



**Homeland
Security**

Science and Technology

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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Tactical Entry Equipment (Battering Rams)

(AEL reference number 20TE-00-NTRY)

In order to provide emergency responders with information on currently available tactical entry equipment technologies, capabilities, and limitations, Science Applications International Corporation (SAIC) conducted a comparative assessment of battering rams used by law enforcement for the SAVER Program in February 2008. Detailed findings are provided in the Assessment Report on Tactical Entry Equipment (Battering Rams), which is available by request at <https://www.rkb.us/saver>.

Background

In order to maintain control of a situation and ensure optimal safety, law enforcement personnel use stealth and surprise when breaching. Tactical entry equipment is used by law enforcement practitioners, specifically specialized teams such as special weapons and tactics (SWAT) or tactical entry teams, to gain access to restricted areas (e.g., barricaded entries, boarded buildings, and locked doors). Tactical entry equipment allows law enforcement personnel to obtain access to criminals, as well as access to victims during rescue operations (e.g., hostage situations). When speed of entry is more important than preventing property damage, responders will use equipment such as battering rams to breach obstructions.

Assessment

Prior to the assessment, the SAVER Program conducted a market survey to investigate currently available tactical entry equipment. The primary objective of the market survey was to provide an overview of available equipment to law enforcement agencies. Then, a focus group consisting of eight law enforcement professionals selected from different jurisdictions met in October 2007 to identify equipment selection criteria, determine evaluation criteria, and recommend assessment scenarios.

The focus group discussed the forced entry uses and manufacturers and agreed that it would be beneficial to assess comparable battering rams, specifically one-person manual battering rams that are transportable and reasonably priced. They then recommended four specific battering rams that meet these selection criteria for the upcoming assessment. Based on the focus group recommended selection criteria and market survey research, the SAVER Program assessed the following four battering rams:

- Zak Tool ZT-75 Compact Door Ram
- Blackhawk[®] Thunderbolt[®] CQB
- Blackhawk[®] Thunderbolt[®] Twin Turbo
- Breaching Technologies Incorporated Mity Mouse.

Eight emergency response practitioners with law enforcement backgrounds were selected to serve as assessment evaluators. Each battering ram was used to simulate law enforcement scenarios involving breaching of varying

entrances. Evaluators conducted four rotations, and each rotation consisted of four stations. The first station required evaluators to breach a lightweight exterior door that would normally be encountered during building search and seizure operations. The second station tasked evaluators with forcing an interior door within a restricted working area such as an apartment building or hallway. The third station required evaluators to breach a reinforced exterior door. The final station required evaluators to perform tactical entry on a boarded up doorway intended to keep out trespassers.



Lightweight Exterior Door



Interior Door

The assessment environment and activities performed were replicable should there be a need to repeat an identical or similar assessment in the future. The activities performed in this assessment were consistent with operational objectives that exist in emergency response situations.

Assessment Results

Evaluators rated the battering rams based on the evaluation criteria established by the tactical entry equipment focus group. Each criterion was prioritized within the five SAVER categories and assigned a weighting factor based on a 100-point scale. The

SAVER Program 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.

SAVER category and composite scores are shown in Table 1. Higher scores indicate better performance. To view how each battering ram scored within the specific evaluation criteria assigned to the SAVER Program categories, see Table 2 (on page 7).

The following sections provide a brief summary of the evaluator comments and feedback on each type of battering ram employed during the assessment. The equipment models are listed by highest to lowest composite scores. The full report includes a more thorough review of evaluator comments on the TEE by category and individual criterion.

Table 1. Battering Ram Assessment Results

Model	Composite Score	Affordability (35% Weighting)	Capability (20% Weighting)	Deployability (10% Weighting)	Maintainability (5% Weighting)	Usability (30% Weighting)
ZT-75	69.8	71	70	73	61	68
CQB	69.5	62	70	80	60	76
Twin Turbo	66.4	64	63	68	64	72
Mity Mouse	59.8	57	66	66	63	57

Note:

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.

ZT-75

The ZT-75 received the highest composite score of the assessed tools. The ZT-75 tied with the CQB by receiving the highest category scores in the capability category, and it received the highest category score in the affordability category. Manufacturer and vendor information clearly states the ZT-75 is made entirely of steel and coated with a textured polyurethane material over the entire surface of the ram. The ZT-75 is designed with a single handle that is mounted parallel to the ram body and has an unlimited lifetime guarantee offered by the manufacturer.

Evaluators agreed the ZT-75 is better suited for breaching lightweight doors. The weight of the battering ram did not allow them to generate enough energy to breach fortified doors. The tool has a symmetrical design and can be used by a right- or left-handed individual for different types of breaching operations. The weight of the tool is distributed evenly, and the compact size of the ZT-75 allowed for ease of use in multiple body positions during assessment tasks.

