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Science and Technology

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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

Surface Water Operations Fins

(AEL reference number 01SW-04-FINS)

In order to provide emergency responders with information on currently available surface water operations fins, Science Applications International Corporation (SAIC) conducted a comparative assessment of surface water operations fins for the System Assessment and Validation for Emergency Responders (SAVER) Program in May 2011. Detailed findings are provided in the Surface Water Operations Fins Assessment Report, which is available by request at <https://www.rkb.us/saver>.

Background

Surface water operations fins are used with surface water rescue ensembles by specially trained emergency responders to increase speed and maneuverability, reduce fatigue, and enhance operational capabilities during surface water operations.

Assessment Methodology

Prior to the assessment, eight emergency responders were chosen from various jurisdictions to participate in a focus group. Participants possessed strong backgrounds in surface/swift water rescue, search and rescue, firefighting, and emergency medicine. The group's primary objectives were to recommend evaluation criteria, product selection criteria, and possible scenarios for the assessment.

Based on focus group recommendations, market research, and product availability, the following fins were assessed:

- Shredder SAR (Shredder), Aqua Lung;
- Stealth Rescue Flipfin™ (Flipfin), Omega Aquatics;
- Rocket II, Aqua Lung; and
- Hot Spot Rescue Fins (Hot Spot), Viper.

Eight responders served as evaluators for this assessment. All evaluators had at least 5 years of experience using surface water operations fins.

Evaluators were tasked to participate in two phases of the assessment: the specification assessment and the operational assessment. During the specification assessment, evaluators assessed the fins based on vendor-provided information and specifications. During the operational assessment, evaluators performed water rescue operations in Class I (slow), Class II (moderate), and Class III (swift) currents.

Assessment Results

Evaluators rated the surface water operations fins based on the evaluation criteria established by the focus group. The focus group assigned each criterion 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

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. The advantages and disadvantages of each fin, as identified by evaluators, are listed in table 2. To view how each of the surface water operations fins scored against the evaluation criteria assigned to the SAVER categories, see table 3. For product specifications, see table 4.

The following paragraphs provide a brief summary of evaluator comments and feedback on the surface water operations fins used during the assessment; the complete assessment report includes a breakdown of evaluator comments by evaluation criteria. The fins are listed from highest to lowest composite score.

Shredder

The Shredder fins received a composite score of 80. The following paragraphs provide a summary of evaluator comments and feedback on the Shredder fins.

The Shredder surface water operations fins were lightweight and highly visible. Their length and traction made them easy to walk in for short distances. They had a large, open-toed foot pocket with good drainage and were designed with padded heel straps. The Shredder fins were easy to don and doff and easy to adjust with one hand, including a gloved hand.

Evaluators stated, however, that the fins were short and rigid and provided limited propulsion power and speed. They also found the fins difficult to maneuver in the varying water currents.

SAVER Category Definitions	
Affordability	groups criteria related to life-cycle costs of a piece of equipment or system.
Capability	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 relevant tasks.
Deployability	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	groups criteria related to the maintenance and restoration of a piece of equipment or system to operational condition by responders.
Usability	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.

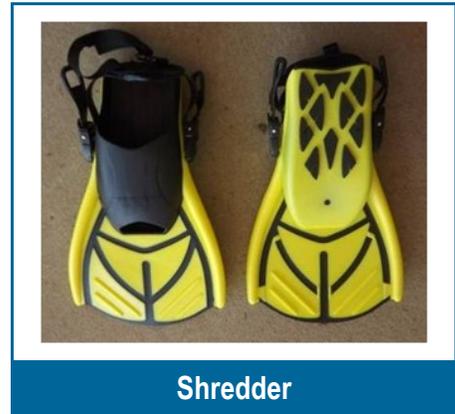


Table 1. Surface Water Operations Fins Assessment Results¹

Fins	Composite Score	Affordability (20% Weighting)	Capability (20% Weighting)	Deployability (10% Weighting)	Maintainability (10% Weighting)	Usability (40% Weighting)
Shredder	80	88	83	89	85	72
Flipfin	66	56	74	92	63	60
Rocket II	65	65	57	56	66	72
Hot Spot	62	75	50	60	67	61

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.



Flipfin

Flipfin

The Flipfin received a composite score of 66. The following paragraphs provide a summary of evaluator comments and feedback on the Flipfins.

The Flipfin surface water operations fins were buoyant, lightweight, and designed with a comfortable foot pocket and bottom tread. They were easy to don and doff with the pull loops on the straps, and they were easy to walk in when the blade hinge was engaged.

Evaluators stated, however, that the hinge was problematic at times during the assessment because the blade would not stay down when swimming. The hinge also showed wear after a few assessment

rotations. The length and rigidity of the Flipfin blades made the fins difficult to control in strong currents, which caused fatigue.



Rocket II

Rocket II

The Rocket II received a composite score of 65. The following paragraphs provide a summary of evaluator comments and feedback on the Rocket II fins.

The Rocket II surface water operations fins were flexible and provided good speed and propulsion power. The weight and length of the fins provided power and were good for swimming in still water and moderate water currents. The foot pockets were comfortable, were designed with tread on the bottom, and had good drainage. The Rocket II fins had attachment points on both ends that were used when hanging the fins for cleaning. The replacement straps are reasonably priced.

Evaluators stated, however, that the Rocket II fins were difficult to don, doff, and walk in. The length of the blades was not conducive to swift water applications, and the fins had no buoyancy. The heel straps were difficult to adjust with and without gloves, and the straps were difficult to lock in place.



Hot Spot

Hot Spot

The Hot Spot received a composite score of 62. The following paragraphs provide a summary of evaluator comments and feedback on the Hot Spot fins.

