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**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 assessments and validations 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?"

For more information on this and other technologies, contact the SAVER Program Support Office.

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# Summary

## Chain Saws for Firefighting and Rescue

(AEL reference number 03SR-02-TPGS)

*In order to provide emergency responders with information on the capabilities, limitations, and usability of currently available chain saws for firefighting and rescue, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic conducted a comparative assessment of chain saws for the System Assessment and Validation for Emergency Responders (SAVER) Program in May 2009. Detailed findings are provided in the complete Chain Saws for Firefighting and Rescue Assessment Report, which is available by request at <https://www.rkb.us/saver>.*

### Background

Firefighters and urban search and rescue teams use chain saws to facilitate firefighting, rescue, and forcible entry. Chain saws allow emergency response personnel to perform vital emergency-related tasks such as cutting ventilation holes in structures, constructing shoring systems to support unstable buildings, and clearing fire lines.

For the purpose of this assessment, chain saws were defined as handheld, portable, self-contained, gasoline-powered devices consisting of a powerhead, bar, and linked chain. Specialty chain saws designed to cut concrete were not addressed in this assessment.

### Assessment

The assessment focused on evaluating chain saws in firefighting and rescue applications and was structured according to criteria and operational scenarios identified by a focus group of emergency response personnel that met in August 2008. Assessment scenarios were developed by the focus group to facilitate a consistent, repeatable assessment that would produce credible data. These scenarios included bucking a tree, precise cutting of lumber, cutting multiple layers of construction materials, and free-style cutting. To allow the evaluators to rate the powerhead and its capability uniformly, each saw was fitted with a third-party high-speed steel chain and guide bar prior to the assessment.

The chain saws evaluated in this assessment were selected from the *Gasoline Powered Chain Saws for Emergency Responders Market Survey Report* based on how well each saw met the product selection criteria identified by the focus group. The selection included the following:

- Husqvarna 575XPW
- Stihl MS460R
- Tempest 575XT-20-DG.404
- Unifire PS-20-DG-SB
- Cutters Edge CE2171RSD8A
- Echo CS-670.

The assessment was conducted in two phases. Phase I consisted of two stages—the pre-scenario and scenario assessments. During the pre-scenario assessment, evaluators assessed each product against specific usability and maintainability criteria, which would not have been practical to assess during the four scenario assessments. Evaluators were rotated during the assessment to ensure that all had an opportunity to use each saw in every scenario. Phase II gave evaluators the opportunity to assess each saw against criteria associated with product design, cost, and customer support using vendor-provided information.

## Assessment Results

Evaluators rated the chain saws based on assessment criteria established by the focus group. Each criterion was assigned to one of the five SAVER categories, and each SAVER category was assigned a weight factor to indicate its impact on the total composite score. The SAVER category and composite scores are shown in table 1. Higher scores indicate a higher rating by evaluators, though all six products scored favorably and within a small range, indicating only slight differences in overall performance. For product specifications, see table 2. To view how each product scored against individual assessment criterion, see table 3.

The following paragraphs provide a brief summary of evaluator comments and feedback on the chain saws included in this assessment from highest to lowest

### 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.

composite score. For the purposes of this SAVER Summary, category scores are normalized and rounded to the nearest whole number.

### Husqvarna 575XPW




The Husqvarna 575XPW received the highest composite score. Evaluators noted that the saw is well

**Table 1. Chain Saw Assessment Results<sup>1</sup>**

System	Composite Score	Affordability (19% Weighting)	Capability (33% Weighting)	Deployability (3% Weighting)	Maintainability (22% Weighting)	Usability (23% Weighting)
Husqvarna 575XPW	97	100	100	92	92	94
Stihl MS460R	94	90	96	96	94	94
Tempest 575XT-20-DG.404	92	80	100	92	90	94
Unifire PS-20-DG-SB	91	82	92	96	92	96
Cutters Edge CE2171RSD8A	90	72	100	92	86	94
Echo CS-670	81	86	70	84	88	86

Note:

<sup>1</sup> Scores contained in the assessment report may be displayed differently. For the purposes of the SAVER Summary, all SAVER category scores are normalized using a 100-point scale and rounded to the nearest whole number.




