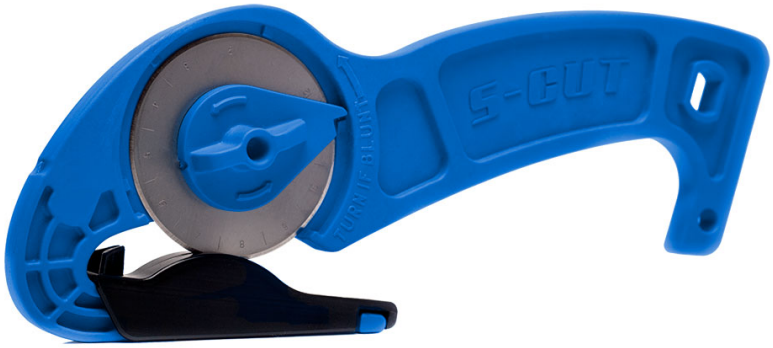
1. S-Cuts



Principal Investigator

Juan Cienfuegos, Southwest Synergistic Solutions, LLC

Capability Area of Interest

Humanitarian Assistance (HA), Disaster Response (DR), Defense Support to Civil Authority (DSCA), and pandemic response

Capability Description

The capability this experiment proposes to explore is the improvement S-Cuts represent over shears & other textile cutting tools in terms of long term cost savings and improved performance and safety of our military personnel and first responders. The S-Cut is capable of quickly and safely removing specialized suits like HAZMAT Suits, EOD suits, JSLIST suits and every day clothing as well.

S-CUT is designed for use on patients in rescue situations as well as emergency situations in hospitals. It is a fast way to remove the patient's clothes in order to expose injuries without needing to change the patient's position which could inflict further injury or unnecessary pain.

S-CUT replaces scissors, knifes and similar tools. Ordinary fabrics as well as leather belts, zippers and heavy outerwear can be easily cut. All you need is a free edge of the clothes where you can start the cut. S-CUT is designed for optimal ergonomics and provides an excellent grip. Using scissors in heavy materials will most often require a lot of effort. The S-CUT is used with a pulling action requiring minimal effort.

The circular cutting blade is recessed in order to protect the patient and user from injury. The cutting blade can be easily replaced without the need for any additional tools. Few parts, which can be easily removed and assembled, making the cleaning process easy.

Easily be twice as fast and move the patient half as much using the S-Cuts vs. using current cutting methods and tools

Experiment Hypothesis and Objectives

The objective of the experiment is to determine how much time and ease is afforded our military & first responder personnel when equipped with S-Cuts vs. shears and other military cutters. It is a fact, that the faster you can expose a wound, the faster you can treat a wound and this results in the chances of patient survival being increased. Moving the patient as little as possible in many situations is also very critical. What the experiment intends to prove is that the S-Cut tools are at least twice as effective and carrying one S-Cut is lighter than the number of shears required to perform the same cuts (clothing/suit removals).

Experiment Plan / Data Collection Plan

Imagine a disaster area created by a bomb or contamination from chemicals or that there is a huge oil spill and the persons cleaning the spillage need to take off their protective clothes, so do the folks found in the area at the time of the disaster. How quickly and effectively (not further injuring the patient) can the suits and clothing be removed?

I propose having four sets of responders, one set utilizes the S-Cut QE's, one set utilizes the S-Cuts 501's, one set utilizes currently issued medical shears, and one set utilizes the current cutters found in US Army IFAKS.

We either dress up 20 dummies or utilize 20 people to simulate patients that need to have their HAZMAT suit removed or need to remove their clothing to expose the wounds.

Five people are assigned to each set of responders. On a side by side comparison all responders start removing the suits or clothing from the patients. Once the patient has been removed from the suit or disrobed, then the responders attend to the next patient. During this time the patient that was recently attended too gets dressed once again so that a total of 10 to 20 patients per team are treated. We then take note of the number of tools required by each to team to remove the patients from their suits or clothing and the time it took. We also will take a questionnaire from the patients & responders as to how they felt about how much they had to move the patient to achieve removing the suit or clothing.

At the end of the exercise each responder will perform one cut using each tool and give their opinion as to which they find the most effective and desirable to have on hand to do their jobs the best they can.

Measures of Performance/Effectiveness

To do the test you need 40 to 80 sets of a mix of t-shirt, sweater, jeans, military clothing, HAZMAT suits, protective gear, jackets, boots, shoes, etc… The type of clothing you would wear in winter time.

