System Assessment and Validation for Emergency Responders (SAVER)

Radar Systems for Through-the-Wall Surveillance Market Survey Report

September 2013

Homeland Security

Science and Technology

U.S. Department of Homeland Security

SAVER

System Assessment and Validation for Emergency Responders

Prepared by Space and Naval Warfare Systems Center Atlantic

The *Radar Systems for Through-the-Wall Surveillance Market Survey Report* was funded under Interagency Agreement No. HSHQPM-12-X-00031 from the U.S. Department of Homeland Security, Science and Technology Directorate.

FOREWORD

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 mission includes:

- Conducting impartial, practitioner-relevant, operationally oriented assessments and validations of emergency response equipment; and
- Providing information, in the form of knowledge products, that enables decision-makers and responders to better select, procure, use, and maintain emergency response equipment.

Information provided by the SAVER Program will be 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. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

As a SAVER Program Technical Agent, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic has been tasked to provide expertise and analysis on key subject areas, including communications, sensors, security, weapon detection, and surveillance, among others. In support of this tasking, SPAWARSYSCEN Atlantic conducted a market survey of commercially available radar systems for through-the-wall surveillance. Radar systems for through-the-wall surveillance fall under AEL reference number 15IN-00-RADR titled Radar, Ground/Wall Penetrating.

Visit the SAVER section of the Responder Knowledge Base (RKB) website at https://www.rkb.us/saver for more information on the SAVER Program or to view additional reports on radar systems for through-the-wall surveillance or other technologies.

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1. INTRODUCTION

Radar systems for through-the-wall surveillance are handheld units typically used by law enforcement personnel to detect individuals behind doors, walls, and windows, hereinafter referred to as walls. These systems enhance situational awareness in operations such as forced entry and hostage rescue when knowledge of the whereabouts of individuals would be beneficial. To provide emergency responders with information on radar systems for through-the-wall surveillance, the System Assessment and Validation for Emergency Responders (SAVER) Program conducted a market survey.

This market survey report is based on information gathered from February to July 2013 from Internet searches, industry publications, an emergency responder focus group, and a government issued Request for Information (RFI) accessible from the Federal Business Opportunities website, as well as directly from vendors. For inclusion in this report, the radar systems for through-the-wall surveillance had to be fully-developed handheld systems. Due diligence was performed to develop a report that is representative of products in the marketplace.

The *Radar Systems for Through-the-Wall Surveillance Market Survey Report* was prepared in collaboration with the National Institute of Justice (NIJ). The *Through-the-Wall Sensors for Law Enforcement: Market Survey*, published by NIJ, was referred to while preparing this report. The NIJ market survey includes information on the basic principles of through-the-wall sensor operation, commercially available equipment, and prototype equipment. This SAVER market survey report, as well as other SAVER reports on through-the wall sensors, is intended to be complementary to NIJ publications available at https://www.justnet.org. The NIJ and SAVER reports should be referred to by agencies considering purchase of radar systems for through-the-wall surveillance.

2. RADAR SYSTEMS FOR THROUGH-THE-WALL SURVEILLANCE OVERVIEW

Radar systems for through-the-wall surveillance emit radio waves to detect movement through walls. In order to do so, the radio waves must be able to penetrate the wall, reflect off objects, and return to the receiver. Radio waves reflected from stationary objects return to the receiver with the same frequency as the radio waves that were emitted. Radio waves reflected from moving objects return to the receiver with a slightly different frequency (i.e., Doppler shift), indicating an object is moving. The distance to the moving object is reported by the system. Some systems may also report static object detection (e.g., location of walls or partitions).

2.1 Current Technologies

The ability of radar systems for through-the-wall surveillance to detect movement through walls is dependent upon how well the radio waves penetrate the wall. The material and thickness of the wall impact the ability of the system to acquire a reading; the radio waves cannot penetrate steel, and extremely thick barriers may block the radio waves or delay the time it takes to acquire a reading. In addition, interference may occur when simultaneously using multiple systems or other devices that operate within the same radio frequency range.

Systems may report the location of movement in either one-dimension (1-D) or two-dimensions (2-D). A 1-D system displays a target's distance from the sensor while a 2-D system displays x and y distances from the sensor.

