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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

Rescue Boards

(AEL reference number 03WA-02-BORD)

In order to provide emergency responders with information on currently available rescue boards, capabilities, and considerations, Science Applications International Corporation (SAIC) conducted a comparative assessment of rescue boards for the System Assessment and Validation for Emergency Responders (SAVER) Program in July 2010. Detailed findings are provided in the Assessment Report on Rescue Boards, which is available by request at <https://www.rkb.us/saver>.

Background

A rescue board is a specialized, rapidly deployable craft for water and ice rescue operations. Emergency responders use these boards to conduct search and rescue response efforts for victims in marine environments. These efforts include medically stabilizing and extricating victims in the shortest amount of time while maintaining rescuer safety. The boards can be used in floodwaters, swift water, and rip currents, and during ocean surf and ice rescues.

Assessment

The SAVER Program conducted a market survey to investigate currently available rescue boards. The primary objective of the market survey was to provide the nation's emergency responders with an overview of the rescue boards available, as well as their capabilities, features, and considerations.

Prior to the assessment, eight emergency responders were chosen from various jurisdictions to participate in a focus group. Participants possessed strong backgrounds in fire service, emergency medicine, search and rescue, and hazardous materials (HAZMAT) response. The focus group's primary assignment was to develop rescue board evaluation criteria; however, they were also tasked with recommending possible uses and operational outcomes to support the assessment plan development. The group's final task was to recommend for evaluation specific rescue boards considered potentially beneficial to the response disciplines.

Based on focus group recommendations, market survey research, and system availability, four rescue boards were assessed. The focus group also recommended that the assessment provide feedback on an inflatable board for informational purposes only; the inflatable board was not scored as part of the comparative assessment. The following rescue boards were selected:

- Carlson Designs Rescue Board
- Extractor Rescue Sleds RIVERx
- Surftech International 7'6" Swift Water Rescue
- Rocky Mountain Riverboards (RMR) RescueBoard
- Northwest River Supplies (NRS) Inflatable Rescue Board.

Eight emergency responders served as evaluators for this assessment. All evaluators had experience in emergency response disciplines including

firefighting, law enforcement, search and rescue, emergency medical services, and HAZMAT response. Evaluators were required to have completed training and received swift water technician certification, and have at least 2 years of experience using rescue boards.

Evaluators were tasked to participate in controlled rescue operations in smooth, slow-moving, moderate, and swift water conditions. The assessment environment and activities performed were replicable should there be a future need to repeat an identical or similar assessment.

Assessment Results

Evaluators rated the rescue boards based on the evaluation criteria established by the rescue boards focus group. Each criterion was assigned to one of the five SAVER categories and then assigned a weight for its level of importance. Once the criteria were weighted, the five SAVER Program categories were assigned a percentage value to represent the level of each category's importance relative to the other categories.

Table 1 displays the composite assessment scores as well as the category scores for each product. Higher scores indicate a higher rating by evaluators. For product specifications, see table 2. To view how each rescue board scored against the evaluation criteria assigned to the SAVER Program categories, see table 3.

The following paragraphs provide a brief summary of evaluator comments and feedback on each rescue board used during the assessment. The systems are

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.

listed from highest to lowest composite score. The complete assessment report includes a breakdown of evaluator comments by criterion.

Carlson Designs Rescue Board

Carlson Designs Rescue Board received the highest composite score. The board is well-constructed and rugged, with a hard plastic bottom that is durable and provides protection for the board. The handles are durable, well-constructed, and well-placed, though one plastic grommet pulled slightly through the bottom

Table 1. Rescue Board Assessment Results¹

Product	Composite Score	Affordability (5% Weighting)	Capability (35% Weighting)	Deployability (20% Weighting)	Maintainability (10% Weighting)	Usability (30% Weighting)
Carlson Designs Rescue Board	82	73	83	84	74	84
Extractor Rescue Sleds RIVERx	78	77	80	80	79	74
Surftech International 7'6" Swift Water Rescue	74	77	73	82	63	74
RMR RescueBoard	57	52	48	71	61	58

Note:

¹ 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.

skin during the assessment. The handles feature finger grooves and do not collapse. The weight capacity of the board ensures safe rescue and retrieval of a water rescue victim by providing high flotation; the board remains buoyant for two people. In addition, the board does not absorb water. The board is a good length and shape for easy movement, and the curve on the board's tail allows a responder to conform to the board, making it easier to control, steer, and maneuver. The padding and molded grooves down the center improve comfort and enhance control. The board provides the same buoyancy for two people as it does for one person; the additional buoyancy is an advantage in calm water, but is difficult to control in swift water. The board has a good center of gravity and can be easily righted if flipped over during operations. The easily deployable board is lightweight and can be carried by one responder. The Carlson is priced well, especially considering the 3-year warranty on the skin and handles.