	 <b>Pros</b>	<ul style="list-style-type: none"> <li>• Initial cost</li> <li>• Cutting speed</li> <li>• Cuts through multiple materials</li> <li>• Weight</li> <li>• Easy to start</li> </ul>
	 <b>Cons</b>	<ul style="list-style-type: none"> <li>• Half wrap handle</li> <li>• Sprocket tip not field-replaceable</li> </ul>
<b>Husqvarna 575XPW</b>	<b>Composite Assessment Score: 97</b>	

-balanced, maneuverable, and—with an engine displacement of 73.5 cubic centimeters (cc)—has enough power and speed for emergency response applications. The saw cut smoothly through multiple materials and evaluators commented that the saw’s size and weight are preferred for this application. The fuel tank is easy to fill and provides sufficient operational capacity without adding excess weight or bulk, and the fuel and oil caps are leak-proof and interchangeable. Smaller departments will be able to afford the 575XPW due to its low initial cost; however, the saw is not equipped with a carbide saw chain or depth gauge. Associated additional costs should be considered if these items are required.

While most evaluators were satisfied with the saw’s anti-vibration system, one evaluator felt that the half wrap handle contributed to additional vibration; evaluators preferred a full wrap handle. A lighter saw is also preferable for precision cuts. It was noted that the saw is field-maintainable with the exception of the guide bar sprocket tip, which can be lubed but not replaced in the field. Also, the field service kit cannot be carried on the saw. In addition, evaluators were unsure that the automatic oiler would provide enough lubricating oil to the saw chain.

### Stihl MS460R

The Stihl MS460R received the second highest composite score. Evaluators stated that the saw was

	 <b>Pros</b>	<ul style="list-style-type: none"> <li>• Cuts through multiple materials</li> <li>• Easy-to-fill fuel tank</li> <li>• Leak-proof fuel and oil caps</li> <li>• Full wrap handle</li> <li>• Easy guide bar replacement</li> </ul>
	 <b>Cons</b>	<ul style="list-style-type: none"> <li>• Sprocket tip not field-replaceable</li> <li>• Fuel filter replacement</li> </ul>
<b>Stihl MS460R</b>	<b>Composite Assessment Score: 94</b>	




well-balanced and—with an engine displacement of 76.5 cc—had more than enough power to cut complex roofing materials. Based on its power, evaluators felt that the saw could support a longer guide bar. The fuel tank is easy to fill and provides sufficient operational capacity without adding excess weight or bulk, and the leak-proof fuel cap is unique in that it requires only a quarter turn to fully close; the oil cap is also leak-proof. The saw is equipped with a full wrap handle, which allows operators to comfortably position the saw; though vibration was felt through the handle, it was tolerable. With an initial cost that includes a carbide saw chain and depth gauge, evaluators found the saw to be a good value.

The MS460R does not have a compression release, leading to mixed opinions about how easy the saw is to start. Evaluators indicated that the saw is field-maintainable with the exception of the sprocket tip bar, which cannot be lubed or replaced in the field. It was also noted that fuel filter replacement is difficult due to the short intake hose. While the saw’s weight assisted in pushing through multiple materials, evaluators found the saw heavy for some applications, particularly precision cuts.

### Tempest 575XT-20-DG.404

The Tempest 575XT-20-DG.404 tied for the third highest composite score. Evaluators commented that the saw is well-balanced, cuts well, and—with an engine displacement of 73.5 cc—has enough power for emergency response applications. The fuel tank is easy to fill and provides sufficient operational capacity without adding excess weight or bulk, and fuel and oil caps are leak-proof and interchangeable. The saw is also equipped with a strong, lightweight, full wrap handle, which allows operators to comfortably position the saw. Evaluators also considered the tool holder a plus.

The 575XT-20-DG.404 under-performed when using the carbide tooth saw chain, which wore out or lost teeth when cutting multiple materials. It was noted




	 <b>Pros</b>	<ul style="list-style-type: none"> <li>• Cutting speed</li> <li>• Full wrap handle</li> <li>• Easy-to-fill fuel tank</li> </ul>
	 <b>Cons</b>	<ul style="list-style-type: none"> <li>• Sprocket tip not field-replaceable</li> <li>• Initial cost</li> </ul>
<b>Tempest 575XT-20-DG.404</b>	<b>Composite Assessment Score: 92</b>	

that, in some cases, warm starts took multiple attempts. Evaluators felt that the saw is too heavy for use in a long-term wildland fire situation, but ideal for roof or ventilation operations. They were also unsure that the automatic oiler would provide enough lubricating oil to the saw chain. The saw is field-maintainable with the exception of the sprocket tip bar; the sprocket tip is not repairable and in the event of a failure, the guide bar must be replaced. In addition, the tip contains sealed bearings that cannot be lubricated. Overall, evaluators found the initial cost high and noted that price may be prohibitive for smaller departments.