2.2 Standards/Regulations

The Federal Communications Commission (FCC) regulates interstate and international communications by radio, television, wire, satellite, and cable in all 50 states, the District of Columbia, and U.S. territories. The FCC governs all systems that emit radio waves, regulating the frequencies and power levels on which the systems are allowed to operate, and distributes licenses for the use of frequency bands as necessary. The FCC governs radar systems for through-the-wall surveillance and requires FCC certification of such systems. FCC-certified systems will have an FCC Identification (FCCID) number associated with them and shall be labeled as such. FCC certification can be verified by requesting the FCCID number from the product's vendor and using the FCCID to search the FCC database for authorized equipment (https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm).

Federal agencies are not regulated by the FCC and are instead governed by the Interdepartmental Radio Advisory Committee (IRAC) of the National Telecommunications and Information Administration (NTIA) (http://www.ntia.doc.gov).

This summary of regulations is provided for informational and planning purposes only. Jurisdictions planning to use this technology should contact the appropriate agencies for further details.

3. PRODUCT DATA

RFI responses were received for six radar systems for through-the-wall surveillance, which range in price from $6,000 to $40,500. Most systems are customizable and can be tailored to fit agency requirements. All systems are FCC certified as indicated by the FCCID number in the product comparison matrix. At a minimum, all systems are resistant to shock and water. They also have indicators to notify the user of system status, such as interference detection or battery status. Technical support is provided, at least Monday through Friday, for 8 hours each day.

Product data presented in this report was obtained directly from vendors. The information has not been independently verified by the SAVER Program. Features in the product comparison matrix are defined as follows, listed in column order:

MSRP refers to the manufacturer's suggested retail price (MSRP) of the system.

Warranty (years) refers to the duration of the warranty. Coverage is subject to terms and conditions set forth in the warranty.

Spatial Representation refers to whether the system displays movement in 1-D or 2-D.

Detection Range (feet) refers to the maximum distance that the system can detect movement through a wall.

Multiple Targets indicates if the system can detect and display multiple moving objects and people simultaneously.

Standoff Detection indicates if the system can operate at a distance from a wall.

Static Object Detection refers to the ability of the system to report the location of inanimate objects, such as walls.

Field of View refers to the system's angular field of view.

Power refers to the type of batteries the system uses as its primary power source. If available, alternate power options are also listed.

Battery Runtime (hours) refers to the amount of time the batteries will power the system with continuous use.

Dimensions (inches) refers to the length, width, and height of the system.

Display Size (inches) refers to the diagonal length of the display screen.

Weight (pounds) refers to the weight of the system including batteries, rounded to the nearest pound.

Mounting Options refers to whether the system can be wrist worn, robot mountable, or supported by a tripod or monopod.

Remote Viewing refers to whether the system provides remote viewing by a wireless or tethered connection.

Min/Max Temperatures (°F) refers to the minimum and maximum operating and storage temperatures of the system. Only one range is provided when the minimum and maximum operating and storage temperatures are the same.

24/7 Technical Support indicates if technical support is available 24 hours per day, 7 days per week.

Training Included indicates if training is included with system purchase.

Table 3-1. Product Comparison Matrix

Vendor	Product	MSRP	Warranty (years)	Spatial Representation	Detection Range (feet)	Multiple Targets	Standoff Detection	Static Object Detection	Field of View	Power	Battery Runtime (hours)	Dimensions (inches)	Display Size (inches)	Weight (pounds)	Mounting Options	Remote Viewing	Min/Max Temperatures (°F)	24/7 Technical Support	Training Included
Camero-Tech Ltd.	Xaver™ 100 (FCCID A42X100F) 	$11,500	1	1-D	66		✓		120°	2 AA[1] batteries or 4 CR123A[1] batteries	1.5 to 3.5	9.0x4.0x3.0	2.0	2	T[1]	Wireless[1, 2]	-5/131 (O) -40/158 (S)		
	Xaver 400 (FCCID A42X400F) 	$40,500 plus mandatory training cost	1	2-D	66	✓	✓	✓	120°	6 Ultralife HiRate® U10017[1] batteries or 1 rechargeable lithium battery (non-standard size) or AC cord	4.5 to 2.5	14.5x8.9x4.7	3.5	7	T[1]	Tethered[1]	-4/122 (O) -40/158 (S)		

