System Assessment and Validation for emergency Responders

Summary

SAVER

September 2004

Assessment of Non-Motorized Extrication Devices

This comparative analysis project was conducted by the Center for Domestic Preparedness in Anniston, Alabama.

SAVER Summary of the Following Report:

Center for Domestic Preparedness, Office Of Domestic Preparedness, (1) *Market Survey for Responder Assessment/Validation of User Equipment (RAVUE)—Extrication Devices*, (2) *Extrication Devices Focus Group Report: Focus Group Assessment Criteria Recommendations*, and (3) *Assessment Report: Responder Assessment and Validation of User Equipment (RAVUE): Non-Motorized Extrication Devices*, special reports prepared for the Responder Assessment and Validation of User Equipment (RAVUE) Program, 2004.

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Extrication devices are commonly used in the emergency response community for removing victims with limited mobility. As with most emergency response equipment, varying manufacturers and models are available. The Center for Domestic Preparedness (CDP) in McClellan, AL, a SAVER Partner, conducted a comparative analysis on several available models. This assessment is unique in that the non-motorized extrication equipment was operated by practitioners using standardized weapons of mass destruction (WMD) scenarios.

The evaluation criterion for this assessment was based upon the recommendations of a focus group that met at the CDP on April 7, 2004.

Evaluation Criteria

Based on focus group discussions, the following evaluation measurements were recommended for evaluation of WMD response extrication equipment. These criteria are listed in order of significance, beginning with those judged to be of greatest importance.

High Priority Evaluation Criteria

- Ease of use
- Lightweight
- Portability
- Durability
- Non-reactive/ reusable/multiple extrications
- Multiple environments
- Ease of decontamination

Medium Priority Evaluation Criteria

- Equipment compatibility
- Cost
- Easy to assemble
- Storage

Low Priority Evaluation Criteria

- Inter-agency compatibility
- Sizability
- Simple/clear instructions or Diagram
- Recoverable
- Disposable

Items to be Assessed

Of the twenty-six companies contacted that produce extrication devices, nine vendors responded. In addition, four companies responded to the Sources Sought Notice posted on the Federal Business Opportunity website. From these manufacturers, nine devices were selected for assessment.
The products nominated were organized into three movement categories:

- Drag-type devices
- Carry devices
- Extrication chairs

Several manufacturers recommended more than one product for assessment. However, the CDP recommended that a "top-of-the-line" tool from vendors with more than one model be assessed.

Selected Devices

The extrication devices selected are listed in table 1. They consist of five carry devices, three drag devices, and one extrication chair.

Selected Extrication Devices	
Company	**Model**
Activeaid, Inc.	#40B4C.I.D. Spinegurard®
Arizona Industries for the Blind	Decontaminable Folding Pole Litter
Hartwell Medical Corporation	CombiCarrier®
Henley Board, Inc.	Henley Spinal Immobilization Device HB1010
LIfeSlider, Inc.	LS100 LifeSlider
Rapid Deployment Products, Inc.	Pro-Lite Spineboard® (716)
Red Sled, Inc	RED SLED
Skedco, Inc.	HMD Sked®
Stryker Medical	Model 6253 Evacuation Chair

Table 1: Selected Extrication Devices

Assessment Procedures

During the assessment, evaluator teams extricated non-ambulatory casualties from first and second floor structures and moved them approximately 70 yards from the building to a decontamination point. At the decontamination point, the victims were processed and passed to the simulated decontamination team. The evaluator teams took the same extrication device and returned to the incident site to extricate the next casualty.

To ensure objectivity, all devices were assessed by evaluators under similar physical stress conditions.

- Each device was evaluated by rested, slightly fatigued, and fatigued response personnel.
- Evaluators assessed each device while in Level A PPE in the three stress levels described above.

