



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 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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Throw Bags

In order to provide emergency responders with information on currently available throw bag capabilities, limitations, and usability, Science Applications International Corporation (SAIC) conducted a comparative assessment of water rescue throw bags for the SAVER Program in July 2008. Detailed findings are provided in the complete Assessment Report on Throw Bags, which is available by request at <https://www.rkb.us/saver>.

Background

Throw bags are important rescue devices used by specially trained emergency response personnel to reach victims during still water and swift water rescues. Throw bags are sometimes used as messenger lines (or throwlines) to deploy larger bags and as anchors to secure boats and other vessels to docks.

Numerous throw bag configurations exist that allow responders to select designs best suited for their individual needs. Different synthetics such as polypropylene, nylon, and polyester are used to construct the ropes, and rope lengths typically range from 50 to 100 feet. Floating rescue ropes are often brightly colored in yellow, red, or a combination of colors.

The bags in which the ropes are stored also vary. Manufacturers use materials such as Cordura® nylon, denier polyethylene, or pack cloth to construct the bags. Features such as handles, grab loops, drawstring closures, and elastic loops for illumination sticks are available. Some throw bags provide built-in discs for flotation capabilities, and many offer mesh panels or grommets for easy drainage and ventilation. Throw bags are also available in an array of colors such as orange, red, blue, and yellow.

Assessment

A focus group of eight emergency response practitioners from various regions of the country met in December 2007 to identify equipment selection criteria, evaluation criteria, and assessment scenarios. Focus group-recommended selection criteria included varying rope lengths and different bag designs. Based on focus group recommendations and market survey research, SAIC selected the following four throw bag systems for assessment:

- Whitewater Designs, Inc., Reverse Taper Throw Bag
- North Water Paddle Sports Equipment, DL Wide-Mouth
- Northwest River Supplies (NRS), NRS NFPA Throw Bag
- Stearns®, Inc. Rescue Mate™.

Eight emergency response practitioners were selected to serve as assessment evaluators. Each of the participants were certified swift water technicians, and specific safety measures were followed throughout the assessment to mitigate risks.

Each throw bag was used during controlled still water and swift water rescue activities. Evaluators conducted four rotations, and a different throw bag was assigned for each rotation. There were four assessment stations within each

rotation: (1) stationary targets, (2) still water rescue, (3) swift water rescue, and (4) multiple victim rescues.

Station 1 allowed evaluators to practice deploying the throw bags at stationary targets at distances of 50 feet before proceeding to the water exercises. Station 2 required evaluators to rescue a victim in still water who was staged at a set distance. Station 3 required evaluators to rescue a single victim moving downstream, and Station 4 required evaluators to rescue multiple victims in swift moving water, with rescues timed approximately 30 seconds apart.

Assessment Results

Evaluators rated the throw bags based on the evaluation criteria established by the focus group. Each recommended criterion was assigned to one of the five SAVER categories, and each SAVER category was assigned a weighting factor to indicate its impact on the total composite score. The SAVER category and composite scores are shown in table 1. Higher scores indicate better equipment performance.

The following paragraphs provide a brief summary of the evaluator comments and feedback on each throw bag system and present the systems from the highest to lowest composite score. To view how each throw bag scored within the specific evaluation criteria assigned to the SAVER Program categories, see table 2 (on page 7).

The complete assessment report includes a breakdown of evaluator comments by individual criterion.

Reverse Taper

The Reverse Taper received the highest score in the usability category. Evaluators stated the Reverse Taper includes a 75-foot pliable, buoyant rope that has

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.

a 3/8-inch diameter. Its 1,900-pound tensile strength was deemed adequate for routine water rescues, as well as other non-life threatening response applications.