Vendor	Product	MSRP	Warranty (years)	Spatial Representation	Detection Range (feet)	Multiple Targets	Standoff Detection	Static Object Detection	Field of View	Power	Battery Runtime (hours)	Dimensions (inches)	Display Size (inches)	Weight (pounds)	Mounting Options	Remote Viewing	Min/Max Temperatures (°F)	24/7 Technical Support	Training Included
L-3 CyTerra	Range-R® (FCCID YKD-25TWD3000) 	$6,000	1[3]	1-D	50				160°	4 AA[1] batteries or 2 AA[1] rechargeable battery kit	1.0	8.9x4.0x2.7	2.0	1	M[4]	Wireless[2] (Range-R Link only)	0/125 (O) -40/160 (S)	✓	✓
	Range-R Link (FCCID YKD-25TWD3000-029) 	$8,760																	

Vendor	Product	MSRP	Warranty (years)	Spatial Representation	Detection Range (feet)	Multiple Targets Standoff Detection	Static Object Detection	Field of View	Power	Battery Runtime (hours)	Dimensions (inches)	Display Size (inches)	Weight (pounds)	Mounting Options	Remote Viewing	Min/Max Temperatures (°F)	24/7 Technical Support Training Included	
TiaLinx Inc.	Eagle45-W (FCCID 2AAD6EAGLE5N) 	$9,000	7	1-D	40	✓	✓	✓	60°	1 LiPo battery (non-standard size) or AC cord	1.5	7.0x5.0x2.0	NA[5]	4	W	Wireless[1, 2]	23/130 (O) -10/160 (S)	✓	✓
	Eagle5-NB (FCCID 2AAD6EAGLE5N) 	$19,500	7	2-D	60	✓	✓	✓	30°	1 LiPo battery (non-standard size) or AC cord	1.5	8.0x8.0x4.5	5.0	7	T, R	Wireless[1]	23/130 (O) -10/160 (S)	✓	✓

Notes:
[1]Not included with purchase
[2]Multiple system displays can be viewed on the same remote display
[3]Optional 3-year extended warranty
[4]Included with Range-R Link; optional accessory for Range-R
[5]Goggles with heads-up display; diagonal measurement does not apply

✓—system is equipped with corresponding feature
NA—not applicable
Product—Federal Communications Commission Identification (FCCID)
Spatial Representation—One-dimension (1-D); two-dimensions (2-D)
Power—Alternating current (AC); lithium polymer (LiPo)
Mounting Options—Wrist worn (W); robot mountable (R); tripod (T); monopod (M)
Min/Max Temperatures (°F)—Degrees Fahrenheit (°F); operating (O); storage (S)

Information presented in the table is based on data gathered from February to July 2013.

4. VENDOR CONTACT INFORMATION

Additional information on the radar systems for through-the-wall surveillance included in this market survey report can be obtained from the vendors listed in Table 4-1.

Table 4-1. Vendor Contact Information

Vendor	Phone Number	Website/E-Mail Address
Mistral Security Inc.[1]	(800) 964-7872	http://www.camero-tech.com http://www.mistralsecurityinc.com securitysales@mistralgroup.com
L-3 CyTerra	(407) 926-1900	http://www.cyterra.com info.cyterra@L-3Com.com
TiaLinx Inc.	(949) 748-7575	http://www.tialinx.com sales@tialinx.com

[1]U.S. distributor for Camero-Tech Ltd

5. SUMMARY

This market survey report includes six radar systems for through-the-wall surveillance. The primary differences relate to cost, detection range, multiple target and static object detection, spatial representation, field of view, standoff detection, and training. Operating and storage temperatures vary slightly. Most systems are similar in size and weight and have mounting options and remote viewing capabilities. All systems are battery powered with similar runtimes and include a warranty and technical support. Items included with purchase may vary; most systems are customizable and can be tailored to fit agency requirements.

Emergency responder agencies that consider purchasing radar systems for through-the-wall surveillance should carefully research each product's overall capabilities and limitations in relation to their agency's operational needs.