The Carlson is not designed with grooves or ribs on the smooth bottom side of the board. The black top and black handles of the board are not easily seen, and there is no reflective trim. The board does not include attachment points other than handles; holes or grommets for ropes would give rescuers additional options when performing their tasks. In addition,

	 Pros	<ul style="list-style-type: none"> • Buoyancy in smooth water • Easy to maneuver with fins • Center channels • Good center of gravity • Easy to right • Easy to tow • Board length good for simultaneous kicking and paddling • Width for paddling • Rigid handles • Finger grooves on handles • Lightweight • Does not absorb water • Easy to deploy • Versatile
	 Cons	<ul style="list-style-type: none"> • Lack of control in swift water • Smooth bottom • Low visibility • No reflective trim • Handle positions not good for carrying or transport • Handle loosened • No front attachment points • Difficult to decontaminate
Carlson Designs Rescue Board	Composite Assessment Score: 82	

more handles would give victims additional places to grasp and enhance carrying options. As with the other boards, the manufacturer does not provide information as to whether the board can be decontaminated without degrading the board materials.

Extractor Rescue Sleds RIVERx

The Extractor Rescue Sleds RIVERx received the second highest composite score. The board protects one person well and is durable and constructed with large, adjustable handles that are easy to grip. There are holes molded into the board for drainage and rope attachment points. The board is designed with elbow and torso indentations on the top surface and has chines on the tail, which enhance maneuverability. The board has a good center of balance, and paddling, steering, and maneuverability are relatively easy due to weight placement and board shape; the board is easy to right and tow. The 18-pound board is easy to carry for short distances and maintained a good center of balance.

The bright yellow color of the board and the contrasting red of the handles are highly visible. The

	 Pros	<ul style="list-style-type: none"> • Buoyancy • Durability • Side elbow supports • Stabilizing chines • Easy to right • Easy to deploy • Easy to tow • Well-balanced when carried • Concave hull shape • Non-slip surface • Adjustable handles • Large, easy-to-grip handles • Well-placed handles (high, middle, and low) • Angle of middle handles • Color contrast of handles and board • Attachment holes • Versatility • Easy to maintain • Able to repair locally • Easy to drain water
	 Cons	<ul style="list-style-type: none"> • Weight when carried • Full leg kicking hindered by length of board • Paddling hindered by molded side • Arms rubbed by sides of board when paddling • No reflective trim
Extractor Rescue Sleds RIVERx	Composite Assessment Score: 78	

non-slip textured deck padding is comfortable, and the deck material has limited slippage, does not absorb water, and provides additional protection. This board also includes rails that can be added to the bottom for ice rescue operations. The manufacturer provides instructions for how to repair the board locally, including the types of tools and materials required and a supply source for spare parts. For major repairs, the board can be returned to the manufacturer. The cost of the Extractor is justified based on the board's durability and versatility.

Though the shape of the board forms to the user's body, the molded elbow supports can sometimes limit full use of arms. The board submerges under the weight of two people, and one team noted that the board sinks in swift water. The width of the board hinders the user's ability to paddle and causes fatigue when paddling for long distances. There are no reflective materials on the board to aid low-light visibility. At times, the Extractor had some difficulty remaining on a level plane, with some lifting of the nose observed during the assessment tasks.

Surftech International 7'6" Swift Water Rescue

The Surftech International 7'6" Swift Water Rescue received the third highest composite score. The board works well in smooth water and is buoyant enough for one person, but could use additional buoyancy for two people. The length of the board provides support for the victim, and the board is evenly balanced. The Surftech's fin, width, and shape enhance maneuverability. The Surftech balances easily and has a good center of gravity, allowing the user to remain stable on the board. During swift water scenarios, however, the board is difficult to stabilize. The board's bright red color and yellow stripe are easy to see. The Surftech can also be used for other rescue applications including ice rescue.

