



# Summary

### 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) of DHS, the SAVER Program conducts objective operational tests 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 mission includes:

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

Information provided by the SAVER Program will be shared nationally with the responder community, providing a life-saving 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?"

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## Portable Loudspeakers Assessment Report

*In order to provide emergency responders with information on currently available portable loudspeaker (LDSPKR) capabilities, limitations, and usability, the U.S. Department of Homeland Security's Center for Domestic Preparedness (CDP) conducted a comparative assessment of LDSPKR equipment for the SAVER Program in December 2006. Detailed findings are provided in the Portable Loudspeakers Assessment Report, which is available by request at <https://www.rkb.us/saver>.*

### Background

LDSPKR equipment allows emergency responders to communicate to civilians at an emergency incident in a manner that is concise, clear, and understandable. LDSPKR equipment allows a single responder, or a limited number of responders wearing personal protective equipment (PPE), to direct the orderly flow of victims through a decontamination corridor in a manner that is safe for the responders, the community, and the environment.

LDSPKR equipment also provides improved communication between responders; this enhanced communication enables responders to more effectively coordinate resources, conduct rescue operations, and direct decontamination operations. Responder instructions given to the public from safe distances ensures minimal exposure to potentially contaminated individuals which increases responder protection from contamination. This in turn assists with the prompt removal of contaminants from the skin and clothing, reduces victim exposure time and contamination levels, protects responders from secondary transfer exposures, and provides victims with psychological comfort that the hazard is being mitigated.

### Assessment

Prior to the assessment, the CDP conducted a market survey in order to compile information on commercially available equipment. Then, a focus group consisting of eight emergency response practitioners from various regions of the country met in June 2006 to identify equipment selection criteria for the assessment, evaluation criteria, and assessment scenarios.

Focus group participants discussed three different LDSPKR technologies: megaphones, voice amplifiers, and portable public address systems. The group agreed that since procurement considerations vary from one jurisdiction to another based on operational requirements, personal preferences, and funding, an assessment that utilizes a combination of the technologies would be more beneficial than assessing a single technology. The focus group recommended six specific models for assessment from the representative sample shown in the market survey. Based on the focus group recommendations and market survey research, the following LDSPKR equipment was assessed:

- CON-SPACE Communications CSVA Voice Amplification System (CON-SPACE)

- Enforcement Technology Group, Inc., Wireless First Responder (ETG)
- Fanon Megaphone (Fanon)
- Hamilton Electronics MM9 (Hamilton)
- Sieler Design Products VoiceAmp 89 (Sieler)
- Speco Technologies® (Speco).

The assessment was conducted using a scenario selected from the Homeland Security National Planning Scenarios and activities. Eight emergency response practitioners were selected to serve as evaluators. Each LDSPKR was evaluated in the same manner, and operational conditions were controlled to make the evaluation of each system as similar as possible.

Evaluators rated LDSPKR equipment based on the evaluation criteria established by the LDSPKR focus group and prioritized within the five SAVER categories.

### Assessment Results

The assessment scoring system was based on a 100-point scale. Higher scores indicate better LDSPKR equipment performance (table 1).

The following sections provide a brief summary of the evaluator comments and feedback on each LDSPKR during the assessment. The LDSPKR equipment is listed by composite score (highest to lowest). The full report includes a breakdown of evaluator comments by individual criteria.

### SAVER 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.

### Sieler

The Sieler received the highest overall evaluator ratings and the highest scores in the capability and affordability categories. Range and clarity were reasons that evaluators rated the Sieler highest overall of those assessed. It demonstrated the ability to

**Table 1. LDSPKR Assessment Results<sup>1</sup>**

LDSPKR	Composite Score	Affordability (10% Weighting)	Capability (30% Weighting)	Deployability (20% Weighting)	Maintainability (10% Weighting)	Usability (30% Weighting)
Sieler	75.1	74	71	76	74	80
CON-SPACE	74.7	69	60	84	87	81
ETG	73.4	62	66	82	82	76
Fanon	68.0	66	61	77	76	67
Hamilton	68.0	56	64	76	73	69
Speco	64.6	48	56	75	69	70

Note:

