Battery-Powered Rescue Tools for Vehicle Extrication Assessment QuickLook

BATTERY-POWERED RESCUE TOOLS FOR VEHICLE EXTRICATION

Battery-powered rescue tools for vehicle extrication, including spreading, cutting, and spreading/cutting combination tools, are used by emergency responders to create greater access to persons trapped within vehicles by spreading or removing areas of damaged vehicle from around them. This equipment falls under the Authorized Equipment List (AEL) reference number 03SR-02-TPHY titled "Tools, Power, Hydraulic, Pneumatic."

Assessment Overview

From October 25–27, 2022, the National Urban Security Technology Laboratory's (NUSTL) System Assessment and Validation for Emergency Responders (SAVER) program, with the support of DAGER Technology, LLC (DAGER), conducted an assessment of battery-powered spreaders and cutters for vehicle extrication (hereafter, "extrication tools") that comply with National Fire Protection Association (NFPA) standards. The assessment was held at General Motors Milford Proving Ground in Milford, Michigan where emergency responders had hands-on experience with six extrication tools and provided feedback to help response agencies make operational and procurement decisions. Assessment activities and evaluation criteria were based on recommendations from a focus group of subject matter experts (SMEs) responders. A report on that focus group can be found in the SAVER Document Library at www.dhs.gov/science-and-technology/science-and-technology-directorate/saver/st-battery-powered-rescue-tools-vehicle-extrication.

Nine SMEs from Colorado, Illinois, New York, Texas, Virginia and Washington DC assessed three cutters and three spreaders (identified below) by using them in simulated operational scenarios involving different types of vehicles. Throughout these scenarios the SMEs assessed 22* evaluation criteria in five SAVER Categories: Capability, Usability, Affordability, Maintainability and Deployability. Nine criteria were assessed operationally: battery operating time, visual displays, LED lights, ergonomics, ease of use, portability, compatibility with PPE, startup time and anti-jam release. Thirteen other criteria – durability, NFPA 1936* performance rating, battery performance, accessories, replacement battery cost, initial price, warranty/service plans, training, customer service, in-house maintenance, mounting options, battery operating conditions and storage conditions – were assessed by reviewing manufacturer-provided specifications.

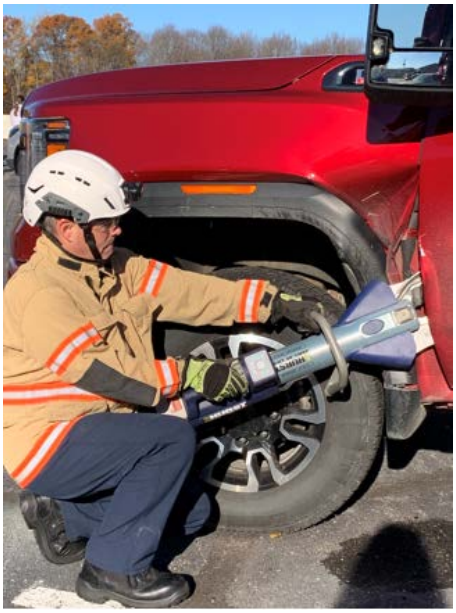


Figure 1. An evaluator uses a HURST S789 E3 cutter on the driver-side door of a truck.

Figure 2. An evaluator uses a Genesis S49-SL3 EForce spreader on the A pillar of a vehicle.

* The NFPA 1936 performance rating criterion is relevant only to cutters therefore cutters were assessed against 22 criteria and spreaders against 21.

Assessed Cutters

Genesis Rescue Systems
C236-SL3 EForce

Holmatro
Pentheon PCU50

HURST Jaws of Life
S789 E3

Assessed Spreaders

Genesis Rescue Systems
S49-SL3 EForce Spreader

Holmatro
Pentheon PSP40

HURST Jaws of Life
SP555 E3

Image Credits: Genesis (left), Holmatro (center) and HURST (right)

Table 1. Cutters' Performance in the Five SAVER Categories

Company	Model	Overall Score	Capability	Usability	Affordability	Maintainability	Deployability
HURST	S789 E3	4.2	4.5	4.1	3.9	4.4	4.1
Holmatro	Pentheon PCU50	4.0	4.0	4.2	3.3	4.3	4.5
Genesis	C236-SL3 EForce	3.5	3.2	3.2	3.9	3.9	3.7