Evaluators agreed that the throw bag can be quickly accessed and minimal steps are required for an expedient deployment. They commented that multiple throwing techniques can be effective, and the throw bag can be accurately cast to reach its intended targets and victims. Evaluators noted that the yellow rope includes orange tracers that are highly visible. In addition, its construction allows both the rescuer and

Table 1. Throw Bags Assessment Results¹

Throw Bag	Composite Score	Affordability (5% Weighting)	Capability (30% Weighting)	Deployability (45% Weighting)	Maintainability (5% Weighting)	Usability (15% Weighting)
Reverse Taper	78	74	77	81	48	81
DL Wide-Mouth	77	64	75	82	50	77
NRS NFPA	76	78	80	76	50	75
Rescue Mate	66	48	68	68	38	75

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.

	 Pros <ul style="list-style-type: none"> • Bag size • Bag design • Bag materials • Bag construction • Drawstring location • Visibility • Repacking • Flight dynamics • Buoyancy (rope and bag) • Grip • Buckle size • Quick-release strap • Strap design • Transport
	 Cons <ul style="list-style-type: none"> • Ventilation • No reflective features/strips • Bag anchorage • Rope construction • Rope entanglement • No cleaning/maintenance information provided
Reverse Taper	Composite Assessment Score: 78

victim to maintain a secure grip during rescue operations.

Minimal steps are also required for redeployment, and evaluators stated that multiple throwing techniques can be used to pay out the rope for subsequent throws. They noted that the Reverse Taper tends to redeploy nicely once it becomes wet.

Evaluators reported that the Reverse Taper bag features a large opening for deployment, and its thick material is easy to grasp while stuffing the rope. The bag includes two foam disks, a grab loop, a barrel-lock drawstring, a quick-release handle, and a grommet for drainage purposes. It is composed of 1,000 denier Cordura Nylon with tapered seams and quality threading, and its features are securely attached, which prevents hindrances from occurring during deployment. The Reverse Taper bag is perfectly sized to house the rope, and its durable construction permits repetitive use. Evaluators stated that the bag offers multiple attachment points that allow the throw bag to be easily carried in different configurations or attached to a response vehicle for transport. Evaluators agreed that the throw bag is reasonably priced and that its quality justifies its cost.




Evaluators reported that the rope arrives from the manufacturer in a tightly prearranged coil; therefore, it must be removed and loosely packed back into the bag prior to its initial use. They reported that the Reverse Taper rope often knots and tangles during retrieval and redeployment, and the bag tends to fill with water and

anchor during retrieval. Evaluators expressed concerns that the loose braiding of the rope could allow dirt and pebbles to enter the rope and weaken its durability.

DL Wide-Mouth

The DL Wide-Mouth received the highest scores in the deployability and maintainability categories. Evaluators reported that the 60-foot rope is stiff at first but becomes supple with use. They noted that the 1/4-inch rope is double braided with quality materials and provides a 3,700-pound tensile strength. The bright yellow rope is highly visible and provides an adequate grip during still water rescues. They stated that the DL Wide-Mouth rope is buoyant and appears to be resistant to abrasions, and it offers the versatility of being used for other response applications that are not life-safety situations. Evaluators reported that the throw bag can be quickly accessed and deployed with minimal steps, and the rope pays out well without any tangles using multiple throwing techniques. Evaluators stated that the rope is easy to recover, and redeployment is more accurate once the rope becomes wet. Redeployment also requires minimal steps, and multiple throwing techniques can be used to successfully redeploy the rope. Evaluators noted that the manufacturer states the rope is rot and mildew resistant and has a high resistance to sunlight, heat, and abrasions.

The DL Wide-Mouth nylon bag features a barrel-lock drawstring closure and a grommet for drainage. It has

	 Pros <ul style="list-style-type: none"> • Size • Weight • Belt options • Rigid-edge mouth • Rope strength • Rope length • Redeployed well in coil • Mouth/opening • Transport/storage • Contact information • Quick-release buckle • Durability
	 Cons <ul style="list-style-type: none"> • Bag visibility • Bag length • Rope diameter • Rope construction • Throat of bag • Expensive • No cleaning/maintenance information provided • Drawstring location
DL Wide-Mouth	Composite Assessment Score: 77




a grab loop, a side carrying strap, and a quick-release buckle, and its quality construction allows it to endure repetitive use. Evaluators reported that the bag material appears abrasion resistant, and its durable features are securely sewn to the bag so that there are no hindrances during deployment. They stated that the red bag offers a rigid-edged mouth that is easy to grip and wide enough to accommodate a gloved hand. Evaluators stated that the belt loops included on the throw bag allow the system to be easily attached to the user’s belt or personal flotation device (PFD), and its size allows the bag to be easily transported on the user’s waistline and stored.