### Unifire PS-20-DG-SB

The Unifire PS-20-DG-SB tied for the third highest composite score. Evaluators indicated that the saw has a good size and cutting speed and enough power for emergency response applications with an engine displacement of 74 cc. The fuel tank is easy to fill and provides sufficient operational capacity without adding excess weight or bulk, and the fuel and oil caps are leak-proof and interchangeable. The full wrap handle allows operators to comfortably position the saw. It was also noted that the tool holder is a plus.




The PS-20-DG-SB had difficulty cutting multiple materials; it would get bogged down in the middle of the cut. The saw also stopped running, indicating a problem with continuous operations. Evaluators felt that the depth gauge, which is heavy and not easily removed, did not provide enough value to justify its additional weight. They were also unsure that the automatic oiler would provide enough lubricating oil to the saw chain. With the exception of the sprocket tip bar, the saw is field-maintainable; the sprocket tip bar can be lubed, but not replaced in the field. The saw's weight was thought to be heavy for some applications, but did assist in pushing through multiple materials. In general, evaluators found the initial cost high and potentially prohibitive for smaller departments.

	 <b>Pros</b>	<ul style="list-style-type: none"> <li>• Full wrap handle</li> <li>• Easy-to-fill fuel tank</li> <li>• Size</li> </ul>
	 <b>Cons</b>	<ul style="list-style-type: none"> <li>• Difficulty cutting through multiple materials</li> <li>• Sprocket tip not field-replaceable</li> <li>• Initial cost</li> </ul>
<b>Unifire PS-20-DG-SB</b>	<b>Composite Assessment Score: 91</b>	

### Cutters Edge CE2171RSD8A




The Cutters Edge CE2171RSD8A received the fourth highest composite score. Evaluators reported that the saw starts easily and is well-balanced, and its cutting speed and ability to cut smoothly through multiple materials are outstanding. With an engine displacement of 71 cc, the saw has enough power for emergency response applications. It is equipped with a full wrap handle, which allows operators to comfortably position the saw. The tool holder on the grab bar was also viewed as a plus. It was noted that the fuel tank is easy to fill and provides sufficient operational capacity without adding excess weight or bulk, and the fuel and oil caps are leak-proof.

The CE2171RSD8A under-performed during the freestyle scenario; the bullet saw chain wore out and lost teeth when cutting through conduit. It was also noted that the depth gauge added substantial weight and cannot be easily removed. The saw is field-maintainable with the exception of the sprocket tip bar, which can be lubed but not replaced in the field. Evaluators were unsure that the automatic oiler would provide enough lubricating oil to the saw chain. In addition, spare parts must be procured through a dealer or distributor, which led to the lowest parts availability rating of all the assessed products. Evaluators found the initial cost high and indicated that the 1-year warranty is insufficient; a 2-year warranty is the industry standard.

	 <b>Pros</b>	<ul style="list-style-type: none"> <li>• Cutting speed</li> <li>• Cuts through multiple materials</li> <li>• Full wrap handle</li> </ul>
	 <b>Cons</b>	<ul style="list-style-type: none"> <li>• Parts availability</li> <li>• Initial cost</li> <li>• Sprocket tip not field-replaceable</li> <li>• 1-year warranty</li> </ul>
<b>Cutters Edge CE2171RSD8A</b>	<b>Composite Assessment Score: 90</b>	

### Echo CS-670

The Echo CS-670 received the lowest composite score. Evaluators indicated that the saw is lightweight, well-balanced, and maneuverable. They also commented favorably on the saw's ability to start easily and cut through multiple materials. The fuel tank is easy to fill and provides sufficient operational capacity without adding excess weight or bulk, and the fuel and oil caps are leak-proof and interchangeable. The initial cost is affordable for small departments and

	 <b>Pros</b>	<ul style="list-style-type: none"> <li>• Initial cost</li> <li>• Cuts through multiple materials</li> <li>• Replaceable fuel filter</li> <li>• Easy to start</li> </ul>
	 <b>Cons</b>	<ul style="list-style-type: none"> <li>• Cutting speed</li> <li>• Bogged frequently</li> <li>• Chain brake handle attachment</li> <li>• Saw chain replacement difficult</li> <li>• Half wrap handle</li> <li>• Sprocket tip not field-replaceable</li> <li>• 1-year warranty</li> </ul>
<b>Echo CS-670</b>		<b>Composite Assessment Score: 81</b>

brake handle. The saw is field-maintainable with the exception of the sprocket tip bar, which can be lubed but not replaced in the field. In addition, the saw chain was difficult to change and there is no way to carry the field maintenance kit on the chain saw. Evaluators noted that the 1-year warranty is insufficient; a 2-year warranty is the industry standard.

