FEMA **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. 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 the U.S. Department of Homeland Security, 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?"

To contact the SAVER Program Support Office
Telephone: 877-347-3371
E-mail: FEMA-ASKTS@fema.gov
Visit the SAVER website:
https://saver.fema.gov

Breaching and Breaking Tools (BBTs)

In order to provide emergency responders with information on currently available Breaching and Breaking Tool (BBT) capabilities, limitations, and usability Science Applications International Corporation (SAIC) conducted a comparative assessment on BBTs for the SAVER Program in June 2007, and provided findings in the Assessment Report on Breaching and Breaking Tools (BBTs), *which is available by request at https://saver.fema.gov.*

Background

BBTs are commonly used by emergency responders to access buildings, vehicles, and other locked enclosures. A variety of BBTs are available to the responder community including halligan bars. Halligan bars are used by law enforcement and firefighters in a variety of response situations, such as forced entry on exterior and interior doors. Rescuers use halligan bars to breach walls for entry into otherwise unreachable spaces, to escape from being trapped in a burning room, or help a victim through the opening to reach safety.

Assessment

Prior to the assessment, SAIC conducted a market survey in order to compile information on commercially available equipment. Then, a focus group consisting of eight emergency responders from various regions in the country met in April 2007 to identify equipment selection criteria, determine evaluation criteria, and recommend assessment scenarios.

The focus group discussed how BBTs are often used differently based on respective disciplines and/or task requirements. They stated that firefighters typically use halligan bars with axes while law enforcement personnel use the same halligan bar with a sledgehammer. A consensus was reached that the upcoming assessment should concentrate primarily on halligan bars used in firefighting scenarios. The equipment to be assessed should have breaching capabilities, such as pounding, prying, puncturing, cutting, forcing, and twisting. The shaft options should be 36 to 42 inches in length and can be hollow or solid.

Based on focus group recommendations and market survey research, the following BBTs were assessed:

- Fire Hooks Unlimited Pro Bar
- Ziamatic Corporation 4005 Quic-Bar
- Paratech®, Inc. Hooligan Bar Claw
- Zak Tool Halligan Rapid Entry Tool.

Eight emergency response subject matter experts (SMEs) served as evaluators for the assessment. During the assessment, each selected halligan bar was used to simulate response activities where breaching a door or wall is required. Evaluators used forced-entry techniques to breach training doors. The training doors were simulated (commercial and residential) wood and

metal exterior entry doors as well as interior residential doors. Evaluators also used the halligan bars to breach a wall with a 1-inch thick layer of drywall on each side. When needed, the evaluators paired two halligans to create better leverage and used the halligans or an axe as pounding tools to achieve a better purchase point. Each halligan bar was evaluated in the same manner, and the assessment conditions were controlled to make the evaluation of each halligan bar as similar as possible.

Assessment Results

Evaluators rated the halligan bars based on the evaluation criteria established by the BBT focus group. Each criterion was prioritized within the five SAVER categories, and was then assigned a weighting factor based on a 100-point scale. The evaluator category and composite scores are shown in table 1. Higher scores indicate better halligan bar performance.

The following paragraphs provide a brief summary of the evaluator comments on each halligan bar used during the assessment. The tools are listed by composite score (highest to lowest). The full assessment report includes a breakdown of evaluator comments by individual criterion.

Fire Hooks

The Fire Hooks Pro Bar tool received the highest score in the capability category. Evaluators reported that the wide, thin fork end was efficient in forcing the training doors. They observed a very minimal amount of flex in the shaft when the halligan bars were used individually, but the shaft was not damaged. They reported that the adz, pick, and fork on the Fire Hooks tool effectively breached the drywall. Evaluators noted that the tool's striking surface was not ideal to be struck by another halligan bar. Evaluators also commented that the tool was not heavy enough to effectively strike another halligan bar, but they stated that the tool worked well with the axe to create a better purchase point. They reported that it was difficult to keep the adz end in the door jamb when forcing the door. Evaluators reported that when they paired the halligan bars together to gain additional leverage, the shaft of the halligan bar inserted in the door jamb bent.

The Fire Hooks Pro Bar tool also received the highest score under the usability category. Evaluators were able to breach the training doors in less than 5 minutes on the wood door settings and less than 10 minutes on

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.

Table 1. BBT Assessment Results[1]

Halligan Bar	Composite Score	Affordability (10% Weighting)	Capability (35% Weighting)	Deployability (10% Weighting)	Maintainability (10% Weighting)	Usability (35% Weighting)
Fire Hooks	73.9	66	79	67	51	79
Ziamatic	71.2	66	76	64	53	75
Paratech	70.6	67	76	66	52	73
Zak Tool	69.4	71	74	64	55	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.