Three daily assessment segments were conducted at each lane in the hazardous materials training area. During each segment, a different extrication device was used for extricating three non-ambulatory victims. After extricating the third victim in the assessment segment, the evaluator team temporarily stopped assessment activities, hydrated themselves, and underwent a device debriefing. Following a one-hour rest and recovery period, the evaluators performed a second and third extrication vignette using other extrication devices. Nine non-ambulatory victims were extricated using a each device during the three assessment days.

Results

The evaluators were able to successfully accomplish the mission in each scenario with each device. The numerical results are presented in table 2. Each device has three scores that represent the evaluators' assessment of the device in the three evaluation priority categories (High, Medium, and Low). **Lower scores in the table indicates better device performance.**

Evaluator Responses to High Priority Evaluation Criteria

The following is a list of the focus group's high priority criteria:

- Ease of Use
- Lightweight
- Portability

Extrication Device	High Priority Criteria Score	Medium Priority Criteria Score	Low Priority Criteria Score
CombiCarrier®	38.36	61.64	151.77
Evacuation Chair	29.02	60.3	137.34
Folding Pole Litter	34.91	78.28	143.1
Henley Spinal Device	52.49	62.18	191.79
HMD Sked®	29.35	54.6	96.39
LifeSlider	36.41	67.98	159.84
Pro-Lite Spineboard®	39.32	54.48	117.93
REDSLED	40.99	67	137.73
Spineguard®	40.49	60.18	129.12

Table 2: Results of evaluator's assessment of extrication devices.

- Durability
- Non-reactive/ reusable/multiple extrications
- Use in multiple environments
- Ease of decontamination

The scoring order for the extrication devices is depicted in table 3.

During the post assessment review, evaluators commented that jurisdictions should consider using different type devices for different portions of the extrication. The suggested mission profile was to use one team with a drag-type device within the building, transferring the victim to another team with an extrication chair to descend the stairs. The third team with another device would be utilized to move the victim outside the building to the decontamination point.

Evaluator Responses to Medium Priority Evaluation Criteria

The following is a list of the focus group's medium priority criteria:

- Equipment Compatibility
- Cost
- Ease of Assembly
- Storage

Cost was not scored by the evaluators, but a comparison of equipment costs is provided. The scoring order for the extrication devices is depicted in table 4.

Cost was listed as being of medium importance to the Responder Focus Group determining the evaluation criteria. Therefore, it was included in figure 1 for completeness.
The Pro-Lite Spineboard® was received without immobilization straps or a head immobilization restraint. To configure the device similarly to the other extrication devices and to configure the board for moving patients safely down

High Priority Scoring Order
Evacuation Chair
HMD Sked®
Folding Pole Litter
LifeSlider
CombiCarrier®
Pro-Lite Spineboard®
Spineguard®
Red Sled
Henley Spinal Device

Table 3: High Priority Scoring Order of Extrication Devices

Medium Priority Scoring Order
Pro-Lite Spineboard®
HMD Sked®
Spineguard®
Evacuation Chair
CombiCarrier®
Henley Spinal Device
LifeSlider
Red Sled
Folding Pole Litter

Table 4: Medium Priority Scoring Order of Extrication Devices

Low Priority Scoring Order
HMD Sked®
Pro-Lite Spineboard®
Spineguard®
Evacuation Chair
Red Sled
Folding Pole Litter
CombiCarrier®
LifeSlider
Henley Spinal Device

Table 5: Low Priority Scoring Order of Extrication Devices

stairs, straps and head restraints were procured at an additional cost of $123.00. This raised the total comparative cost of the Pro-Lite Spineboard® to $324.00. It should also be noted that the Folding Pole Litter was not offered with straps.