Performance is measured by taking the time it takes each team to finish treating 10 to 20 patients. How many tools per team were needed will also be noted to determine the cost to attend the 10 to 20 patients and maybe try to make note of how much time getting new tools takes away from treating the patients.

What new capability does this represent?

The S-Cut tool ingenious approach that won it the 2016 EMS World Innovation award is the fact that it's like carrying 5 to 6 shears in one tool that is safer and more effective than shears. The new capability not require them to carry or look for a new pair of shears when needed because by simply rotating the blade on the S-Cuts you get a new cutting edge, using the same tool. The S-Cut is used with a pulling action requiring minimal effort. The circular cutting blade is recessed in order to protect the patient and user from injury. The cutting blade can be easily replaced without the need for any additional tools. Few parts, which can be easily removed and assembled, makes the cleaning process easy.

What capability gap does this address?

Improved life support during evacuation and warfighter performance enhancements are both addressed by the S-Cuts. It is a known fact that the faster you expose a wound the faster you can attend the wound and that contributes to improved probabilities of survival. Seconds do count! The S-Cut moves us from technologies using double or single edges that cannot be easily re-sharpened and are usually discarded after the blades dull to a technology in which the blades can be replaced and used multiple times, each time till the fresh edge dulls. Enhancing or warfighters performance in the battlefield regarding this area is important.

<u>Quantitative Results:</u>

Chart of results:

Times to finish cutting & total number of tools used

S-Cut 501	S-Cut QE	Shears	Rescue hook	
48.45 sec.	47.75 sec.	2.36.93 min.	1.33.43 min.	Round 1Time

Original	Original	Original	Original	# of Tools used
47.76 sec.	1.11.37 min.	3.11.78 min.	1.23.72 min.	Round 2 Time
Original	Original	Original	Original	# of tools used
1.32.32 min.	1.10.72 min.	2.50.10 min.	2.23.66 min.	Round 3 Time
Original	Original	Original	Replaced	# of tools used
25.81 sec.	45.10 sec.	2.42.03 min.	59.50 sec.	Round 4 Times
Same tool, switched to 2nd edge	Same tool, switched to 2nd edge	Replaced	2nd tool	# of tools used
N/A	N/A	N/A	N/A	Round 5
N/A	N/A	N/A	N/A	# of tools used

Round 1 results:

The S-Cuts were the fastest at removing the clothing. The S-Cut QE was slightly faster than the S-Cut 501 by less than 1 second. The Tytek 5.5” shears took over 3 times, more time to remove the same type of clothing. The Benchmade rescue hooks took almost twice as long as the S-Cuts.

Round 2 results:

The S-Cuts were the fastest at removing the clothing. The S-Cut 501 was the fastest and under a minute. The second fastest was the S-Cut QE, taking only ~23 seconds longer. A close third was the Benchmade rescue hook taking ~12 seconds longer than the S-Cut QE. In last place was the Tytek 5.5” shear taking more than 3 times longer than the S-Cut 501.

Round 3 results:

The S-Cuts were the fastest at removing the clothing. The S-Cut QE was the fastest at ~1 minute, 10 seconds. The S-cut 501 came in second at ~22 seconds longer than the S-Cut QE. The Benchmade rescue hook took more than twice as long as the S-Cut QE at ~2 minutes, 23 seconds and was replaced with a new one for this round. In this round, the Tytek 5.5" shears came in at a close fourth place taking only ~27 seconds longer than the Benchmade rescue hook. During this round, the shears were replaced and a new set used to finish the cutting.

Round 4 results:

The S-Cuts were the fastest at removing the clothing. The S-Cut 501 having been switched to the 2nd fresh edge, of six edges available, came in first with a time of 25.51 seconds. The S-Cut QE was also set to the 2nd fresh edge, of the 5 available edges, came in second taking only ~20 seconds longer. The Benchmade rescue hook came in a close third place taking only ~14 seconds longer than the S-Cut QE. The S-Cut 501, S-Cut QE & the Benchmade rescue hook all took less than 1 minute in this round. The 5.5" Tytek shears took almost 5 times longer than the S-Cut 501 finishing in ~2 minutes, 42 seconds.

Total tools used in the four rounds– 1 S-Cut 501, 1 S-Cut QE, 2 Benchmade rescue hooks, 2 5.5" Tytek shears.