The short blades of the Hot Spot fins made them easy to walk in and provided good propulsion power. The fins were easy to maneuver in varying water currents. The length of the blades can be easily customized, and the heel straps were easy to adjust. The costs of the fins and the replacement straps are reasonable.

Evaluators stated, however, that the Hot Spot fins were slightly heavy and rigid, requiring extra exertion when swimming. Evaluators described the foot pocket as narrow and stated that there is no traction on the bottom of the fins. The fins were difficult to don and doff, and the heel straps had no pull loop and were difficult to lock after adjusted. The black color of the fins had low visibility, and the fins were not buoyant.

Conclusion

Evaluators were able to successfully complete the assessment tasks with the Shredder, Flipfin, Rocket II, and Hot Spot fins. Analysis of evaluator comments and scores revealed the following common observations concerning the assessed surface water operations fins:

- Evaluators placed a high value on fins that were designed to provide speed and propulsion.
- Evaluators preferred fins that were lightweight and buoyant.
- Evaluators preferred fins that were easy to don and doff.
- Evaluators favored fins that had comfortable foot pockets and heel straps that provided a secure fit and were easy to adjust.
- Evaluators favored foot pockets that were designed to allow for sufficient drainage.
- Evaluators expressed a strong preference for fins that were flexible and not too rigid to allow good maneuverability.
- Evaluators favored fins that were designed with tread on the bottoms for traction and with blades that supported walking for short distances.

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. Surface Water Operations Fins Advantages and Disadvantages

Fins	Advantages	Disadvantages
 <p>Shredder Composite Score: 80</p>	<ul style="list-style-type: none"> • Lightweight • High visibility • Second strap to tether • Heel padding on strap • Large foot pocket • Drainage holes • Tread on bottom • Easy-to-adjust straps • Positive buoyancy • Easy to don and doff • Easy to walk in • Easy to replace straps 	<ul style="list-style-type: none"> • Lack of speed • Blade shape inhibits propulsion • Lack of maneuverability • Retention strap inhibits emergency doffing • Too rigid
 <p>Flipfin Composite Score: 66</p>	<ul style="list-style-type: none"> • Lightweight • Easy to release in emergency • Comfortable foot pocket • Tread on bottom • Easy-to-adjust strap • Accessories • Easy to don and doff • Easy to walk in • Easy to replace strap 	<ul style="list-style-type: none"> • Lack of control in strong currents • Excessive length • Blade would frequently unlock while swimming • Straps would not stay adjusted • Low visibility • Rigidity of blade causes excessive fatigue • No drain holes • Cost • Lack of durability • Excessive wear on blade locking device • Limited warranty
 <p>Rocket II Composite Score: 65</p>	<ul style="list-style-type: none"> • Speed and propulsion power • Flexibility • Drainage holes • Tread on bottom • Comfortable foot pocket • Attachment points on both ends • Replacement strap cost • Easy to clean 	<ul style="list-style-type: none"> • Length too long for swift water • Low visibility • Difficult to adjust • Difficult to lock strap in place • Negative buoyancy • Difficult to don and doff • Difficult to walk in

Table 2. Surface Water Operations Fins Advantages and Disadvantages (Continued)

Fins	Advantages	Disadvantages
 <p>Hot Spot Composite Score: 62</p>	<ul style="list-style-type: none"> • Short blade • Propulsion • Customizable length • Maneuverability • Easy-to-adjust straps • Replacement strap cost • Easy to walk in 	<ul style="list-style-type: none"> • Slightly heavy • Low visibility • Rigid design • Narrow foot pocket • Lack of traction • No loop on heel strap • Difficult to lock strap after adjustment • Negative buoyancy • Difficult to don and doff

Table 3. Surface Water Operations Fins Criteria Ratings¹

<p>KEY</p> <p>Least Favorable → Most Favorable</p> <p>○ ◐ ◑ ◒ ●</p>	 <p>Shredder</p>	 <p>Flipfin</p>	 <p>Rocket II</p>	 <p>Hot Spot</p>
Affordability				
Costs	●	◐	◑	◑
Accessories	◑	◑	◑	◑
Capability				
Construction	◑	◑	◑	◐
Adjustment capabilities	●	◑	◐	◐
Buoyancy	●	◑	◐	◐
Deployability				
Ease of donning/doffing (out of water)	●	●	◐	◐
Walking capability	●	●	◐	◑
Maintainability				
Field replacement	●	◑	◑	◑
Cleaning requirements	◑	◑	◑	◑
Usability				
Performance	◑	◐	●	◑
Secure fit	●	◑	◑	◑
Emergency removal	◑	●	◐	◐
Visibility	●	◐	◐	◐

Note:

¹ Averaged criteria ratings for each assessed product are graphically represented by colored and shaded circles. Highest ratings are represented by full green circles.

Table 4. Surface Water Operations Fins Specifications¹

Specifications	Shredder	Flipfin	Rocket II	Hot Spot
Material	Techno polymer	Blended polypropylene/ thermal plastic elastomer (TPE)	Rubber	Rubber
Closure(s)	Quick release	Quick release	Stainless steel buckle, strap with loop	Rubber with nickel-coated buckles
Colors	Yellow/black Black	Red/black Black	Black	Black
Size(s)	Large	Large 7-9	Regular 9-11	Medium
		Extra large 11-14	Super 12+	Large
Dimensions (length x width)	16.5 x 10 inches	12.25 x 9.25 inches	21.75 x 9.5 inches	14 x 9 inches
Weight	4.5 pounds	4.0 pounds (Large) 4.4 pounds (Extra large)	6.2 pounds	5.0 pounds
MSRP cost	\$70	\$96	\$140 to \$150	\$50

Notes:

¹ Information was provided by manufacturers and has not been independently verified by the SAVER Program.

MSRP = manufacturer's suggested retail price