Evaluators noted that it is difficult for victims to see or maintain a grip on the DL Wide-Mouth while in moving water. They stated that the rope is difficult to repack due to the narrow storage area of the bag (i.e., throat), and they agreed that the rope would repack more easily if the bag was longer or the throat diameter was larger. Evaluators noted that the DL Wide-Mouth is the most expensive throw bag used during the assessment, and there was concern that the quality of the throw bag system may not justify its higher cost.

NRS NFPA

The NRS NFPA received the highest scores in the capability and affordability categories, and it tied with the DL Wide-Mouth in receiving the highest maintainability score. The NRS NFPA includes a 75-foot Grabline™ by Sterling Rope that has a 3/8-inch diameter and tensile strength of 3,282 pounds. Evaluators reported that the rope remains buoyant during water rescues, and its materials appear resistant to abrasions for extended use. They stated that the rope is adequate for diverse water rescue situations, and it is versatile enough to be used for other response operations as well (i.e., non life-safety situations). Evaluators noted that the yellow rope and orange tracers are highly visible, and the rope texture allows the rescuer and victims to maintain sufficient grip. Evaluators reported that the NRS NFPA can be quickly accessed, and multiple throwing techniques can be used to effectively deploy and redeploy the rope. Evaluators stated that they experienced no twisting or knotting with this rope, and the rope redeployed nicely once it has become wet.

The NRS NFPA bag features a large, flexible opening with a barrel-lock drawstring. It includes an internal flotation disk, quick-release straps, mesh panels, a grommet, and a grab loop with a polyethylene sheath.




	<div>  </div> <div> Pros </div> <ul style="list-style-type: none"> • Repacking • Drawstring length • Mesh panels • Warranty • NFPA compliance • Reflective strips • Light stick holder • Bag color • Quick-release buckles • Buoyancy (rope and bag) • Knotting capabilities • Cost • Protective sheath on loop
	<div>  </div> <div> Cons </div> <ul style="list-style-type: none"> • Bulkiness/heaviness • Transport • Rope length • Bag size • Location of quick-release strap • Entanglement hazard • No cleaning/maintenance information provided
NRS NFPA	Composite Assessment Score: 76

Evaluators noted that the orange bag offers two reflective strips and attachments for an optional light stick for increased visibility. They stated that the bag provides durable features not typically found on throw bags within its price range, and they agreed that the throw bag system is an excellent value. Evaluators reported that the bag is well made of thick, durable materials that are capable of resisting abrasions and withstanding repetitive use. Its quick-release buckles can be easily used with gloves, and they allow the throw bag to be easily connected to the user’s PFD or response vehicle.

Evaluators stated that the top strap on the bag sometimes tangles with the rope if the buckle is not fastened prior to paying out the rope. They noted that the rope length, combined with its diameter and weight, seems to slow recovery and redeployment. Evaluators noted that the bag is bulkier than the other assessed throw bags. Evaluators reported that the nylon material of the bag becomes slippery when wet and creates challenges for the rescuer when attempting to repack the rope.

Rescue Mate

The Rescue Mate scored the lowest in all SAVER categories and tied with the NRS NFPA in the usability category. A 100-foot polypropylene rope is included with the Rescue Mate throw bag system. It has a 3/8-inch diameter and 1,800 pounds of tensile strength. The Rescue Mate bag includes a flotation disk, a quick-release carrying strap, a barrel-lock

