for surveillance operations.

The assessment was conducted in two phases focused on specific assessment criteria: (1) operational assessment and (2) specification assessment.

The operational assessment phase consisted of three segments: (1) system setup, (2) system operation, and (3) reporting and exporting. During the specification assessment, evaluators rated criteria associated with system design, pricing, and customer support using vendor-provided information.

The operational and specification assessments were conducted over the course of 3 days; one system was evaluated each day. At the beginning of each system assessment, the facilitators provided assessment procedures orientation and vendors provided system training to the evaluators. Detailed comments captured by the data collectors during the assessment activities have been included in the full assessment report.

Assessment Results

Evaluators rated the AVL systems based on the weighted evaluation criteria established by the AVL systems focus group. Each criterion was prioritized within the five SAVER categories and assigned a weighting factor based on a 100-point scale. The SAVER category and composite scores are shown in table 1. Higher scores indicate a higher rating by evaluators. To view how each AVL system scored against each of the evaluation criteria assigned to the SAVER Program categories, see table 2.

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

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.

system used during the assessment. The AVL systems are listed by highest to lowest composite score.

All-in-One AGenT

The Coleman Technologies, Inc. (CTI) All-in-One AGenT received the highest composite score as well as the highest score in all SAVER categories except affordability. Evaluators were especially pleased with the software features and noted that the system can notify users of boundary breaches by both e-mail and text notification. They also agreed that the system configuration was intuitive and the mapping application was user-friendly and easy to navigate.

Evaluators found the tracking unit to be small and easily concealable and noted that the unit indicators

Table 1. Automatic Vehicle Locating Systems Assessment Results¹

System	Composite Score	Affordability (15% Weighting)	Capability (29% Weighting)	Deployability (25% Weighting)	Maintainability (11% Weighting)	Usability (20% Weighting)
All-in-One AGenT	90	84	88	96	94	88
RAPiD Tracker	87	90	86	90	86	82
GPS-212G	71	78	72	68	74	70

Note:

¹ Scores contained in the complete assessment report may be listed in a different numerical scale. For the purposes of the SAVER Summary, SAVER category scores are normalized and rounded to the nearest whole number.

	 Pros	<ul style="list-style-type: none"> • Easy to use software • Commercially available battery type • Unit conceals well • Variety of power options • Quiet mounting due to sleeve • Pelican™ brand storage case • Options for exporting data • Capable of sending e-mail and text alerts for boundary breaches • LEDs that indicate system operation and verify power to the unit
	 Cons	<ul style="list-style-type: none"> • No tamper alert • Mounting sleeve interferes with battery swaps • Battery costs • Short battery life
All-in-One AGenT	Composite Assessment Score: 90	

were favorable. The tracking unit is equipped with two push-button activated light-emitting diodes (LEDs) that indicate system operation and verify power to the unit. Evaluators agreed the availability of technical support 24 hours a day, 7 days a week via a toll-free number was an important and beneficial feature. They were also impressed with the service contract, which includes free software and firmware updates as long as an active wireless service account is maintained with CTI. Evaluators found the AA lithium disposable batteries to be a favorable battery type because they are readily available.

There were some disadvantages to the All-in-One AGenT noted by evaluators. They would like to see a longer estimated battery life due to the cost of the disposable lithium batteries, and some evaluators commented that the magnetic sleeve interfered with battery replacement. Some evaluators were also concerned about the costs associated with replacing the disposable lithium batteries.

RAPiD Tracker

The Datong Electronics RAPiD Tracker received the second highest composite score and the highest score in the affordability category. Evaluators were impressed with the system’s software and most found it user-friendly. The mapping application is accessed through an Internet browser and features a mobile application that is currently accessible with the Apple® iPhone® mobile-digital device. Evaluators commented favorably on the mapping interface and software features; multiple users can view a single tracking unit at the same time.

	 Pros	<ul style="list-style-type: none"> • Intuitive, user-friendly Web-based mapping application • No exposed antennas • Tracking unit design aids in covert installation • Secure installation due to magnet strength • Rechargeable battery
	 Cons	<ul style="list-style-type: none"> • No e-mail alert options for boundary breaches • Loud installation due to magnet strength • Reports GPS coordinate data instead of addresses • Initial setup is time-consuming
RAPiD Tracker	Composite Assessment Score: 87	

Evaluators were most impressed with the physical characteristics of the tracking unit, such as the size and color, as well as the absence of external antennas that aids covert installation. All of the evaluators agreed that the magnets used to mount the tracking unit are very strong and that movement of the unit once installed was unlikely. Evaluators were also impressed with the initial system cost and noted that this was “a great price for a system of this caliber.” The tracking unit is powered by an internal, non-replaceable, rechargeable battery; several evaluators agreed that this feature was a cost-saving benefit. Evaluators also agreed that the availability of technical support 24 hours a day, 7 days a week via e-mail, phone, and the vendor’s Web site were beneficial.