The ZT-75 has a horizontal handle coated with nonslip material that provides a firm grip, but the texture was rough on hands and caused blistering even when entry gloves were worn. Evaluators reported the handle is

	<p> Pros</p> <ul style="list-style-type: none"> • Effective length for confined areas • Proportional weight and size • Easy to transport • Easy to repair after liner cracks • Option of two heads • Round head better for concentrated force • Square head good for wooden door • Easy hand off to other responders • Reasonable price
	<p> Cons</p> <ul style="list-style-type: none"> • Metal exposed when liner cracked and peeled • Coating chipped by jambs and knobs • Poor ergonomic design • Short standoff distance • No shock resistance • Hands slide forward on handle • Handle material caused abrasions to gloved hands • Limited conductive protection • Suitable for lightweight obstacles only • Noisy during deployment
ZT-75	Composite Assessment Score: 69.8

inflexible when grasped, and the parallel design forced their hands to slide forward while striking objects. They also stated that the handle on the tool does not provide adequate shock resistance while operating and can possibly cause hand and forearm fatigue. The handle position places the user's front hand too close to the front striking position of the ram; the user might sustain injury to the hands if the ram penetrates a surface.

No additional accessories were available with the ZT-75 battering ram. Evaluators agreed that the battering ram cost is reasonable.

Thunderbolt CQB

The Thunderbolt CQB received the second highest composite score by 0.3 points. It tied with the ZT-75 in receiving the highest capability category score, and it also received the highest scores in the usability and deployability categories.

The vendor information clearly states that the ram is designed for lightweight exterior doors rather than heavy steel doors. The manufacturer does not state the number of users that are required to employ the ram, but evaluators concluded it is intended for one person because of its size. The symmetrical design is beneficial because it can be used by the left or right hand. The light ram weight works effectively in most

	<p> Pros</p> <ul style="list-style-type: none"> • Lightweight • Effective for interior doors • Good shock absorption • Effective underhand swing • Good in confined spaces • Nonconductive • Easily transported • Easily retracted from penetrated door
	<p> Cons</p> <ul style="list-style-type: none"> • Striking surface too smooth, slides off of target • End caps damaged easily • Slipped during off-center strike • Handle hard to control • Handle not durable • Hands too close on the handle during striking • Short standoff distance • Recoil • Did not work well on steel reinforced door • Cannot effectively breach from behind cover • Cannot use effectively with a one-handed swing
CQB	Composite Assessment Score: 69.5

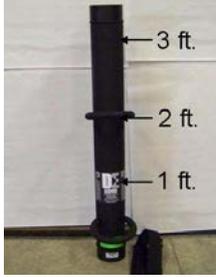
breaching positions, especially in confined spaces. The CQB is encased in a polyurethane material with a handle molded into the body of the ram, and the end caps are made of hardened plastic material designed to withstand the impact of striking an object. It is made with a nonconductive and spark-resistant material.

Evaluators stated that the handle on the CQB is easy to grasp, flexible, and slips minimally while wearing gloves. They noted that the rubberized flex handle reduces the amount of shock experienced by the user, provides a nonslip grip during use, and makes the ram easy to handle. The ergonomics of the ram did not result in undue strain to the users' arms, and evaluators experienced little fatigue with this ram. The weight allows easy recovery for follow up hits; however, the weight is too light to transfer increased force on the target. The short ram length of the CQB allows for an easy swing in close quarters. Evaluators stated that the handle is too flexible and requires some practice to control the angle of the ram during the swing and that the flex handle provides no protection for their hands. Grasping lower on the "u" shaped handle causes more shock to the user. Some evaluators stated that the handle design caused minor discomfort in the hands during assessment tasks. In addition, they reported that the user could possibly hit the doorframe if the ram is employed from the jamb side. They also noted that the strike plate appears to be susceptible to cracking or chipping during breaching operations, but indicated this would not normally make the ram inoperable.

Evaluators reported that the CQB ram can be transported by one person. The ram size does not interfere with the user's movement when it is carried, does not cause fatigue while running or walking, and does not increase difficulty when climbing a ladder. A lifetime warranty is provided in the manufacturer's information, but the terms of the warranty are not specified.

