Homeland Security
Science and Technology

Summary

U.S. Department of Homeland Security

SAVER

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.

RKB/SAVER Telephone: 877-336-2752
E-mail: saver@dhs.gov
Web site: https://www.rkb.us/saver

Mobile Command Systems

(AEL reference numbers 06CP-01-MOBL and 04HW-01-INHW)

In order to provide emergency responders with information on currently available mobile command system technologies, capabilities, and considerations, the Justice and Safety Center at Eastern Kentucky University conducted a comparative assessment of mobile command systems for the System Assessment and Validation for Emergency Responders (SAVER) Program in June 2010. Detailed findings are provided in the Mobile Command Systems Assessment Report*, which is available by request at* https://www.rkb.us/saver*.*

Background

A mobile command system is a lightweight, compact system consisting of software, hardware, and communications technologies that support the management of incidents and interoperability needs for single- and multi-agency responses. These systems provide voice and data communication and network capabilities as well as information-sharing over long distances in various operational environments. Mobile command systems can be used to support emergency operations when accessibility is limited or constrained by terrain, environmental conditions, or other factors. Systems can be configured differently based on the needs of the end user.

Assessment

The SAVER Program conducted a market survey to investigate currently available mobile command systems. The primary objective of the market survey was to provide the nation's emergency responders with an overview of the mobile command systems available, as well as their capabilities, features, and considerations.

Prior to the assessment, eight emergency responders were chosen from various jurisdictions to participate in a focus group. Participants possessed strong backgrounds in firefighting, search and rescue, law enforcement, emergency management, and emergency medical services. The focus group's primary assignment was to develop mobile command system evaluation criteria; however, they were also tasked with recommending possible uses and operational factors in preparation for the assessment. The group's final task was to recommend for evaluation specific mobile command systems considered potentially beneficial to the response disciplines. The emphasis for this project was on the needs of responders from small and rural communities.

Based on focus group recommendations, market survey research, and system availability, the following mobile command systems were assessed:

- Systems Engineering Technologies (SyTech) Corporation Radio Interoperability System (RIOS) Fly-Away Interoperability Kit
- CVG, Inc. CVG 4200 Emergency Communications Kit

- Tacticon Research Corporation Mobile Information and Telecom Operations Center (MITOC).

Six responders served as evaluators for this assessment. All evaluators had at least 10 years of experience in emergency response disciplines including firefighting, search and rescue, and law enforcement.

Evaluators were tasked to participate in two phases of the assessment: the operational assessment and the specification assessment. During the operational assessment, evaluators assessed the systems based on hands-on experience with the systems. During the specification assessment, evaluators assessed the systems based on vendor-provided information and specifications. The assessment environment and activities performed were replicable should there be a future need to repeat an identical or similar assessment.

Assessment Results

Evaluators rated the mobile command systems based on the evaluation criteria established by the mobile command systems focus group. Each criterion was assigned to one of the five SAVER categories, and then assigned a weight for its level of importance. Once the criteria were weighted, the five SAVER Program categories were assigned a percentage value to represent the level of each category's importance relative to the other categories.

Table 1 displays the composite assessment scores as well as the category scores for each product. Higher scores indicate a higher rating by evaluators. To view how each mobile command system scored against 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 evaluator comments and feedback on each mobile command system used during the assessment. The systems are listed from highest to lowest composite score. The complete assessment report includes a breakdown of evaluator comments by SAVER categories.

Table 1. Mobile Command Systems Assessment Results[1]

System	Composite Score	Affordability (22% Weighting)	Capability (38% Weighting)	Deployability (13% Weighting)	Maintainability (7% Weighting)	Usability (20% Weighting)
RIOS Fly-Away Interoperability Kit	**66**	68	64	76	68	58
CVG 4200 Emergency Communications Kit	**57**	56	54	62	54	62
MITOC	**57**	58	46	72	72	60

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.