Qualitative Results:

- The four Marines who participated all felt that the S-Cuts are the best choice for specialized units, for example EOD or CST/WMD teams. They also stated the S-Cuts have a place in all types of hospitals.
- Marines commented the S-Cuts were too bulky and that they liked the way the Benchmade rescue hooks fit easily with their gear. They also stated they liked the shears in general because they could be used for a variety of tasks that the Benchmade rescue hooks and S-Cuts could not.
- The types of clothes that were cut included sports coats, work type boots, leather belts, knitted tops, warm up bottoms, cotton shirts, sweaters, tennis shoes, cloth belts, winter boots, leather shoes, jeans and T-shirts. See images and clothing material below.
- Following are the comments from the Marines who participated in the S-Cut experiment when asked questions from both the perspective of the person cutting the clothing from the patient, and as the patient who's clothing was being cut off:

A. Patients perspective, person who's clothing was being removed.

Name - _Mark Krueger_____

Position - _____

Are you a medic or have prior medical experience (Y/N) - _____N_____

1. What tool was used to cut you out of the clothes?

Benchmade, shears, 501, QE

2. How do you feel the tool performed?

- Benchmade did well, but cutter had to move patient around
- Shears took a long time to remove clothes, dulled easily, had difficulty cutting
- 501 & QE performed very well. Clothes came off easily & they cut through all materials, a lot faster.

3. If multiple tools were used at different times, which ones were they, and share your opinion regarding which performed the best and why?

Best 1: 501, easy to grip

2: QE

3: Benchmade

Worst 4: Shears didn't maintain edge, random part that made it hard to get good cutting angle.

4. Did you feel comfortable with the tool or tools being used?

- I felt most comfortable having my clothes removed by the 501 and QE

Name - Mike Roots

Position - Recon Marine w/combat medicine training

Are you a medic or have prior medical experience (Y/N) - Yes

1. What tool was used to cut you out of the clothes?

Benchmade cutter, S-Cut 501, S-Cut QE, Shears

2. How do you feel the tool performed?

They all performed admirably in the light clothing I was wearing.

3. If multiple tools were used at different times, which ones were they, and share your opinion regarding which performed the best and why?

The S-Cut 501 made me feel the most comfortable with having clothing cut off of me, and it seemed to be the smoothest.

4. Did you feel comfortable with the tool or tools being used?

The S-Cut QE would be more realistic if it was smaller.

Name - __Matt Foglesong_____

Position - ____Recon Marine_____

Are you a medic or have prior medical experience (Y/N) - _Yes, Paramedic and USMC Combat Medicine Training_____

1. What tool was used to cut you out of the clothes?

The S-Cut 501 & QE

Trauma Shears

Benchmade hook knife

2. How do you feel the tool performed?

Trauma Shears and Bemchmade dulled quickly. S-Cut tools performed smoothly.

3. If multiple tools were used at different times, which ones were they, and share your opinion regarding which performed the best and why?

While the S-Cut tool worked quickest, it was also the smoothest. The hook blade & shears required change out.

4. Did you feel comfortable with the tool or tools being used?

S-Cut tools felt the safest.

Name - __Martin Prado SGT_____

Position - __Reconnaissance Man_____

Are you a medic or have prior medical experience (Y/N) - _Y prior medical experience_____

1. What tool was used to cut you out of the clothes?

S-Cut 501, S-Cut QE, Benchmade, Shears

2. How do you feel the tool performed?

S-Cut was the fastest of all of them and it was the only one that did not hurt at all.

3. If multiple tools were used at different times, which ones were they, and share your opinion regarding which performed the best and why?

S-Cuts were two best because they were safer & fastest

4. Did you feel comfortable with the tool or tools being used?

Yes

B. Perspective as the person cutting the clothes of the patient.

Name - ___Mark Krueger_____

Position - _____

Are you a medic or have prior medical experience (Y/N) -
_____N_____

1. Which tool did you use?

501, QE, Benchmade, Shears

2. How do you feel the tool performed?

The 501 & QE performed really well. Very little effort required to cut the clothing.