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

	<p style="text-align: center;">↑ <b>Pros</b></p>	<ul style="list-style-type: none"> <li>• Demonstrated the ability to clearly deliver commands from evaluators wearing APR and SCBA up to 700 feet</li> <li>• Operational simplicity</li> <li>• Compact size and weight made it easy to manipulate</li> <li>• Highly compatible with PPE</li> <li>• Arrives ready to use</li> <li>• Excellent warranty information</li> </ul>
	<p style="text-align: center;">↓ <b>Cons</b></p>	<ul style="list-style-type: none"> <li>• User manual specified wrong battery type</li> <li>• No visual instructions</li> <li>• Tools required to change batteries</li> <li>• Awkward for left-handed operators to carry</li> <li>• No alert tone</li> </ul>
<p style="text-align: center;"><b>Sieler</b></p>	<p style="text-align: center;"><b>Composite Assessment Score: 75.1</b></p>	

clearly deliver commands from evaluators wearing air-purifying respirators (APR) and self-contained breathing apparatus (SCBA) up to 700 feet. Evaluators were able to clearly understand voice commands at this distance when the user turned 45 and 90 degrees to his/her left or right. Voice commands were faint at 900 feet, but could be understood.

Operational simplicity was another reason that evaluators rated the Sieler highest overall. The combination volume control on/off switch was the only control switch on the Sieler loudspeaker, and the push-to-talk button was conveniently located on the side of the microphone handle. The push-to-talk feature was easy to activate with one hand due to its large size and spring button action. Evaluators determined that the compact size, light weight, and dimensions of the loudspeaker made it easy to manipulate by a right-handed evaluator.

The Sieler system was equipped with several features that made it compatible with PPE. Evaluators commented that the push-to-talk function was easy to manipulate with a gloved hand. Additionally, the microphone cord was highly compatible with PPE. Evaluators pointed out that the heavy duty webbed carry strap allowed evaluators to easily maneuver the Sieler in all required directions and to carry the system for short periods of time without fatigue.

The Sieler system arrived ready to use with pre-installed batteries. Evaluators noted that the Sieler system was extremely easy to deploy, but the operating instructions lacked the detail found in the

other assessed LDSPKR equipment. The evaluators complimented the 6 years from date of manufacture warranty, as well as the attached product registry card. Evaluators noted that the warranty information included manufacturer contact information via a toll-free phone number, which was viewed as helpful. The basic warranty covered most issues a responder might encounter during the life of the warranty. The terms and conditions of the manufacturer warranty increased the evaluators' confidence in the quality of the Sieler loudspeaker.

The evaluators determined that there were a few drawbacks with the assessed Sieler system. They noted that the manual specified the wrong battery type, there were no visual instructions provided by the manufacturer, and tools were required to change out the batteries. Left-handed evaluators noted that the Sieler box housing made the loudspeaker awkward to carry when using the shoulder strap. The Sieler also did not include an alert tone.

### CON-SPACE

The CON-SPACE system received the second highest overall evaluator rating plus the highest scores in the usability, deployability, and maintainability categories. Evaluators noted that at a range of 100 feet it was difficult to hear a responder using the CON-SPACE and commands were difficult to understand. However, evaluators emphasized that the CON-SPACE device was not designed for use as a long range communicator and lacked the range of the other assessed LDSPKR. Due to its shorter range, the evaluators used the CON-SPACE in conjunction with the Fanon and Sieler LDSPKR to determine if the responders using the CON-SPACE could use another LDSPKR when greater distances are required. Evaluators reported that the CON-SPACE can easily be used with other LDSPKRs if needed.

	<p style="text-align: center;">↑ <b>Pros</b></p>	<ul style="list-style-type: none"> <li>• Ease of operation while wearing PPE</li> <li>• Lanyard and belt clip allowed hands-free use</li> <li>• Easy to follow step-by-step instructions</li> </ul>
	<p style="text-align: center;">↓ <b>Cons</b></p>	<ul style="list-style-type: none"> <li>• Constant hiss during operations</li> <li>• No alert tone</li> <li>• Range and clarity insufficient</li> <li>• Belt clip too small</li> </ul>
<p style="text-align: center;"><b>CON-SPACE</b></p>	<p style="text-align: center;"><b>Composite Assessment Score: 74.7</b></p>	

Evaluators complimented the CON-SPACE's ease of operation while wearing PPE. The CON-SPACE featured a quick-connect adjustable neck strap and belt clip that allowed evaluators to easily wear the speaker with PPE. The lanyard and belt clip permitted the evaluators to use the CON-SPACE in a manner that was hands-free and allowed freedom of movement in all directions. The assessed CON-SPACE system was delivered with easy-to-follow, step-by-step instructions. Evaluators commented that the instructions were a marked improvement over the Sieler and ETG systems. The operating instructions were sufficient to allow the CON-SPACE to be deployed in less than 2 minutes.