Table 2. Spreaders' Performance in the Five SAVER Categories

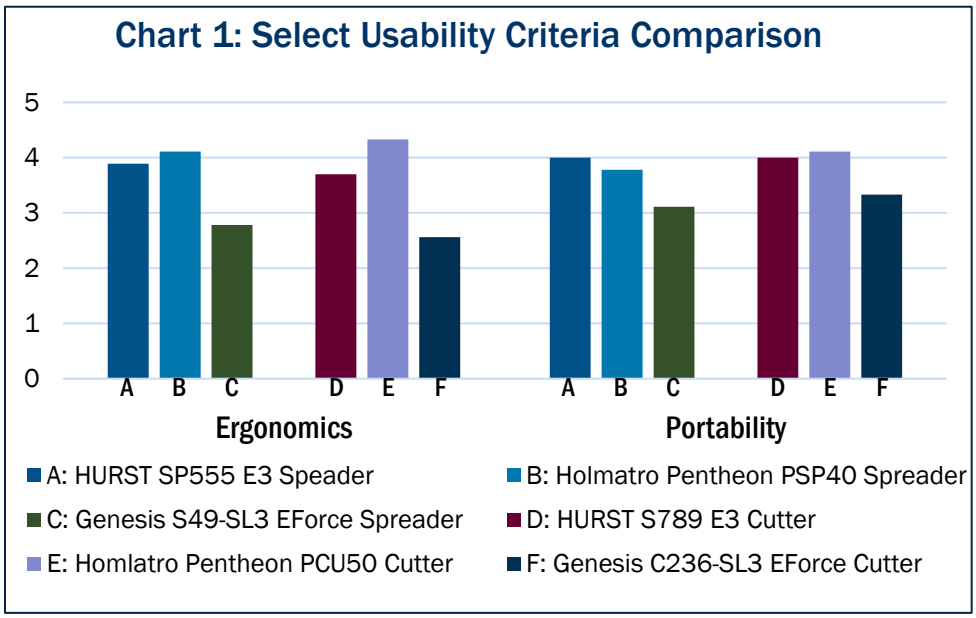
Company	Model	Overall Score	Capability	Usability	Affordability	Maintainability	Deployability
HURST	SP555 E3	4.3	4.6	4.2	3.9	4.4	4.2
Holmatro	Pentheon PSP40	4.0	4.2	4.0	3.3	4.1	4.4
Genesis	S49-SL3 EForce	3.5	3.0	3.4	4.2	3.8	3.5

Overall Results

HURST scored the highest overall for both cutters and spreaders, followed by Holmatro and then Genesis. The tables above present the overall scores and category scores for each product by rescue tool type. Products are listed from highest to lowest overall score. Each criterion is scored on a scale from 1 to 5. The category scores are determined by calculation of a weighted average of the evaluation criteria scores. The overall score is a weighted average of the five category scores. An average rating for each criterion is calculated by summing the evaluators' scores and dividing the sum by the number of responses.

Key Takeaways

Scores for four select criteria covering Usability and Capability are displayed in Charts 1 and 2. These criteria highlight key findings between the devices and where evaluators found more pronounced differences between the tools. Products are displayed in order of their score by criterion with spreaders as the three bars on the left and cutters as the three bars on the right by criteria.



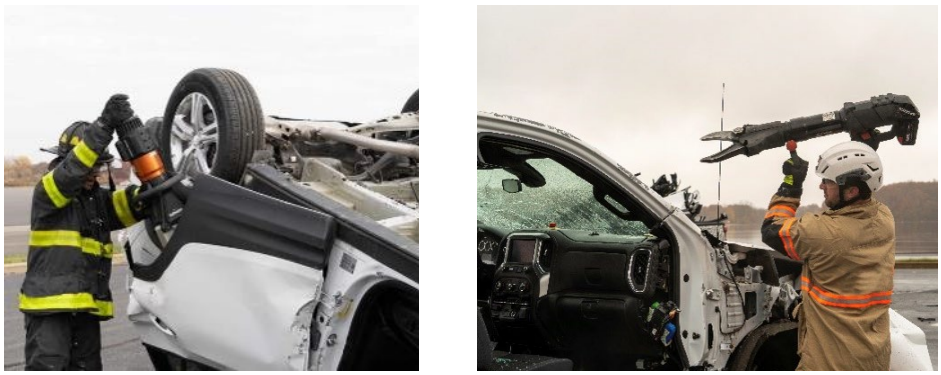


Figure 3. A responder operates a Holmatro Pentheon PCU50 Cutter, using the 360 rear handle for leverage (left). Another responder lifts a Genesis C236-SL3 EForce Cutter into place (right); note the length and back end design of the tool.