Evaluator Responses to Low Priority Evaluation Criteria

The following is a list of the focus group's medium priority criteria:

- Interagency compatibility
- Sizability
- Simple/clear instructions or diagrams
- Recoverability
- Disposability

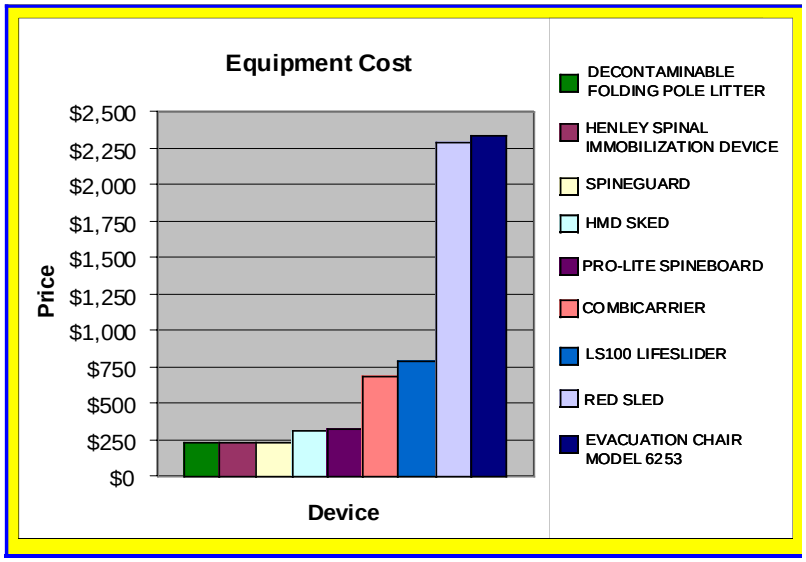

Figure 1: Extrication Device Equipment Cost

The scoring order for the extrication devices is depicted in table 5.

There were no known environmental, hazardous, or recoverable components or materials on any of the devices that would require special handling or special recovery procedures.

Comparative Assessment Conclusions

Each extrication device used in this assessment performed up to the manufacturer's advertised capabilities within the scenarios presented in the RAVUE assessment. No unrealistic or extravagant claims were noted. Additionally, all of the devices were able to be successfully used by the evaluators wearing Level A PPE. Therefore, all nine of the devices would be useful in extricating victims from a WMD mass casualty incident.

It is interesting to note that the two devices that evaluators scored the highest in the high priority evaluation criteria were among both the least and the most expensive items. This tends to indicate that cost is not a reliable indicator of relative merit for the extrication devices, especially within the scenarios used in this assessment.

It should also be recognized that most scenarios presented in this assessment involved descending no less than fifteen stairs. This resulted in several evaluator comments after the assessment, stating that devices such as the Red Sled were not advertised by their manufacturer as being designed for stair extrication. Thus, according to some evaluators, using this device in scenarios that required traversing stairs might be a misapplication of the devices' many other attributes. Consequently, the evaluators recommended that a combination of extrication devices might best contribute to a mass casualty situation, tailored to the environment in which the extrications would occur.

Lastly, the single area that evaluators believed manufacturers might easily improve upon is strap color coding and restraining strap configurations. Black straps with black buckles are nearly invisible when attempting to buckle them while wearing black protective gloves molded into the Level A suits. This is further complicated when operating under dimly lit conditions and looking through a fogged PPE face piece. Also the material used in the straps is important when considering ease of decontamination, because it needs to be easily handled by responders wearing Level A suits. Materials which would be easier to decontaminate might include loose weave synthetic materials resistant to agent absorption versus tight weave fiber materials such as cotton, polyester, or nylon.

Figure 2: Extrication Device Evaluation. The following weights were applied in computing the display on the left:

Affordability	**10%**
Capability	**30%**
Deploy ability	**20%**
Maintainability	**10%**
Usability	**30%**

However, readers are invited to use the "Adjust Weights" feature found on the SAVER website to change weighting factors and the star displays based on their local priorities.

For more information on non-motorized extrication devices, visit the SAVER website at http://www.dhs-saver.info or call the Center for Domestic Preparedness, RAVUE Chief, at (256) 847-2314.