RIOS Fly-Away Interoperability Kit

The RIOS Fly-Away Interoperability Kit received a composite score of 66. The kit included a laptop, radio interface cables, solar panel, battery packs, CradlePoint router with Wi-Fi® and data connections, cellular data modem, two smart phones, and the RIOS Interoperability Software, among other accessories. The system's Land Mobile Radio (LMR) interface consists of a Universal Serial Bus (USB) input/output chassis with four ports for radio connectivity and the RIOS Interoperability Software. The software allows responders to patch radios and communicate across different types of radios and on different bands and frequencies. The standard Microsoft® Office® applications installed on the system provide a good base of operational tools, and the expandable design of the system, which allows for customization of the kit, provides flexibility to the user. The system comes with a standard 1-year warranty, but the cost of the standard kit may be too expensive for small or rural agencies, though SyTech does offer a leasing option. The system, including the Graphical User Interface (GUI), was easy to use and the manuals were easy to follow. The kit was easy to set up and put into operation, and the cables and ports were properly labeled. The Pelican™ case that houses the system was easily carried by two persons using opposing handles, though the handles dug into evaluators' hands during transport. The batteries, battery life, and alternate power sources (e.g., solar panel, 12-volt connection) enhanced maintainability.
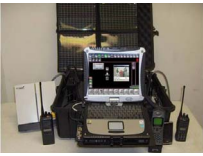
Some disadvantages to the RIOS Fly-Away Interoperability Kit were noted. The satellite capabilities, which are available only as an option, are necessary for the system to be truly operational in a remote area. In addition, the integrated standard webcam does not meet the need to provide imagery beyond the command area. The cost of additional training may be too expensive for small or rural agencies. The computer screen easily washed out in daylight operations and the lack of keyboard backlighting and insufficient illumination from the laptop light and flashlight hampered nighttime operations. The system is light enough to be carried by one individual, but the distance one person could carry it is limited. The drilled holes in the Pelican case could allow water and debris to enter the case during transport. In addition, the entire system is reliant on the system laptop and proprietary software, rendering the system useless should the laptop crash or lose power.

CVG 4200 Emergency Communications Kit

The CVG 4200 Emergency Communications Kit received a composite score of 57. The kit included a ruggedized laptop, Broadband Global Area Network (BGAN) satellite terminal and phone, Iridium® satellite phone, cellular data modem and hub, and Ethernet and Integrated Services Digital Network (ISDN) ports, among other components. Though the CVG 4200 does not have LMR capabilities, the other communications capabilities were sufficient, particularly the Iridium satellite phone, which allows immediate communications after arrival on scene even in rural or remote locations. The system can be upgraded by adding software to the Windows®-based laptop or connecting additional hardware via the USB hub. The computer keyboard and screen were easily viewed in daytime and nighttime operating environments, and the adjustable screen brightness and keyboard lights enhanced the usability. The system was easy to set up and was operational quickly. The Pelican case provides adequate protection for the system. The two inverters can operate off either the civilian 12-volt system or the military 24-volt system, which was considered an important capability.

Some disadvantages to the CVG 4200 Emergency Communications Kit were noted. The lack of mapping, imagery, global positioning system (GPS), and other incident decision support software limited the capabilities of the system. Also, while the system did include various Incident Command System (ICS) software, no user manuals are provided for these programs. The commercial off-the-shelf standalone webcam does not meet the need to provide imagery beyond the command area, and the battery life of the

	Pros	• LMR interoperability • Interoperability/Gateway software • Flexible design for customization • Ease of setup • Lease option • Comes with two smart phones
	Cons	• No satellite capability in standard package; provided as an option • Cost for additional training • Illumination • May not be cost effective
RIOS Fly-Away Interoperability Kit	**Composite Assessment Score: 66**	