Thunderbolt Twin Turbo

The Twin Turbo received the highest category score in the maintainability category. The Twin Turbo is encased in a polyurethane material with two rubberized flexible handles molded into the body of the ram, and the ram has end caps made of hardened plastic material designed to withstand the impact of striking an object. The manufacturer and vendor clearly state that the Twin Turbo is made with a nonconductive and spark-resistant material, and the

	<p style="text-align: center;"> Pros</p> <ul style="list-style-type: none"> • Handle placement for one- and two-person operations • Good standoff distance on the jamb side • Shock absorbing handles • Strap for carrying with quick release • Easily retractable from penetrated door • Nonsparking composite coating • Less noise than steel ram • Proportional weight for size • Quickest access through toughest barriers with two people • Generated a great deal of energy • Easy hand off to another responder
	<p style="text-align: center;"> Cons</p> <ul style="list-style-type: none"> • Strap became entangled with other worn equipment • Length makes for difficult transport • Restricted swing in confined space • Cumbersome • Heads susceptible to chipping/cracking • Head slippery on contact • Off center hits slide off
Twin Turbo	Composite Assessment Score: 66.4

ram's configuration allows for both right- and left-hand breaching.

Evaluators noted that the ram is too heavy to be used by a single person and should preferably be used in two-man operations. They stated that the ram is effective when breaching fortified doors, particularly in a two-person operation. The shape of the Twin Turbo battering ram head creates a striking surface that can deliver maximum force when a direct strike is made. The battering ram is also effective when breaching lightweight obstacles, but evaluators noted that it might be unsafe to use the ram to breach glass or plywood. The weight could increase the risk of the battering ram penetrating the target and exposing the user to injury.

The battering ram handles are coated with a nonslip grip material, and evaluators reported that the handles provide a secure grip during breaching tasks. However, they also noted that the placement of the flex handles is uncomfortable and does not assist in controlling the tool. The flex handles reduced shock and did not slip during tasks, but caused recoil during breaching. The length and weight of the Twin Turbo prevent the user from attempting positions other than a

standard swing during breaching operations, and the length of the battering ram interferes with confined space entries. However, the Twin Turbo allows more standoff distance from the door in less confined spaces, which provides protection for users' hands and arms. A sling is provided with the battering ram, but it does not assist in transport. The sling became tangled in the evaluators' gear and interfered with breaching operations during the assessment tasks.

Evaluators noted that the price of the ram is reasonable for its size, but they agreed that it is more expensive than rams they typically purchase. They reported that a lifetime warranty is provided in the manufacturer's information, but the terms of the warranty are not clearly stated.

Mity Mouse

The Mity Mouse ram is constructed entirely of steel, as indicated in the manufacturer/vendor information. It was designed with two welded steel handles and two jamb guards with serrated edges. The steel handles are coated with a nonslip grip material. Evaluators reported that the manufacturer provides conflicting information on its web page regarding length of warranty and few details on the terms of a warranty.

The Mity Mouse size and ram weight allow for effective breaching of lightweight exterior or interior doors, but the battering ram requires an impractical

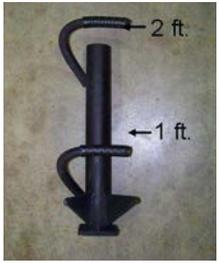
amount of strikes to breach a steel reinforced door. Evaluators noted that the ram is too heavy for its compact size, but the square shape of the ram's head makes a solid striking surface for contact with the breach target, and it is effective in confined spaces.

Evaluators reported that the battering ram is designed for one user, but the ram's weight made it difficult for one user to hold and carry. They also noted that the ergonomic design of the handles assists in controlling the ram while operating and that the two handles are necessary because of the heavy ram weight. The Mity Mouse handles are easy to grasp while wearing gloves; however, the rubberized handgrip did not provide adequate shock resistance, and the rear handle transferred the shock directly to the hand, wrist, and forearm during operation. Evaluators reported that the serrated jamb guards on the Mity Mouse ram are effective at protecting the user's hands, but they noted that the guards could become lodged in material such as plywood. They also noted that the serrated jamb guards interfered with duty equipment and became entangled during use.

Conclusion

Evaluators were able to successfully complete the assessment tasks with all four of the assessed battering rams. An analysis of the evaluator comments and scores revealed these common observations concerning the assessed battering rams:

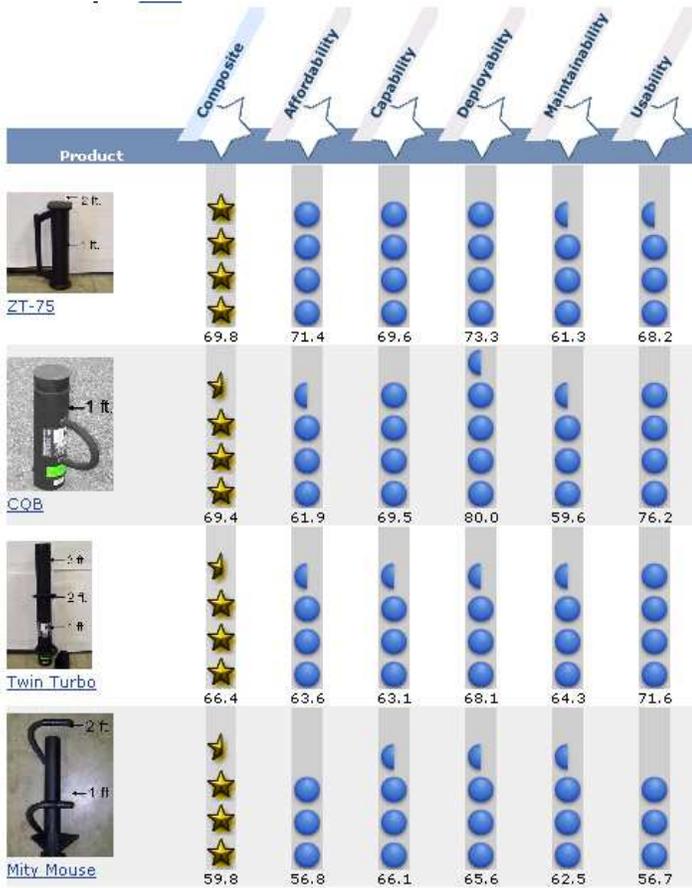
- Battering rams with flexible, shock-resistant handles are preferred. These handles prevent undue strain to the user and reduce fatigue during breaching operations.
- Battering rams that work effectively in confined spaces are highly valued. Heavy, compact size rams are efficient when there is limited space to make an entry.
- Evaluators preferred battering rams that allow for standoff. Standoff from an entryway protects the users' hands and allows responders to breach from behind cover to protect them from combative or armed suspects.
- Battering rams with durable heads are preferable. A ram should not require constant maintenance because of cracks and gouges on the head.
- Evaluators expressed a strong preference for battering rams that are coated with material that prevents conductivity or sparking. Conductivity could expose the user to additional hazards.

	 Pros	<ul style="list-style-type: none"> • Heavy weight effective in confined-space breaching • Delivers good impact in confined space • Breached all doors in stations
	 Cons	<ul style="list-style-type: none"> • Heavy when carrying • Little shock resistance • Rubber hand grips cracked and split after use • No standoff distance • Difficult to transport • Sharp edges on jamb guards • Difficult to transfer to another responder • Excessive cost • Jamb guards susceptible to bending • Cupping on head • Poor quality head material • Broken teeth on jamb guard • No protection from conductivity or sparking • Conflicting warranty information
Mity Mouse		Composite Assessment Score: 59.8

- Proper handle placement is a key component of a battering ram. A correct placement of the handles assists with control and increases the force that can be applied to the breach target.

All reports in this series as well as reports on other technologies are available by request at <https://www.rkb.us/saver>.

QuickLook Snapshot



Note:

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.

		KEY					← 2 ft.		← 1 ft.		← 3 ft.		← 2 ft.	
		Least Favorable	→			Most Favorable	ZT-75	CQB	Twin Turbo	Mity Mouse				
		○	◓	◑	◔	●	ZT-75	CQB	Twin Turbo	Mity Mouse				
Assessment Criteria	Affordability	Cost per Unit	●	●	●	●	●	●	●	●				
		Warranty	◔	◔	◔	◔	◔	◔	◔	◔				
		Accessory Cost	◑	◑	◑	◑	◑	◑	◑	◑				
		Training Cost	◑	◔	◔	◔	◔	◔	◔	◑				
	Capability	Validation of Vendor Specifications	●	●	◔	●	●	●	◔	●				
		Size	●	●	◔	◔	●	●	◔	◔				
		Material	◔	◑	◑	◑	◑	◑	◑	◔				
		Shape of Head	◔	◔	◔	◔	◔	◔	◔	◔				
		Accessories	◑	◑	◑	◑	◑	◑	◑	◑				
		Multiple vs. Single	◑	◑	◑	◑	◑	◑	◑	◑				
		Force of Impact	◔	◑	◑	◑	◑	◑	◑	◔				
	Deployability	Ease of Carry	●	●	●	●	●	●	●	●				
		Ease of Use	◔	●	●	●	●	●	●	◔				
		Transportation via Vehicle	◔	●	●	●	●	●	◔	◔				
	Maintainability	Inspection	●	●	●	●	●	●	●	●				
		Low Level of Maintenance	◑	◑	◑	◑	◑	◑	◑	◑				
	Usability	Handle Comfort	●	●	●	●	●	●	●	◔				
		Maneuverability for Target	◔	●	●	●	●	●	◑	◔				
		Nonconductive Material	◔	●	●	●	●	●	◔	◓				
		One or Two Person Configuration	◔	◑	◑	◑	◑	◑	◑	◑				
		Weight Distribution	◔	◔	◔	◔	◔	◔	◔	◑				
		Hand Shields	◑	◑	◑	◑	◑	◑	◑	◑				