The evaluators concluded that the warranty offered by the manufacturer covered workmanship and all defects for a 1-year period and that it should be sufficient to cover most issues a responder might encounter during the life of the warranty. Several evaluators noted that the basic warranty appeared to be vague and required additional information. However, evaluators still favored this device's warranty information over the other assessed models, except the Sieler.

Evaluators identified several disadvantages of the CON-SPACE system during the assessment.

Evaluators noted that the belt clip was too small, range and clarity were insufficient, and there was a constant hiss during operation. In addition, the assessed CON-SPACE model did not offer an alert tone, which was viewed by the evaluators as a drawback.

### **ETG**

The ETG received the third highest overall score plus the second highest scores in the capability, deployability, and maintainability categories. The range, clarity, and ease of use while wearing PPE were all viewed favorably by the evaluators. Evaluators were able to clearly understand voice commands at 500 feet when the user turned 45 and 90 degrees to his/her left or right. Voice commands were faint at 700 feet and could not be understood.

The on/off switch was the only knob on the system; the evaluators identified it as sufficiently labeled and relatively easy to use. The other control switches were slide type controls, including the push-to-talk feature on the microphone. The slide type controls were extremely difficult to slide while wearing PPE gloves. The ETG system was equipped with a shoulder strap that evaluators described as durable and adjustable for length. The shoulder strap length was sufficient to accommodate the wearing of PPE. The handle's shape

	<p style="text-align: center;"> <b>Pros</b></p>	<ul style="list-style-type: none"> <li>• Demonstrated the ability to clearly deliver commands from evaluators wearing APR and SCBA up to 500 feet</li> <li>• Shoulder strap durable and adjustable</li> <li>• Microphone easily accessible for both left and right handed operators</li> <li>• Compact size, shape, and weight</li> </ul>
	<p style="text-align: center;"> <b>Cons</b></p>	<ul style="list-style-type: none"> <li>• Absence of warranty information</li> <li>• Insufficient operating instructions</li> <li>• Substantial and continuous battery charging requirements</li> </ul>
<b>ETG</b>	<b>Composite Assessment Score: 73.4</b>	

enabled evaluators to grasp it while wearing PPE gloves. The compact size, shape, and weight of the ETG system allowed one evaluator to carry it by hand for short periods of time, while the shoulder strap allowed for more extended carry times. The microphone position was easily accessible for right- or left-handed operators.

The evaluators identified disadvantages with the assessed ETG system. Particular disadvantages included the absence of warranty information, insufficient operating instructions, and substantial and continuous charging requirements of the nickel cadmium battery. The evaluators found that warranty information, including availability, was not present in the package. The lack of warranty information decreased evaluators' confidence in the quality of the ETG system. The absence of an alert tone was viewed as a disadvantage.

### **Fanon**

The evaluated Fanon megaphone tied with the Hamilton for the fourth highest overall score. The Fanon received higher scores than the Hamilton in the affordability, deployability, and maintainability categories. The Fanon demonstrated superior range and clarity versus other assessed LDSPKR, with the exception of the Sieler. Evaluators were able to clearly understand voice commands at 500 feet when the user turned 45 and 90 degrees to his/her left or right. Voice commands were faint at 900 feet and could not be understood.

The evaluators noted that the Fanon was equipped with a fog horn alert tone. Evaluators commented that

	<p style="text-align: center;">↑ <b>Pros</b></p>	<ul style="list-style-type: none"> <li>• Demonstrated the ability to clearly deliver commands from evaluators wearing APR and SCBA up to 500 feet</li> <li>• Equipped with a foghorn alert tone easily heard at a distance of 900 feet</li> <li>• Warranty information and coverage increased confidence in quality</li> </ul>
	<p style="text-align: center;">↓ <b>Cons</b></p>	<ul style="list-style-type: none"> <li>• No manufacturer contact information</li> <li>• Vinyl shoulder strap may be susceptible to cracking</li> <li>• Megaphone housing did not appear to be durable</li> </ul>
<b>Fanon</b>	<b>Composite Assessment Score: 68.0</b>	

	<p style="text-align: center;">↑ <b>Pros</b></p>	<ul style="list-style-type: none"> <li>• Demonstrated the ability to clearly deliver commands from evaluators wearing APR and SCBA up to 500 feet</li> <li>• Equipped with both whistle and siren alert tones</li> <li>• Able to clearly understand voice commands at 500 feet</li> </ul>
	<p style="text-align: center;">↓ <b>Cons</b></p>	<ul style="list-style-type: none"> <li>• Warranty information was not included in the manuals</li> <li>• Confusing battery diagram</li> <li>• Vinyl strap that appears to be vulnerable to cracking</li> </ul>
<b>Hamilton</b>	<b>Composite Assessment Score: 68.0</b>	

the Fanon fog horn alert tone could easily be heard at a distance of 900 feet while evaluators were wearing PPE.