	 Pros <ul style="list-style-type: none"> • Location of quick-release • Reflective stripe • Rope quality • Drawstring location
	 Cons <ul style="list-style-type: none"> • Bag construction/stitching • Rope length • Drawstring length • Bag anchorage • Redeployment • Value/cost • No cleaning/maintenance information provided
Rescue Mate	Composite Assessment Score: 66

drawstring, a grommet, and a 1-inch reflective strip. Orange tracers within the yellow rope make the system highly visible. Evaluators reported that the rope provides adequate strength for routine water rescue operations, and it appears to be capable of withstanding repetitive use. They also stated that the rope is versatile and can be used for different applications. Evaluators reported that the throw bag can be quickly accessed, and minimal steps are required for deployment. Multiple throwing techniques can be used to effectively deploy and redeploy the rope, and evaluators stated that the rope can be easily deployed and retrieved. Evaluators reported that the bag is adequately sized for rope storage, its quick-release easily attaches to the user, and its side handle does not hinder rope deployment.

Due to being tightly coiled in the bag, evaluators stated the rope must be removed and repacked prior to its initial use. They reported that the rope does not fully deploy on second and subsequent throws, noting that it only pays out approximately 70 feet during redeployment. In addition, the rope has the tendency to knot and tangle during retrieval and redeployment, and its excessive line creates an entanglement hazard for the rescuer. Evaluators reported that the bag fills with water during retrieval and has the tendency to become inverted while being pulled back in. They noted that the bag material becomes slippery when wet, creating difficulties for the user when repacking the rope. The mouth of the throw bag is too tight to easily repack the rope, and the seams of the bag tend to rip when stuffing the rope for redeployment.

Evaluators expressed concern that the dark orange color of the bag can easily become dirty or faded. They agreed that the bag is poorly constructed with weak seams, and the bag features are not securely sewn to the bag. In addition, evaluators agreed that the bag cannot endure abrasion or repetitive responder

use—the handle detached from the bag and seams pulled apart after only two throws during the assessment. Although the Rescue Mate is the least expensive throw bag assessed, evaluators agreed its cost is not justified due to the poor quality and construction of the bag.

Conclusion

Emergency response practitioners from across the nation successfully evaluated four water rescue throw bags. The Reverse Taper by White Water Designs, Inc. scored the highest, followed by the DL Wide-Mouth by North Water Paddle Sports Equipment. The NRS NFPA by Northwest River Supplies received the third highest score, and the Rescue Mate by Stearns, Inc. received the lowest score.

- Evaluators felt that throw bags should be well made and constructed with quality materials.
- Evaluators agreed that durable features should be securely attached to the bag, and they preferred bags with features such as quick-release straps, mesh panels, barrel-lock closures, and buckles that can be easily operated with a gloved hand.
- Evaluators stated that bright colors such as orange or yellow allow the rope and bag to be easily seen, and tracers braided throughout the rope increase visibility.
- Evaluators agreed that throw bags should be adequately sized for water rescue operations and that they should be designed to enhance deployment, retrieval, and redeployment.
- Evaluators concluded that throw bags should be capable of being easily grasped during swift water rescue to ensure that both the victim and user are able to maintain an adequate grip during victim rescue and retrieval.

QuickLook Snapshot²








































































































Notes:

² 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.

³ Scores contained in the assessment report may be displayed differently. For purposes of the QuickLook, all SAVER category scores are normalized using a 100-point scale.

For additional information on the assessment and to access other reports in the series, visit the SAVER Web site (<https://www.rkb.us/saver>).

Table 2. SAVER Category and Criteria Scores

KEY					
Least Favorable	➔	Most Favorable			
					
		Reverse Taper	DL Wide-Mouth	NRS NFPA	Rescue Mate
Capability					
Rope construction					
Bag construction					
Rope size					
Rope durability					
Bag size					
Rope visibility					
Bag visibility					
Bag durability					
Accessories					
Usability					
Ease of retrieval					
Ease of attachment/detachment					
Versatility					
Affordability					
Initial cost					
Replacement/repairs					
Deployability					
Ease of deployment					
Deployment time					
Flight dynamics					
Ease of redeployment					
Ease of transport					
Maintainability					
Environmental effects					
Breathability					
Cleaning requirements					
Ease of repacking					
Storage		