	Pros	
	▲ **Pros**	• Two satellite capabilities for providing voice communications • Ease of setup and intuitive in operation • Easily upgraded to meet user needs • Configurable with built-in ports and USB hub • Ruggedized laptop with good visibility
	▼ **Cons**	• No LMRs or LMR connectivity • Costs for training, support, options, and satellite service • Lacks pre-installed software for incident management • Battery life for BGAN terminal • Portability • Lamp illumination • Webcam
CVG 4200 Emergency Communications Kit	**Composite Assessment Score: 57**	

despite the lack of LMR capabilities, because the satellite capability allows communication even in remote or rural environments. In addition, the Windows operating system meets user needs, as does the ability of the system to be easily upgraded. The seamless transition from one battery to another is a valuable asset, as are the two additional batteries that, when added to the internal batteries, can power the system for more than 20 hours. Also, the system's router is able to change data paths automatically should one path fail. The cost of the system is reasonable for most small or rural agencies, though evaluators urged agencies to review whether the basic setup of the system would meet their requirements before purchase, especially given the lack of leasing options. The user manual provides step-by-step instructions, and the work lamp can be mounted in various locations on the system. The system was relatively easy to set up and is lightweight, compact, and well-balanced, allowing for easy transport by a single individual. The battery life is sufficient, and the alternate power sources include a solar panel and a 12-volt connection/converter. The system comes with 1 year of support and an extended warranty option.

laptop and the BGAN terminal, at approximately 4 hours, limits the duration of system use. The cost of the standard system and the optional training may be prohibitive for small or rural agencies, especially given that the system does not include LMR capabilities and CVG, Inc. does not provide a leasing option. The work lamp, a consumer-grade USB-powered light-emitting diode (LED), only provides sufficient light on one side of the workstation and the lamp's mount attaches to the side of the laptop screen only, hampering usability. The only ruggedized elements of the system are the Pelican case and the laptop, and the Pelican case would benefit from opposing handles, which would allow more than one individual to assist in its deployability. The system weight is unbalanced in the case and is difficult for one person to carry; also, the case wheels are not large, all-terrain wheels, prohibiting transport over rough terrain.

MITOC

The MITOC received a composite score of 57. The system included cellular data communications with a USB card slot, two mobile Cisco phones, CradlePoint router with three Wi-Fi antennas, BGAN satellite terminal and service, laptop, two Brunton lithium batteries, and a solar panel. The communications capabilities, which include satellite communications and cellular and Wi-Fi connectivity, are sufficient

Some disadvantages of the MITOC were noted. The capabilities of the system are limited by the lack of mapping, imagery, GPS, and video capabilities. In addition, the laptop does not include any incident decision support software bundles or the capability to print or scan documents. The supplied laptop, a Dell Netbook, is designed for indoor use, which hampers its ability to be easily viewed during daytime and nighttime operations. In addition, the Netbook has a small screen size and the ability of the system is not easily expanded. The spaces and cut-outs inside the

	Pros	
	▲ **Pros**	• Portability • Primary and alternate power sources • Wireless router • Provided data network failover • Ease of setup • Warranty and technical support cost-free
	▼ **Cons**	• Netbook laptop provided limited capability • No LMRs or LMR connectivity • No printing or scanning capability • No video, camera, or GPS capability
MITOC	**Composite Assessment Score: 57**	

Pelican case are not suited for complete isolation of individual components, which means items can move around and hit each other while in the case. The wireless router in the case enclosure lid was not fully secured, which could result in damage that would render the system useless. Also, wheels or backpack straps would increase deployability of the system in rough terrain.

Conclusion

Evaluators observed advantages and disadvantages of the assessed mobile command systems, but noted that no two systems were alike or provided exactly the same capabilities. Evaluators recognized that most systems can be customized by the end user, allowing them to swap out less desirable capabilities for more desirable ones, which they viewed as a strength. Evaluators also felt that mobile command systems should possess LMRs or connections for LMRs and a satellite communications capability. They also emphasized the need for systems to come with incident decision support software. Evaluators identified the following considerations to assist other responders in procuring mobile command systems, indicating that mobile command systems should:

- Allow for communications and other operations in rugged terrain that is inaccessible by vehicle
- Be lightweight with a rugged case that can be carried by one or two persons or sling loaded by air
- Provide a "turnkey" solution that requires little setup
- Provide an immediate capability for the first operational or attack phase of an incident
- Provide communications redundancy and command capabilities
- Be an alternative to mobile command vehicles
- Be relatively inexpensive and able to be purchased in bulk.