Evaluators found that the warranty information, coverage, and availability increased their confidence in the quality of the Fanon when judged against the Hamilton and Speco megaphones. However, the evaluators identified a few disadvantages with the assessed Fanon megaphone. They noted that there was no manufacturer contact information included, the vinyl shoulder strap appeared to be vulnerable to cracking, and the megaphone plastic housing did not appear to be durable.

### **Hamilton**

The Hamilton megaphone tied with the Fanon megaphone for the fourth highest overall score. The Hamilton megaphone received higher scores than the Fanon in the usability and capability categories. The Hamilton literature states that the device has an operational range of 2,640 feet. Evaluators declared that the Hamilton demonstrated the ability to clearly deliver commands from evaluators wearing APR and SCBA up to a distance of 500 feet. Evaluators were able to clearly understand voice commands at this distance when the user turned 45 and 90 degree to his/her left or right. Voice commands were faint at 700 feet and could not be understood.

The Hamilton was equipped with both whistle and siren alert tones that could be used by a responder to gain the public's attention during an incident. Both alert tone options demonstrated an effective operational range of 900 feet. Evaluators noted that having multiple alert tone options was beneficial.

The evaluators determined that there were a few disadvantages with the assessed Hamilton megaphone. They were dissatisfied to find that warranty information was not included in the manuals. However, evaluators found via the Internet that the Hamilton had a 1-year basic warranty. Other criticisms included a confusing battery diagram and a vinyl strap that appeared to be vulnerable to cracking.

### **Speco**

The Speco received the lowest overall score from evaluators in every SAVER category except usability. Evaluators commented that the Speco demonstrated the ability to clearly deliver commands from evaluators wearing APR and SCBA up to 500 feet. Evaluators were able to clearly understand voice commands at this distance when the user turned 45 and 90 degrees to his/her left or right. Voice commands were faint at 700 feet and could not be understood. The siren and fog horn alert tones demonstrated an audible range of 900 feet. Evaluators identified the Speco's multiple alert tone capability as an advantage over the Sieler and CON-SPACE systems, which offered no alert tones, and the Fanon megaphone's single alert tone.

The evaluators identified a number of disadvantages with the assessed Speco megaphone. Evaluators labeled the Speco megaphone warranty information as inadequate. The 90-day warranty was not deemed to be sufficient time to cover most issues a responder might encounter. Additionally, one of the four Speco loudspeakers functioned only intermittently during the assessment. Other disadvantages included a confusing battery diagram and carry strap that was not adjustable to better accommodate PPE.

	 <b>Pros</b>	<ul style="list-style-type: none"> <li>• Demonstrated the ability to clearly deliver commands from evaluators wearing APR and SCBA up to 500 feet</li> <li>• Siren and fog horn alert tones demonstrated an audible range of 900 feet</li> <li>• Multiple alert tone capability</li> </ul>
	 <b>Cons</b>	<ul style="list-style-type: none"> <li>• Warranty information inadequate</li> <li>• A confusing battery diagram</li> <li>• A carry strap that was not adjustable to better accommodate PPE</li> </ul>
<b>Speco</b>	<b>Composite Assessment Score: 64.6</b>	

## Conclusion

The evaluator comments and scoring indicated that all of the assessed LDSPKR equipment would enable emergency responders to successfully direct mass decontamination operations while wearing PPE. Evaluators favored LDSPKR equipment that allowed for freedom of movement in all directions, a minimum 500-foot operational voice range, compatibility with PPE use, and warranty that covered most issues a responder might encounter during the life of the warranty. More information on LDSPKR assessment procedures and performances can be found in the full assessment report.

## QuickLook Snapshot<sup>2</sup>



<sup>2</sup> The SAVER QuickLook, available on the SAVER Web site, allows users to select the SAVER categories that are most important to their department and view results according to their specific needs.

All reports in this series as well as reports on other technologies are available on the SAVER Web site (<https://www.rkb.us/saver>).