Fire Hooks

Pros	• Fork width • Curved, thin, and long adz • Thin fork was easy to drive into door jamb • Forks pair well • Pick, fork, and adz worked well when breaching and cutting drywall • Celtex grip
Cons	• 3-piece construction • Shaft bent when pairing halligan bars • Shaft strength

Composite Assessment Score: 73.9

the metal door settings. Evaluators reported that the Pro Bar was well balanced with three different usable tips: adz, pick, and fork. They noted that the adz design was excellent. The fork seemed to provide adequate hand clearance when used to force the training doors, but a few evaluators suggested that hand clearance may not be as good on a more challenging door.

Striking the Fire Hooks

Evaluators reported that the Fire Hooks Pro Bar offers a 1-year warranty, which requires the owner to return the halligan bar to the manufacturer for replacement.

Ziamatic

Evaluators were able to successfully pry open the training doors without permanently deforming or breaking the adz or the fork ends. The adz end of the tool worked well when forcing the training doors and did not deform in the process. Evaluators commented that the smooth nickel finish of the fork caused the adz to slip on the metal door jambs. They also noted that the Ziamatic's pick was well-designed and can easily puncture a wooden door jamb and drywall. Although the shaft was slippery, the adz, fork, and pick successfully breached drywall. Evaluators stated that the striking surface was too small to effectively create a better purchase point using another halligan bar, but they were able to create a better purchase point when

Ziamatic

Pros	• Adz angle • Pick • Large striking surface on adz • Warranty
Cons	• 3-piece construction • Shaft strength • Shaft shape • Grip • Fork thickness • Vibration • Adz was slick causing it to slide out of the jamb

Composite Assessment Score: 71.2

using an axe. Evaluators reported that the vibration caused by striking the tool with an axe or another halligan bar made the tool difficult to hold. The adz and the fork were deemed to be very strong, but the evaluators noticed that the stress caused by prying created a separation in the joint between the shaft and the fork.

Striking the Ziamatic

Evaluators stated that the tool could quickly force the training doors on the wood door settings but noted that the steel door settings took considerably more effort. The Ziamatic was reported to be very well balanced and had three different usable tips: adz, pick, and fork. Evaluators commented that the fork made an adequate purchase point, but they noted that the fork was very slick. They also noted that the curve on the fork allowed adequate hand clearance and their hands were not pinched or hit when forcing the doors. Evaluators stated that the thickness of the adz provided a good purchase point. Evaluators reported that the shaft on the Ziamatic was small and hard to grasp. The hexagon-shaped shaft made gripping somewhat easier, but the corners on the shaft were reported to be painful during use and vibration in the shaft caused fatigue.

Evaluators noted a 90-day warranty on the Ziamatic, and that forged tools will be replaced by the manufacturer if broken.

Paratech

Paratech fork

Evaluators noted that the shaft on the Paratech was very strong and was not bent or damaged after assessment tasks. The adz end worked well when forcing the training doors; however, the thickness of the fork made forcing the door jamb difficult. Evaluators reported that the shaft flexed slightly more when paired with another halligan bar. Evaluators commented that the Paratech's sharp, flat adz was effective in cutting the drywall, but they reported that the fork end of the tool was not as effective as the other tools assessed. Evaluators also noted that striking the tool with the striking surface of another halligan did not effectively create a good purchase point, but that the axe worked very well with the adz to achieve a better purchase point. The Paratech adz and fork suffered damage when used to pry the training doors. Burrs developed on the adz and fork, and evaluators pointed out that repeated use could make the damage significant enough to hinder the adz or fork from sliding into a door jamb.

Evaluators easily breached the training doors on the wood door settings with this tool. They stated that the tool's fork made it difficult to find a purchase point in an inward opening steel door, but they were still able to breach the door in less than 10 minutes. Evaluators reported that the Paratech was heavy but well balanced. The tool had three different usable tips: adz, fork, and pick. The curved fork allowed for adequate hand clearance during use, but on difficult doors the hand clearance was not as good. The shaft had an easy-to-grip ribbed design that covered approximately one-third of each end of the shaft; however, the middle section of the shaft was smooth and slippery.

Evaluators noted that the Paratech offers a limited lifetime warranty. They expressed concerns that the warranty specification "with normal use and service" could create challenges for repeated emergency response use.

Paratech®

Pros	• Adz drives well into drywall • Strong shaft • Shaft diameter is good for easy handling • Ribbed area provides good grip
Cons	• 3-piece construction • Adz has no curve • Only 2/3 of the shaft is ribbed for slip resistance • Fork slope and thickness makes it difficult to achieve a purchase point • Weight • Did not effectively breach drywall

Composite Assessment Score: 70.6

Zak Tool

Zak Tool pick

Evaluators reported that the tool was successful in effectively creating a better purchase point when leveraged with another halligan bar or an axe. Evaluators stated that the waffle head provided a good contact striking surface, but they noted that the striking surface was smaller than the other assessed halligan bars. Evaluators also stated that the tool effectively pried open the training doors without deforming or damaging the adz or fork ends. The adz end of the Zak Tool was reported to be more efficient than the fork when forcing the training doors. The evaluators had difficulty safely pairing the Zak Tool halligan bars, and they only briefly used them in

Zak Tool

Pros	• Price • Waffle head is a good striking surface for an axe • Curve of the fork provided good leverage • Warranty
Cons	• 3-piece construction • Difficult to get to purchase point with adz • Thick fork was difficult to get in door jamb • Handle was too large • Hydrant socket drive hindered fork use • Gas shutoff tool location • Flat, rectangular pick design • Did not effectively break drywall

Composite Assessment Score: 69.4

this configuration. Evaluators stated that the tool's pick punctured the wooden door jamb well. They also reported that the Zak Tool's thin, rectangular-shaped pick did not penetrate the drywall as effectively as the other assessed models.

