System Assessment and Validation for Emergency Responders (SAVER)


September 2013

Homeland Security
Science and Technology

Prepared by Space and Naval Warfare Systems Center Atlantic

The views and opinions of authors expressed herein do not necessarily reflect those of the U.S. Government.

Reference herein to any specific commercial products, processes, or services by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the U.S. Government.

The information and statements contained herein shall not be used for the purposes of advertising, nor to imply the endorsement or recommendation of the U.S. Government.

With respect to documentation contained herein, neither the U.S. Government nor any of its employees make any warranty, express or implied, including but not limited to the warranties of merchantability and fitness for a particular purpose. Further, neither the U.S. Government nor any of its employees assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed; nor do they represent that its use would not infringe privately owned rights.

Approved for public release; distribution is unlimited.
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.
POINTS OF CONTACT

SAVER Program
U.S. Department of Homeland Security
Science and Technology Directorate
OTE Stop 0215
245 Murray Lane
Washington, DC 20528-0215
E-mail: saver@hq.dhs.gov
Website: https://www.rkb.us/saver

Space and Naval Warfare Systems Center Atlantic
Advanced Technology and Assessments Branch
P.O. Box 190022
North Charleston, SC 29419-9022
E-mail: ssc_lant_saver_program.fcm@navy.mil
TABLE OF CONTENTS

Foreword........................................................................................................................................ i
Points of Contact................................................................................................................................ ii
1. Introduction.................................................................................................................................... 1
2. Radar Systems For Through-The-Wall Surveillance Overview .................................................. 1
   2.1 Current Technologies.............................................................................................................. 1
   2.2 Standards/Regulations ......................................................................................................... 2
3. Product Data................................................................................................................................... 2
4. Vendor Contact Information.......................................................................................................... 7
5. Summary........................................................................................................................................ 7

LIST OF TABLES

Table 3-1. Product Comparison Matrix.............................................................................................. 4
Table 4-1. Vendor Contact Information............................................................................................... 7
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