Chart 1: Usability

The handle form factor on both the cutters and spreaders were integral to the ergonomics and portability of the tools. The Holmatro Pentheon PCU50 cutter, with its 30-degree offset and 360-degree rear handle, scored the highest in both ergonomics and portability. Evaluators found the device balanced and attributed that to its curved battery, the battery's placement and the rear handle.

Evaluators scored the Genesis products lowest, attributing their scores to being unbalanced due to the design of the backend and length of the tool both of which impacted portability. The adjustable handle further detracted from ergonomics as the locking mechanism resulted in continued movement during use and transportation. Two evaluators found that the back piece of the Genesis spreader also restricted use, requiring them to alter their positions and techniques. Evaluators also factored in the tools' operational switches when assessing usability and ergonomics. Each manufacturer has a unique switch – Genesis a trigger, Holmatro a throttle and HURST uses a thumb-notched wheel switch.

Battery-Powered Rescue Tools

Science and Technology

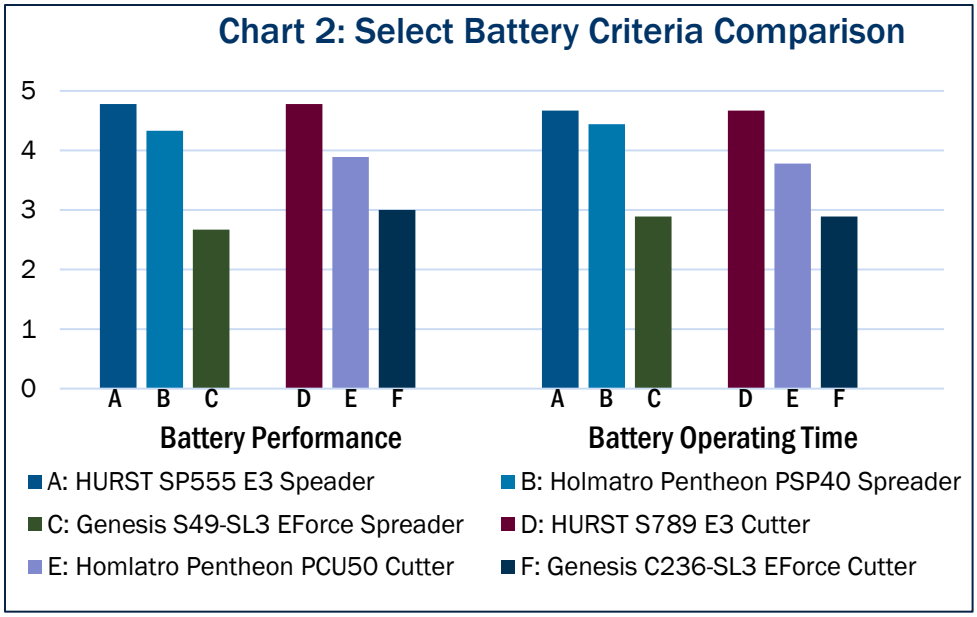


Chart 2: Capability

Evaluators deemed that battery performance and battery operating time are important operational factors. The HURST tools, which use a proprietary battery, scored the highest as their manufacturer-reported operating time was the longest, which was confirmed by responders' observations during the assessment activities.

The Genesis tools, which use a Milwaukee V28 battery, scored the lowest due to limited battery operating time reported by the manufacturer and anecdotally observed during the assessment. Additionally, the Genesis tools go into standby mode after thirty seconds of inactivity, which requires users to turn the tool back on for continued use. Evaluators had mixed feedback regarding this feature: some found it advantageous for saving battery life, while others would prefer a buffer longer than thirty seconds.

Figure 4. HURST (left), Holmatro (center) and Genesis (right) batteries.

For More Information

This document provides limited information on SAVER's battery-powered rescue tools for vehicle extrication assessment including highlights and comparative analysis. Additional information on the assessment and the complete comparative results will be provided in a full report to be published within the SAVER Document Library, specifically the "Battery-Powered Rescue Tools for Vehicle Extrication" page found at https://www.dhs.gov/science-and-technology/science-and-technology-directorate/saver/st-battery-powered-rescue-tools-vehicle-extrication.

More than 1,000 knowledge products can be found within the SAVER Document Library at www.dhs.gov/science-and-technology/saver-documents-library. For more information on the National Urban Security Technology Laboratory please visit our website or contact us at NUSTL@hq.dhs.gov.

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