## Conclusion

Following the assessment, evaluators reached the unanimous conclusion that any saw with a large powerhead can be used in emergency response applications. Chain saws with varying powerheads and differing features were used to cut wood and building material—including steel conduit, metal lath, and composite concrete board—using high-speed steel chains.

Evaluators also noted that the steel saw chain performed better than the carbide saw chain, and using high-speed steel chains, rather than expensive carbide chains, could lead to a significant cost savings. When making a procurement decision, emergency response agencies should carefully weigh the overall capabilities and limitations of each chain saw against the needs of their agency.

All reports in this series are available upon request at <https://www.rkb.us/saver>.



































































































































































































satisfactory to the saw’s level of performance; however, the saw is not equipped with a carbide saw chain or depth gauge. Associated additional costs should be considered if these items are required.

Evaluators indicated that with an engine displacement of 67 cc, the CS-670 does not have enough power for emergency response applications. The saw also bogged down frequently, effecting its cutting speed. While the powerhead supported a guide bar long enough to cut through multiple layers, evaluators felt that a guide bar longer than 18 inches would cause problems due to lack of power. A full wrap handle would have also been preferred to the saw’s half wrap handle, and a heavier saw would have aided in plunge cuts. Evaluators were also unsatisfied with the anti-vibration system and the attachment of the chain

**Table 2. Chain Saw Specifications**

Specifications						
	Husqvarna 575XPW	Stihl MS460R	Tempest 575XT-20-DG.404	Unifire PS-20-DG-SB	Cutters Edge CE2171RSD8A	Echo CS-670
Cost	\$690	\$1,150	\$2,400	\$2,048	\$2,399	\$539
Displacement	73.5 cc	76.5 cc	73.5 cc	74 cc	70.7 cc	66.7 cc
Chain Saw Powerhead Weight	14.55 pounds	15.4 pounds	15.4 pounds	13 pounds	21.65 pounds	14.3 pounds
Guide Bar Length	16 to 32 inches	16 to 25 inches	16 to 28 inches	16 to 20 inches	12 to 20 inches	16 to 27 inches
Fuel Capacity	1.48 pints	1.69 pints	1.48 pints	1.62 pints	1.68 pints	1.35 pints
Warranty Coverage	2 years	2 years	2 years	2 years	1 year	1 year
Included Accessories	Guide bar, 3/8-inch high-speed steel cutting chain, maintenance kit	Guide bar, carbide .063-inch cutting chain, depth gauge, maintenance kit	Guide bar, carbide .063-inch cutting chain, depth gauge, maintenance kit	Guide bar, carbide .063-inch cutting chain, depth gauge, maintenance kit	Guide bar, carbide .063-inch “bullet type” cutting chain, depth gauge, maintenance kit	Guide bar, 3/8-inch high-speed steel cutting chain, guide bar end cover, maintenance kit

**Table 3. SAVER Category and Criteria Scores<sup>1</sup>**

KEY								
Least Favorable		Most Favorable	Husqvarna 575XPW	Stihl MS460R	Tempest 575XT-20-DG.404	Unifire PS-20-DG-SB	Cutters Edge CE2171RSD8A	Echo CS-670
								
Assessment Criteria								
Affordability								
Initial Cost								
Warranty								
Capability								
Engine Displacement								
Cuts Through Multiple Materials								
Cutting Speed								
Powerhead								
Deployability								
Size								
Maintainability								
Field Changeable Saw Chain								
Parts Availability								
Manufacturer Support								
Replaceable Air Filter								
Available Service and Support Centers								
Leak-proof and Vented Fuel and Oil Caps								
Ease of Guide Bar Replacement								
Replaceable Sprocket Tip Bar								
Replaceable Fuel Filter								
Field Replaceable Pull Cord and Handle								
Field Service Kit								
Usability								
Full Wrap Handle								
Weight								
Chain Brake Handle Attachment								
Anti-vibration Systems								
Adjustable Automatic Oiler								
Easy to Start								
Easy-to-Fill Fuel Tank								
Fuel Tank Size								

<sup>1</sup> Averaged criteria ratings for each product that was assessed are graphically represented by colored and shaded circles. Highest ratings are represented by full green circles.