The lightweight board has enough handles, but hands do not always fit, particularly when wearing gloves. The attachment points are too small to be utilized for ropes or other tethering gear. Users are unable to paddle and kick simultaneously due to the length of the board. Minimal maintenance is required for the Surftech and minor repairs can be made locally, though the manufacturer recommends a specialized repair shop, particularly for major repairs. Handles must be replaced after 1 year and are readily available from the manufacturer. Due to its length and removable fin, the Surftech may be challenging to

	<p> Pros</p> <ul style="list-style-type: none"> • Buoyancy for one person • Balance and center of gravity • Visibility • Maneuverability • Easy to paddle with arms • Glides well • Easy to secure victim when tethered • Durability • Easy to change out replaceable fin • Versatility
	<p> Cons</p> <ul style="list-style-type: none"> • Lack of buoyancy with two people • Difficult to kick due to length • Inadequate for swift water • Space between handles and board too small • Annual replacement of handles • Lack of tether points • Tether point too small • Single fin • Durability of fin • No reflective trim • Design too specialized • Storage space
<p>Surftech International 7'6" Swift Water Rescue</p>	<p>Composite Assessment Score: 74</p>

store and transport. In addition, if the fin is removed prior to storage, the responder has to reattach the fin prior to use. Some evaluators found the cost a little high, while others felt the Surftech's quality compared favorably to the cost.

RMR RescueBoard

The RMR RescueBoard received the lowest composite score. The front of the board has a "shark-head" shape that allows more room for the rescuer and/or victim. The handles are positioned appropriately to provide safety to the user and victim. Though the board is short, it is easy to paddle and can be righted without difficulty if flipped. The board is easy to carry by the top handles, but not the center and bottom handles. The RMR can also be used for ice rescues.

The board provides some flotation, but sinks easily and lacks buoyancy. In addition, the board absorbs and retains water. The foam on the RMR is weak and gouges easily. Though the handles are durable, they are not big enough for gloved hands, particularly the blue handles. Also, the handles are made of a durable nylon webbing material that is not rigid, causing the

	<p> Pros</p> <ul style="list-style-type: none"> • Shape of top • Number of handles • Can use on ice
	<p> Cons</p> <ul style="list-style-type: none"> • Maneuverability • Lack of buoyancy • Blue handles too small • Collapsing handles • Protruding hardware • Limited visibility • Weight • Water retention • Sharp foam on outer edge • Easy abrasion • Deck stiffener not secure • No reflective trim • Expensive replacement parts • Limited warranty
RMR RescueBoard	Composite Assessment Score: 57

handle to collapse and making it difficult for the user or victim to grasp. Exposed bolts attaching the handles to the board have the potential to injure rescuers and should be recessed. The raised metal handle brackets also create the potential for injury. The board is difficult to maneuver, and the black and white color is not easily visible during daylight or low-light conditions. The deck stiffener is not secure, creating an opening between the white rim and the board, which could cause injury. Also, the wet foam has sharp edges. The RMR is difficult to control, except when tethered on lines with a technical rope system, and there are not sufficient attachment points for tethering. The center of gravity is not sufficient and the board does not maintain a level plane. The RMR is lightweight when dry, but much heavier after use due to water absorption, requiring prolonged drying time before storage. The board does not have extensive maintenance requirements, but the bolts on the board had to be tightened several times during the assessment. Minor repairs can be performed locally, though major repairs would have to be made by the manufacturer with the purchaser responsible for shipping costs. The RMR is overpriced with a limited warranty, and the follow-on cost of \$45 to \$50 per replacement handle is too high.

NRS Inflatable Rescue Board

Evaluators suggested that an inflatable board be assessed as well. As a result, the NRS Inflatable Rescue Board was chosen to allow evaluators an opportunity to assess this type of equipment for information purposes only; therefore, the inflatable

	<p> Pros</p> <ul style="list-style-type: none"> • Lightweight • Easy to carry • High visibility • Shape; rear stability; easily accommodated use of fins • Handles easy to grip • Durable, stitched, rubber handle • Most inexpensive; a throw-away; easily replaced • Buoyancy easily adjusted by releasing or adding air • Easy-to-tow D-ring • Repair kit available; can repair locally • Storage bag • Protective cover
	<p> Cons</p> <ul style="list-style-type: none"> • No reflective materials • Extremely slick surface • Small handles • Too few handles • Handle placement (need rear handles) • Took too long to inflate (8+ minutes) • Took on excessive water between cover and bladder • Only one air chamber; board unusable if damaged • Not enough attachment points
NRS Inflatable Rescue Board	Composite Assessment Score: N/A

boards were not scored, though feedback and observations were recorded.