Some disadvantages were noted by evaluators. A few evaluators noted that the software seemed slow to update the tracking unit with configuration changes. In general, evaluators agreed the boundary breach notifications were easily configured, but some evaluators noted that they would prefer e-mail notifications in addition to the text message capability that the system currently features. A few evaluators commented that exported data would be more useful if street addresses were exported rather than latitude and longitude coordinates. Some evaluators felt that the installation of the tracking unit could be noisy due to the strength of the magnets, and some found the initial setup of the system to be time-consuming.

GPS-212G

The Griffcomm GPS-212G AVL system received the third highest overall product score. The mapping application is locally installed and does not require a remote or local server for system operation. It is a

	 Pros	<ul style="list-style-type: none"> Tracking unit is easily concealed Tamper alert with text message notification DOV communication enables operation outside of cellular data coverage areas
	 Cons	<ul style="list-style-type: none"> No storage case Initial setup and configuration is difficult Not user-friendly Optional external antenna designed for window installation is not covert Tool required to access battery compartment
GPS-212G		Composite Assessment Score: 71

point-to-point system that communicates with and stores data on a client workstation. Users may access only one tracking unit at a time and only one user can view a single unit at a time; however, multiple tracking units can be monitored on separate client workstations. The GPS-212G is the only system in this assessment equipped with a tamper alert. Evaluators found the amount of storage to be substantial, and most found the number of available configuration options favorable.

Most of the evaluators found the matte black finish of the tracking unit casing to be favorable since it permitted the unit to be easily concealed on a vehicle's undercarriage. Evaluators were most impressed with the free trial that has no time constraints and were also impressed with the initial system price. Most evaluators found the data/communications plan costs to be satisfactory. In general, evaluators agreed that the cables used to power the tracking unit and connect the client workstation with the tracking device were favorable since they are commercially available. The evaluators also noted that the availability of technical support 24 hours a day, 7 days a week via e-mail or phone is a good feature.

Evaluators identified some disadvantages to this system. Some evaluators questioned the accuracy, commenting that during both live transmission and the transmission of stored data, inaccuracies were present. In addition, the GPS-212G features data-over-voice (DOV) communications, which permits live tracking to occur in areas with cellular voice, but little to no cellular data coverage. Overall, evaluators found the mounting options and adaptability of this system to be limited. Evaluators commented that the eight magnets on the mounting bracket produce a lot of noise when

the unit is mounted to the metal components on a vehicle. Evaluators noted that the external cellular antenna is designed for installation on a glass surface, which may not be feasible for covert operations, and most evaluators agreed that the use of a tool for battery access was unfavorable. In addition, evaluators were disappointed that a storage case was not provided with system purchase.

Conclusion

Generally, the evaluators found all three systems able to report location information of the tracking unit including locations where the tracking unit did not have cellular connectivity.

All three systems received favorable scores for the following criteria: onboard storage, physical characteristics, operating temperature, service contract, initial system price, data/communication plan costs, durability, technical support, and sensor input and contact output. The evaluators indicated the following system features would influence their decision to purchase an AVL system:

- The mapping application should be easy to navigate and the system configuration options/settings should be intuitive and user-friendly.
- The physical characteristics of the tracking unit should enable the tracking unit to easily blend in with components on the undercarriage of a vehicle. The tracking unit should be as small as possible to assist with covert mounting in tight spaces. In addition, the casing should feature a solid black matte finish and no colors should show on the tracking unit post-installation.
- The tracking unit should feature an extendable battery life to meet the requirements of both long- and short-term operations (i.e., the unit can be used with external battery packs, hardwired to the vehicle, etc.).
- System purchase should include a storage case for keeping the tracking unit and other components organized between uses.

To choose the best AVL system for a given agency, the needs of that agency must be understood. Therefore, agency-specific variables should be considered when making AVL system procurement and operational decisions.

All reports in this series are available upon request at <https://www.rkb.us/saver>.

Table 2. Criteria Scores¹

KEY				
Least Favorable		Most Favorable		
				
		All-in-One AGenT Coleman Technologies, Inc.	RAPiD Tracker Datong Electronics, Inc.	GPS-212G Griffcomm, Inc.
Assessment Criteria				
Affordability				
Initial System Price				
Data/Communications Plan Costs				
Battery Costs				
Capability				
Accuracy				
Onboard Storage				
Software Features				
Operating Temperature				
Cellular/Satellite Provider				
Configurable Number of Locates				
Power Options				
Internal Antennas				
Battery Life				
Communications Plan Flexibility				
Power Management				
Sensor Inputs and Contact Outputs				
Tamper Alert				
Deployability				
Physical Characteristics				
Mounting Options and Adaptability				
Initial Setup				
Number of Components				
External Antenna				
Maintainability				
Durability				
Technical Support				
Service Contract				
Battery Type				
Parts Replacement				
Equipment Storage				
Connectors				
Usability				
Free System Trial				
User Friendly				
Battery Access				
Visual Indicators				

Note:

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.