Homeland Security
Science and Technology

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.

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 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 Cutting Torch Systems Assessment Report Summary

The objective of the cutting torch systems assessment project was to evaluate and assess the comparative parameters of the three most common torch systems utilized by the emergency-response community—exothermic torches, oxy-acetylene torches, and oxy-gasoline torches. Subject matter experts (SMEs) from the emergency-response community, who have extensive experience and training in cutting and burning applications, were used to evaluate and assess the selected systems (see figure 1). The assessment included torch system characteristics, customer service, operational performance based on field use by SMEs in simulated response scenarios, controlled tests, and after sale support by manufacturers and vendors.

The cutting torch systems assessment project provides the emergency response community with comparative information on

Figure 1. Tactical door entry with oxygen-acetylene torch.

the three most common torch systems used for the purpose of victim extrication, search operations, and removal of obstacles limiting access to areas of operation. The use of torch systems on varying materials were assessed/ Torch systems are commonly used to cut a range of metallic materials, steel, manganese steel, armor plate, mild and hardened steel, as well as the newer technology composite steels. Additionally, the exothermic system can be made applicable to other materials such as concrete of varying aggregate composition. Other factors that were considered during this project are the amount of training and experience of the user, the availability of fuels to power the systems, portability through varying terrains, weather conditions, safety conditions, maintenance requirements, and adaptability to the situations.

Texas A&M Engineering, including Texas Engineering Extension Service (TEEX), Texas Engineering Experiment Station (TEES), and Texas Transportation Institute (TTI), with the support of the U.S. Department of Homeland Security, Preparedness Directorate, Office of Grants and Training (G&T), conducted comparative assessments on portable cutting torch systems from July 19 through July 21, 2005, at Disaster City on the TEEX Brayton Fire Training Field, College Station, Texas.

This is a summary of the contents of the Portable Cutting Torch Systems Assessment report. The report should be reviewed for the full discussion and recommendations. The complete report can be found on the SAVER Web site https://www.rkb.us/saver

The Cutting Torch Systems

The cutting torch models that were included in the assessment were selected based on the primary criterion that the units are intended to be transported and used by one person. Three types of cutting torches representing six different manufacturers were assessed:

Exothermic

- Arcair Slice Pak #63-991-002
- Broco PC/TACMODI

Oxygen-acetylene

- Harris Port-a-Torch #16601-200DLX
- Smith Tag-a-Long #TL-550
- Victor Portable Torch #0384-1412

Oxygen-gasoline

- Petrogen Portable Cutting PCS#6000

Table 1 lists the components of the oxygen-acetylene and oxygen-gasoline torches and the exothermic torches.

Oxygen-Acetylene and Oxygen-Gasoline Torches	Exothermic Torches
• Torch assembly • Oxygen cylinder • Oxygen regulator • Oxygen hose • Fuel cylinder • Fuel regulator • Fuel hose • Cutting tips • Spark Striker	• Torch Assembly • Oxygen Cylinder • Oxygen regulator • Oxygen hose • Rechargeable ignition system • Igniter with cables • Cutting rods • Cutting tips

Table 1. Components for oxygen-acetylene and oxygen-gasoline torches and exothermic torches.

Exothermic Torches

Ratings expressed in Table 2 for the two exothermic cutting torches included the assessment (see figure 2) show that although deployability was the only category in which the Broco rated higher than the Arcair, the overall ratings for the systems were relatively close. The Arcair's very low rating in the deployability category can be attributed to its larger size, greater weight, and requirement of two operators for deployment. Capability and usability are two categories where the ratings slightly exceeded the Broco ratings. Affordability and maintainability are the two categories in which the Arcair ratings were higher than the Broco. The Broco's low rating in the affordability category can be attributed to its high purchase cost, almost double that of the Arcair.

Overall, both exothermic torches provided similar usability, but Arcair system provided better butting capability and maintainability while the Broco system was superior in deployability.

Figure 2. Exothermic cutting torch on rubble.

Oxygen-Acetylene Torches

Ratings listed in Table 2 for the three oxygen-acetylene cutting torches indicate the Smith and Harris had the highest overall ratings followed by the

Portable Cutting Torch	Overall	Affordability Score	Capability Score	Deployability Score	Maintainability Score	Usability Score
Smith	3.31	4.49	2.87	3.81	3.13	3.02
Harris	3.28	4.68	2.97	3.90	1.97	3.26
Victor	3.13	4.83	2.70	3.89	1.90	2.95
Petrogen	3.07	2.53	2.13	4.12	3.54	3.44
Arcair	3.02	2.76	3.73	1.43	2.93	3.58
Broco	2.96	0.53	3.64	3.25	1.77	3.56

Table 2. Portable cutting torch systems assessment results. Note: rated on a 0 (lowest) to 5 (highest0 scale.

Victor. Capability and usability are the two categories in which the Harris system ratings were higher than the other oxygen-acetylene torches were closely rated in these two categories. All oxygen-acetylene cutting torches were very affordable. The purchase prices ranged from $310 to $540 , with the Victor having the lease expensive purchase price. Deployability was a close category with all oxygen-acetylene torches faring quite well. Maintainability was the one category in which the ratings were not grouped together, with ratings for the Smith system higher than the other two oxygen-acetylene cutting torches. The Petrogen was the top performer of all cutting torches in the maintainability and usability categories. Ratings for the Petrogen are listed in Table 2.

Overall Cutting Torch Systems Results

Table 2 lists portable cutting torch system ratingsm on a 0 (lowest) to 5 (highest) scale. These ratings are for the assessments conducted by the Texas A&M Engineering, using category weightings that were based on information reported by Subject Matter Experts in a focus group. Ratings for all cutting torches indicate the Smith and Harris had the Highest overall ratings followed by the Victor, the Petrogen and lastly the exothermic cutting torches, the Arcair and the Broco, respectively.

Affordability was dominated by the oxygen-acetylene torches, which had purchase prices ranging from $310 to $540 (the Victor had the least expensive purchase price). The exothermic and oxygen-gasoline cutting torches comprised the most expensive group of torches, with a purchase price range of $1,680 to $3,150 (the Broco had the highest purchase price of all the cutting torches).

Capability and usability category ratings clustered around cutting torch category types, with the exothermic cutting torches leading, followed by the oxygen-acetylene cutting torches, and lastly the oxygen-gasoline cutting torches, except the Arcair. The Arcair's very low rating in this category can be attributed to its larger size, greater weight, and requirement of two operators for deployment. The Petrogen, which ranked fourth overall of torches tested, ranked highest in deployability and maintainability.

Conclusion

The full cutting torch systems assessment report can be found on the SAVER Web site along with other TAMU reports dealing with the cutting torch assessment project. The QuickLook chart for the cutting torch assessment is also available on the SAVER Web site (see figure 3). The QuickLook chart offers responders a mechanism to select equipment items based on characteristics that are of most importance to their department. Using the QuickLook chart, responders can emphasize and de-emphasize five categories to fully refine their search for equipment items.