The NRS is lightweight, easy to carry, and the bright orange color is highly visible. Handles are easy to grip, and the shape and rear stability were preferred features. The ability to adjust buoyancy by adding or releasing air makes the board more versatile, and it is easy to tow in smooth water with the use of the D-ring. The board is the least expensive of the boards assessed. A repair kit is available, and repairs can be made locally.

The NRS inflatable board's surface is slippery, and it has a limited number of attachment points. The handles are small, and the board does not have handles near the rear. With only one air chamber, the board would not be usable if it was damaged. At 8 minutes, the NRS takes too long to inflate, and the board takes on excessive water between the cover and the bladder.

Conclusion

Evaluators observed advantages and disadvantages of the assessed rescue boards. An analysis of the

evaluator comments and scores revealed these common observations:

- Evaluators placed a high value on rescue boards with high flotation capabilities because the adequate buoyancy allows the rescuer to maintain stability and maneuverability during water rescue operations.
- Evaluators expressed a strong preference for rescue boards that are well-made and constructed with quality materials so the boards are durable enough to withstand rough waters and collision with rocks and other hard objects or surfaces.
- Evaluators preferred rescue boards designed with bright colors for high visibility. In addition, evaluators commented that reflective sections or strips would further enhance visibility.
- Evaluators expressed a strong preference for rescue boards with easy-to-grip handles that are strong enough to withstand being pulled and pushed with great force. They favored rescue boards with handles large enough to be easily grasped. Evaluators preferred boards with handles placed at practical and varied positions and those with the capability to adjust or change handle positions to allow the rescuer and victim easy access.
- Evaluators placed a high value on rescue boards that are adequately sized and shaped for water rescue operations. They agreed that the board width and length should provide sufficient body support for the rescuer and/or the victim’s body and not interfere with paddling, performing swim strokes, or fully kicking legs.
- Evaluators expressed a strong preference for rescue boards that are well-balanced, lightweight, and easy to carry.
- Evaluators underscored the importance of manufacturers providing clear product information, which enables the responder to effectively evaluate the specifications, warranty, parts, and repair information. In addition, proper care and storage information can extend the life of the board and its components.

All reports in this series, as well as reports on other technologies, are available in the SAVER section of the Responder Knowledge Base (RKB) Web site at <https://www.rkb.us/saver>.

Table 2. Rescue Board Specifications

Product	Dimensions L x W x H	Weight	Construction	Color	Handles	Float Capacity
Carlson Designs Rescue Boards	54 x 24 x 4.5 in.	8 lbs	Closed-cell polyethylene foam	Black top, bright green bottom	4	165 lbs
Extractor Rescue Sleds RIVERx	55 x 24 x 6 in.	18 lbs	Molded polyethylene	Yellow with red handles and black deck padding	6	180 lbs
Surftech International 7'6" Swift Water Rescue	90 in. L Nose: 17.5 in. W Middle: 21.38 in. W Tail: 15 in. W	18 lbs	Fused EPS, epoxy, and fiberglass with EVA coating	Red top with yellow band, white bottom	10	Not available
Rocky Mountain Riverboards (RMR) RescueBoard	47 x 30 x 2 in.	10.5 lbs	Closed-cell polyethylene foam	Black/white with blue and red handles	4	Not available
Northwest River Supplies (NRS) Inflatable Rescue Board	58 x 30 in. (height not specified)	7 lbs	840-denier, urethane-coated nylon top, reinforced urethane bottom	Bright orange with black handles	4	300 lbs

Notes:

EPS = expanded polystyrene
EVA = ethylene vinyl acetate

H = height
in. = inches

L = length
lbs = pounds

W = width

Table 3. Rescue Board Criteria Ratings¹

KEY						
Least Favorable	➔	Most Favorable	Carlson Designs Rescue Board	Extractor Rescue Sleds RIVERx	Surftech International 7'6" Swift Water Rescue	RMR RescueBoard
						
Assessment Criteria						
Affordability						
Initial cost						
Follow-on costs						
Capability						
Flotation						
Construction						
Maneuverability						
Safety						
Deployability						
Preparation for use						
Weight						
Shape/size						
Maintainability						
User maintenance						
Storage requirements						
Cleaning requirements						
Shelf life						
Usability						
Ergonomic design						
Control						
Stability						

Note:

¹ 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.