Evaluators were able to breach the training doors in less than 5 minutes on the wood door settings and less than 10 minutes on the metal door settings. Evaluators reported that the tool was heavy and contained at least three different usable tips: adz, fork, and pick. Evaluators reported that the width of the fork provided a good purchase point. They noted that the adz on the halligan bar was not wide enough to get a good purchase point to force the door, and the surface of the adz was slick causing the adz to slip out of the jamb. They stated that the curve of the fork allowed for adequate hand clearance to safely grip the tool when using it to force most types of doors; they also noted that the other tips did not seem to be a danger to the user. Evaluators reported that the tool's tubular steel shaft has a texturized coated grip that reduced slipping during use.

Evaluators reported a lifetime warranty and noted that the terms and conditions were clearly explained. Evaluators stated that the warranty is void if the halligan is abused or improperly handled.

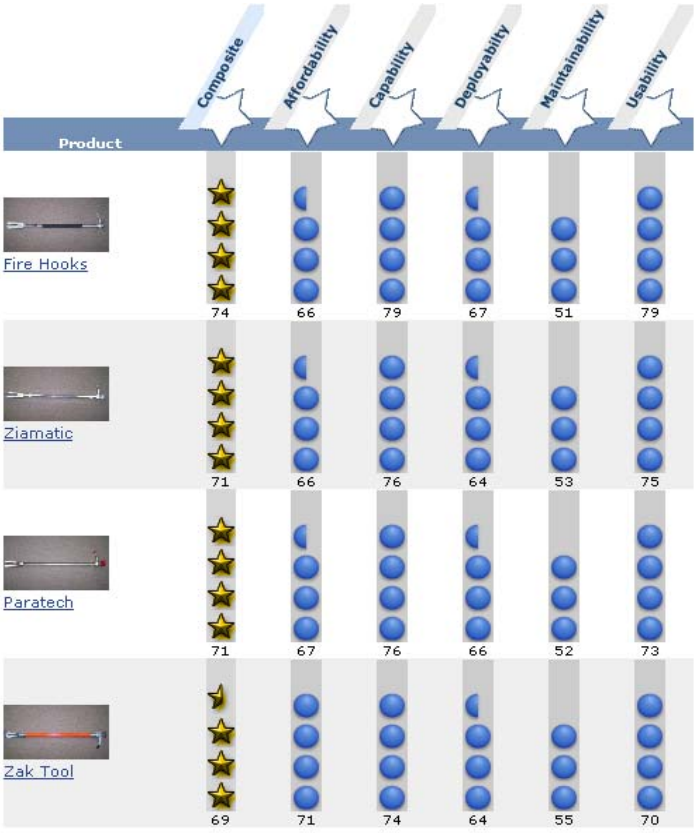
Conclusion

The evaluators were able to successfully complete the assessment tasks using all four assessed halligan bars. The evaluators identified observable advantages and disadvantages of the assessed halligan bars.

An analysis of the evaluator comments and scores revealed the following common observations concerning the assessed halligan bars:

- Evaluators expressed a preference for halligan bars with thin, slightly curved forks. The thinner forks enabled evaluators to quickly and easily obtain a good purchase point and were easier to set deep into the doorjamb to obtain the leverage needed to force the doors. While the thicker, more curved models provided additional leverage once a good purchase point was obtained, they were much more difficult to set deeply into a tight doorjamb.
- Evaluators expressed a preference for halligan bars with a thin, beveled adz. The thinner beveled adz was easier to drive into the tight spaces between the doors and the jambs.
- Evaluators expressed a preference for halligan bars with easy-to-grip, low-vibration shafts.
- Evaluators placed a high value on tool strength. They observed that the three-piece construction can create weak points in the tool, which may limit the performance of the tool. They also observed that tubular shafts might not be strong enough to allow the pairing of two halligan bars for additional leverage.
- Evaluators expressed a preference for non-slip shafts. They observed that slippery shafts hindered the performance of the tool during assessment tasks. They also observed that the halligan bars with covered or ribbed shafts performed better than those without slip-resistant features.

QuickLook Snapshot[2]



Note:

[2] The SAVER QuickLook, available on the SAVER website, 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 the series, as well as reports on other technologies, are available on the SAVER website (https://saver.fema.gov).