3. If you used multiple tools which ones were they, and share your opinion regarding which performed the best and why?

1: 501 – 501 fit in my hands better

2: QE

3: Benchmade

4: Shears

4. Did you feel comfortable using the tool or tools?

With the 501 & QE, I felt more comfortable because I had more control than with the Benchmade

Name - __Mike Roots_____

Position - __Recon Marine w/TCCC training/combat medicine

_____

Are you a medic or have prior medical experience (Y/N) -
__Yes_____

1. Which tool did you use?

Benchmade ripper, S-Cut 501, S-Cut QE, Shears

2. How do you feel the tool performed?

They all performed well, at first. The S-Cuts lasted longer, but the guard got caught in the holes of wool sweaters. The S-Cut QE blade popped out of the guard and was easily put back in position

3. If you used multiple tools which ones were they, and share your opinion regarding which performed the best and why?

The S-Cut 501 worked best for cutting the materials, but the S-Cut QE and Benchmade were right

4. Did you feel comfortable using the tool or tools?

Not around feet, but I did everywhere else.

The S-Cut QE would be more realistic if it was smaller.

Name - ____Matt Foglesong_____

Position - __Recon Marine_____

Are you a medic or have prior medical experience (Y/N) - _Yes, Paramedic and USMC Combat Med Trained_____

1. Which tool did you use?

S-Cut 501 & QE, Benchmade Rescue Hook, Trauma Shears

2. How do you feel the tool performed?

S-Cut 501 & QE tools were undoubtedly the quickest & smoothest

3. If you used multiple tools which ones were they, and share your opinion regarding which performed the best and why?

Shears & hook had to be swapped out, as expected. S-Cut tools were not. However, the S-Cut tools are too bulky

4. Did you feel comfortable using the tool or tools?

Most comfortable using the S-Cut tools, felt less likely to cut patient.

Name - ___Sgt Prado, Martin_____

Position - _Reconnaissance Man_____

Are you a medic or have prior medical experience (Y/N) - __Prior medical experience____

1. Which tool did you use?

S-Cut 501, S-Cut QE, Benchmade, shears

2. How do you feel the tool performed?

S-Cut 501 & QE – I liked both performed better than the Bechmade & shears.

3. If you used multiple tools which ones were they, and share your opinion regarding which performed the best and why?

S-Cut 501 & QE performed best, were fastest and could cut through anything quickly. Only downfall 501 & QE are a bit big.

Benchmade – (no comment made)

Shears – (no comment made)

4. Did you feel comfortable using the tool or tools?

Yes. If you could scale it down a bit then in my opinion they would be perfect.

It has been shown that the S-Cuts cut much faster and move the patient less during the process of removing clothing for the pose of exposing wounds as fast as possible, in order to treat the wound as fast as possible, thus increasing the chances of patient survivability and safety.

Data Questions

What does your data represent? (e.g. IR Video, track data, text, etc)

Time to removal of clothing and shoes during any MCI. Feedback text questionnaires.

What format(s) do you use for your data? (e.g. KML files, Cursor on Target, .txt, etc.…)

Text

How much data (of each type) do you collect or generate during a JIFX event? (e.g. 10GB of video)

One questionnaire from a patient's perspective with four questions. One questionnaire from a perspective of the person cutting the clothing, with four questions. A time sheet showing the time to remove the clothing in four rounds, each user using the four different tools. The participants used all four tools and were undressed using all four tools.

Observations & Comments:

The Tytek 5.5" shears, and the Benchmade rescues cutter had to be replaced at least once during the S-Cut experiment, while only one tool of the S-Cut models was required to finish the four rounds. It would take carrying at least 12 Tytek 5.5" shears to come close to matching the cutting performance of one, six sided, S-Cut 501 blade, before you would have to replace a six sided blade, & hygienic cover that weigh 8.1 grams together. Each Tytek 5.5" shear weighs 36.2 grams, so in order to match the performance of one S-Cut 501 (280 grams), with one 6-sided round blade, you would need to carry twelve Tytek 5.5" shears (36.3g X 12 = 435.6 grams).

The same applies to the Bechmade rescue cutters (50.7 grams each). You would need to carry twelve Benchmade rescue hooks (50.7 g X 12 = 608.4 g) in order to almost match the capability of one S-Cut 501.

When it comes to the S-Cut QE you would need to carry either 10 Tytek 5.5" shears to almost match the capability of one disposable S-Cut QE (62 g each).

Of all the four tools tested the Tytek 5.5" Shears did the poorest in both time to remove the clothing as well as in the questionnaires. The one comment in favor of the shears is that they could be used for more than removing clothing out in the field. The Benchmade rescue hook came in third place every round regarding time to remove the clothing but it did need to be replaced in order to finish four rounds.

Additional Questions:

Did you receive constructive end-user feedback on technology?

Yes, very good and useful feedback.

Did you discover additional capabilities with could be included in your technology?