Certain agencies may not have the funds to purchase additional systems. One alternative identified by evaluators for local communities is to enter into a cost-sharing agreement and procure one or more systems to be leveraged at a regional or multi-jurisdictional level. Local agencies could also capitalize on economies of scale by purchasing larger quantities of systems at lower overall costs. Evaluators also recommended that responders contact agencies currently using these systems for feedback in advance of a purchase.

All reports in this series, as well as reports on other technologies, are available in the SAVER section of the Responder Knowledge Base (RKB) Web site at https://www.rkb.us/saver.
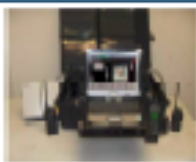
Table 2. Mobile Command Systems Criteria Ratings[1]

Key: ○ Least Favorable → ● Most Favorable (○ = least, ◔, ◐, ◕, ● = most)

Assessment Criteria	RIOS Fly-Away Interoperability Kit	CVG 4200 Emergency Communications Kit	MITOC
Affordability			
Manufacturer's Warranty	◕	◐	◕
Cost Effectiveness	◔	◐	◐
Purchase Options	◕	◔	◔
Expandable System	◕	◕	◐
Capability			
Interoperability	◐	◔	◔
Multiple Capabilities	◐	◕	◐
Effective Range	◕	◔	◐
Upgradable	◕	◕	◐
Encryption	◕	◐	◔
Software Bundles	◕	◐	○[2]
Capacity and Type of Battery	◕	◔	●
Mapping/Imagery	◕	◔	◔
Supports Mesh Networking	○[2]	○[2]	○[2]
Standards in Data Messaging	◕	◐	◔
Remote Cameras	◔	◔	○[2]
Satellite Streaming	○[2]	◕	◐
GPS Tracking	◕	○[2]	○[2]
Multi-Satellite Configuration	○[2]	◕	◔
Deployability			
Ease of Setup	◕	◕	◕
Man-Portable Deployed	◕	◔	◕
Ruggedness	◐	◕	◐
Maintainability			
Company Support	◐	◐	◕
Redundancy to Maintain Operational Readiness	◐	◐	◕
Alternate Power Source	●	◐	◕

6

Table 2. Mobile Command Systems Criteria Ratings[1] (Continued)

KEY — Least Favorable → Most Favorable: ○ (empty) · ◔ (quarter, red) · ◑ (half) · ◕ (three-quarter, green) · ● (full green)

Assessment Criteria	RIOS Fly-Away Interoperability Kit	CVG 4200 Emergency Communications Kit	MITOC
Usability			
Instant Voice (Local)	◕	◕	◕
Vendor Provided On-site (or equivalent) Training	◑	◔	◕
Intuitive Use	◔	◔	◑
Field Programmable Communications	◔	◑	○ [2]
Visibility in Daytime and Nighttime Operations	◔	◕	◔
Seamless Transition	◑	◕	◔
Operating System	◕	◕	◑
Illumination	◔	◔	◑

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]   Circles with no shading may indicate that the feature was not applicable to the assessed system or available to users with the purchase of the standard system. Most notably, none of the systems provided a mesh networking capability for the assessment. In addition, the satellite capabilities of the RIOS Fly-Away Interoperability Kit were not assessed since they are provided as an option to the standard system. Further, the CVG 4200 Emergency Communications Kit did not include a global positioning system (GPS) tracking capability. Lastly, the MITOC system did not include software bundles, remote cameras, a GPS tracking capability, or field programmable communications.