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Product</th>
<th>MSRP</th>
<th>Warranty (years)</th>
<th>Spatial Representation</th>
<th>Detection Range (feet)</th>
<th>Multiple Targets</th>
<th>Standoff Detection</th>
<th>Static Object Detection</th>
<th>Field of View</th>
<th>Power</th>
<th>Battery Runtime (hours)</th>
<th>Dimensions (inches)</th>
<th>Display Size (inches)</th>
<th>Weight (pounds)</th>
<th>Mounting Options</th>
<th>Remote Viewing</th>
<th>Min/Max Temperatures (°F)</th>
<th>Technical Support</th>
<th>Training Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camero-Tech Ltd.</td>
<td>Xaver™ 100 (FCCID A42X100F)</td>
<td>$11,500</td>
<td>1</td>
<td>1-D</td>
<td>66</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>120°</td>
<td>2 AA(^1) batteries or 4 CR123A(^1) batteries</td>
<td>1.5 to 3.5</td>
<td>9.0x4.0x3.0</td>
<td>2.0</td>
<td>2</td>
<td>T(^1)</td>
<td>Wireless(^{1,2})</td>
<td>-5/131 (O) -40/158 (S)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Xaver 400 (FCCID A42X400F)</td>
<td>$40,500</td>
<td>1</td>
<td>2-D</td>
<td>66</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>120°</td>
<td>6 Ultralife HiRate(^{\circ}) U10017(^1) batteries or 1 rechargeable lithium battery (non-standard size) or AC cord</td>
<td>4.5 to 2.5</td>
<td>14.5x8.9x4.7</td>
<td>3.5</td>
<td>7</td>
<td>T(^1)</td>
<td>Tethered(^1)</td>
<td>-4/122 (O) -40/158 (S)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor</td>
<td>Product</td>
<td>MSRP</td>
<td>Warranty (years)</td>
<td>Spatial Representation</td>
<td>Detection Range (feet)</td>
<td>Multiple Targets</td>
<td>Standoff Detection</td>
<td>Static Object Detection</td>
<td>Field of View</td>
<td>Power</td>
<td>Battery Runtime (hours)</td>
<td>Dimensions (inches)</td>
<td>Display Size (inches)</td>
<td>Weight (pounds)</td>
<td>Mounting Options</td>
<td>Remote Viewing</td>
<td>Min/Max Temperatures (°F)</td>
<td>Training Included</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------</td>
<td>-------</td>
<td>-----------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>--------------------</td>
<td>-----------------------</td>
<td>----------------</td>
<td>------------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>---------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>L-3 CyTerra</td>
<td>Range-R® (FCCID YKD-25TWD3000)</td>
<td>$6,000</td>
<td>1</td>
<td>1-D</td>
<td>50</td>
<td>160°</td>
<td></td>
<td></td>
<td></td>
<td>4 AA(^1) batteries or 2 AA(^1) rechargeable battery kit</td>
<td>1.0</td>
<td>8.9x4.0x2.7</td>
<td>2.0</td>
<td>1</td>
<td>M(^4)</td>
<td>Wireless(^2) (Range-R Link only)</td>
<td>0/125 (O) -40/160 (S)</td>
<td>✔️ ✔️</td>
<td></td>
</tr>
<tr>
<td>L-3 CyTerra</td>
<td>Range-R Link (FCCID YKD-25TWD3000-029)</td>
<td>$8,760</td>
<td>1(^3)</td>
<td>1-D</td>
<td>50</td>
<td>160°</td>
<td></td>
<td></td>
<td></td>
<td>4 AA(^1) batteries or 2 AA(^1) rechargeable battery kit</td>
<td>1.0</td>
<td>8.9x4.0x2.7</td>
<td>2.0</td>
<td>1</td>
<td>M(^4)</td>
<td>Wireless(^2) (Range-R Link only)</td>
<td>0/125 (O) -40/160 (S)</td>
<td>✔️ ✔️</td>
<td></td>
</tr>
<tr>
<td>Vendor</td>
<td>Product</td>
<td>MSRP</td>
<td>Warranty (years)</td>
<td>Spatial Representation</td>
<td>Detection Range (feet)</td>
<td>Multiple Targets</td>
<td>Standoff Detection</td>
<td>Static Object Detection</td>
<td>Field of View</td>
<td>Power</td>
<td>Battery Runtime (hours)</td>
<td>Dimensions (inches)</td>
<td>Display Size (inches)</td>
<td>Weight (pounds)</td>
<td>Mounting Options</td>
<td>Remote Viewing</td>
<td>Min/Max Temperatures (°F)</td>
<td>24/7 Technical Support</td>
<td>Training Included</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------</td>
<td>-------</td>
<td>-----------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>----------------------</td>
<td>------------------</td>
<td>-------</td>
<td>------------------------</td>
<td>---------------------</td>
<td>----------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>--------------------------</td>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>TiaLinx Inc.</td>
<td>Eagle45-W (FCCID 2AAD6EAGL E5N)</td>
<td>$9,000</td>
<td>7</td>
<td>1-D</td>
<td>40</td>
<td>✓ ✓ ✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>60°</td>
<td>1 LiPo battery</td>
<td>7.0x5.0x2.0</td>
<td>NA</td>
<td>4.0</td>
<td>W</td>
<td>Wireless¹ ²</td>
<td>23/130 (O) -10/160 (S)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Eagle5-NB (FCCID 2AAD6EAGL E5N)</td>
<td>$19,500</td>
<td>7</td>
<td>2-D</td>
<td>60</td>
<td>✓ ✓ ✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>30°</td>
<td>1 LiPo battery</td>
<td>8.0x8.0x4.5</td>
<td>5.0</td>
<td>7.0</td>
<td>T, R</td>
<td>Wireless¹ ²</td>
<td>23/130 (O) -10/160 (S)</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Notes:

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

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>
<thead>
<tr>
<th>Vendor</th>
<th>Phone Number</th>
<th>Website/E-Mail Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mistral Security Inc.</td>
<td>(800) 964-7872</td>
<td><a href="http://www.camero-tech.com">http://www.camero-tech.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="http://www.mistralsecurityinc.com">http://www.mistralsecurityinc.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:securitysales@mistralsecurity.com">securitysales@mistralsecurity.com</a></td>
</tr>
<tr>
<td>L-3 CyTerra</td>
<td>(407) 926-1900</td>
<td><a href="http://www.cyterra.com">http://www.cyterra.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:info.cyterra@L-3Com.com">info.cyterra@L-3Com.com</a></td>
</tr>
<tr>
<td>TiaLinx Inc.</td>
<td>(949) 748-7575</td>
<td><a href="http://www.tialinx.com">http://www.tialinx.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:sales@tialinx.com">sales@tialinx.com</a></td>
</tr>
</tbody>
</table>

1U.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.