Table 3. Mobile Command Systems Specifications

Specifications	RIOS Fly-Away Interoperability Kit	CVG 4200 Emergency Communications Kit	MITOC
Multi-Satellite Configuration	• Network: Geosynchronous • Operator(s): Inmarsat, Iridium® • Region(s): Worldwide	• Network: Geosynchronous or Low Earth Orbit • Operator(s): Inmarsat, Globalstar™, Iridium handheld satellite phone (ACeS/Thuraya may be provided as an option) • Region(s): All except Polar	• Network: Geosynchronous • Operator(s): Inmarsat • Region(s): All except Polar
Global Positioning System Tracking	• Smart phones with GPS Microsoft® MapPoint® • Any GPS device providing LAT/LONG can be tracked.	• Capability can be available in a customized unit	• Capability can be available in a customized unit
Encryption	• WEP (152),[1] AES 128 encryption, Hash Algorithm MD5	• WEP (64/128)	• WPA™2
Alternate Power Source	• 120 V AC • 12 V or 24 V power inverters • Cigarette lighter adapter • Battery clamps • Solar panel power kit	• 120 V AC • 12 V or 24 V power inverters • Cigarette lighter adapter • Battery clamps • Solar panel power kit (optional)	• 120 V AC • 12 V or 24 V power inverters • Cigarette lighter adapter • Battery clamps • Solar panel power kit
Standards in Data Messaging	• Mesh architecture • TCP/IP, UDP/IP, BSI • EDXL • IP-based communication	• Itronix • Inmarsat Launchpad • Visioneer® Strobe XP100 driver • CounterPath eyebeam VoIP • IP-based communication	• BGAN software • Meets FCC compliance standards • EDXL (CAP, DE, RM) • IP-based communication
Operating System	• Microsoft Windows XP® • Microsoft Windows 2000® • Microsoft Windows Vista® • Microsoft Windows 7®	• Microsoft Windows XP • Microsoft Windows Vista	• Microsoft Windows XP
Ruggedness	• Ruggedized • Waterproof • Pelican™ case • Ingress protection rating:[2] 65	• Ruggedized • Waterproof • Pelican case • Ingress protection rating: 66	• Ruggedized • Waterproof • Pelican case • Ingress protection rating: 55
Cost Effectiveness	• MSRP: $29,950 • Assessed Unit: $24,500 (includes two software licenses, but does not include BGAN terminal and service)	• MSRP: $21,046 • GSA: $18,301	• MSRP: $9,950
Purchase Options	• Leased for 10 to 25 percent of the purchase price per year	• Leasing is negotiable	• No lease option
Company Support	• 12 months of support • Telephone support • Web-based support • E-mail support • Field support (optional) • Extended support (optional) • Follow-on support (optional)	• 12 months of support • Telephone support • Web-based support • E-mail support • Online trouble ticket tracking	• 12 months of support • Telephone support • Extended support (optional)

Table 3. Mobile Command Systems Specifications (Continued)

Notes:

1   Wired Equivalent Privacy (WEP) and Wireless Fidelity (Wi-Fi®) Protected Access (WPA) are types of data encryptions for wireless devices. Use of data encryption reduces the risk that an unauthorized person could access wireless information shared at the incident scene. For additional information about encryption, visit the U.S. Computer Emergency Response Team Web site at http://www.us-cert.gov/index.html.

2   Ruggedness was evaluated using a 2-digit International Electrotechnical Commission (IEC) ingress protection rating. The first digit (scale of 1-6) rates the ability of the mobile command system to resist foreign objects or dust. The second digit (scale of 1-8) rates the ability of the mobile command system to resist moisture. See the following standard for additional information about ingress protection ratings: *IEC 60529, Edition 2.1, International Standard, Degrees of protection provided by enclosures*.

AC	=	alternating current
AES	=	Advanced Encryption Standard
BGAN	=	Broadband Global Area Network
BSI	=	British Standards Institution
CAP	=	Common Alerting Protocol
DE	=	Distribution Element
EDXL	=	Emergency Data eXchange Language
FCC	=	Federal Communications Commission
GPS	=	global positioning system
GSA	=	U.S. General Services Administration
IP	=	Internet Protocol
LAT/LONG	=	latitude/longitude
MITOC	=	Mobile Information and Telecom Operations Center
MSRP	=	Manufacturer Suggested Retail Price
RIOS	=	Radio Interoperability System
RM	=	Resource Messaging
TCP/IP	=	Transmission Control Protocol/Internet Protocol
UDP/IP	=	User Datagram Protocol/Internet Protocol
V	=	volt
VoIP	=	Voice over Internet Protocol
WEP	=	Wire Equivalent Privacy
WPA	=	Wi-Fi Protected Access