Yes, by changing the design of the S-Cut handle to be smaller, and by possibly using a smaller round blade the S-Cut product could be the preferred rescue cutter in the field.

Did you discover additional applications of the technology you produced?

Yes, it could possibly be used for other cutting applications, for example cutting webbing.

Did you perform any on the fly development of your technology during the JIFX week?

No.

Were you provided with additional data necessary to conduct your experiment?

No, but I did receive the recommendation by one of the stakeholders to have each person cutting the clothing use each tool so that they could comment on each tool. This advice was taken and incorporated.

Were you provided with support services necessary to conduct your experiment?

Yes, without the participation of the four Marines I could not have conducted the experiment.

Did you engage in ad-hoc experimentation or collaboration with other experimenters? If so, include names of those experiments for purposes of identification.

Yes, with CMU. I loaned one of the sweaters I took to help them on Thursday's Integrated scenario. I believe it was Joao Paulo Cunha who used it in the exercise.

Did members of the Joint Vulnerability Assessment Branch (JVAB) look at you experiment? If so, please describe the interaction.

No.

What, if any, are the uniquely valuable aspects of this event?

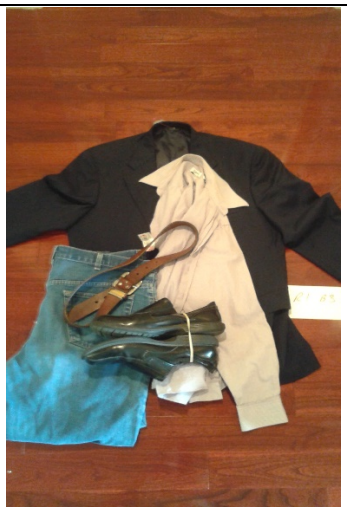
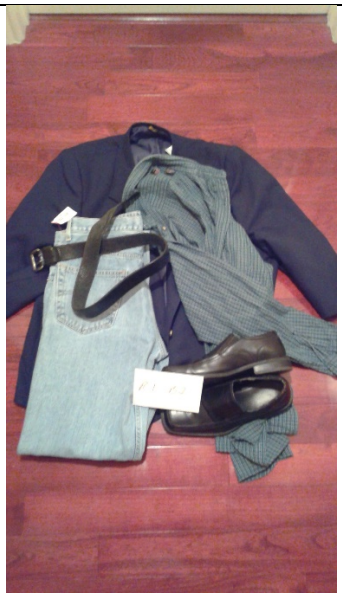
The opportunity to meet so many people developing cutting edge technologies and learning ways to collaborate for the purpose of combining the technologies in the hopes of forming a synergy.

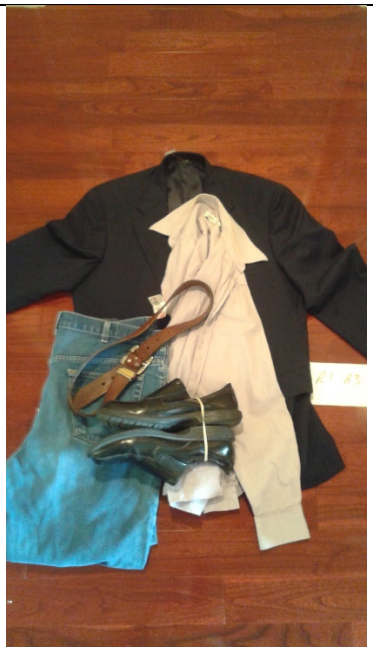
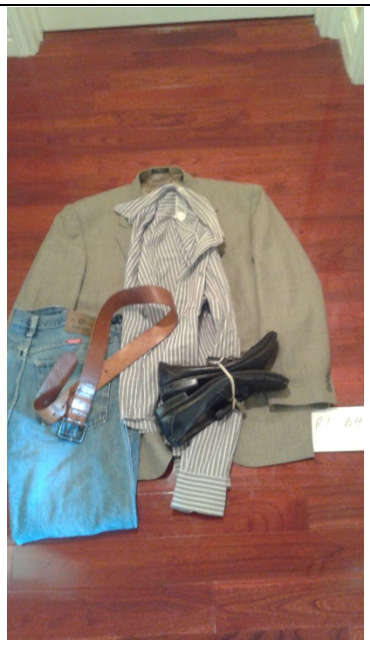
The fact that this information will be utilized in a NPG school report that will be disseminated to many stakeholders.

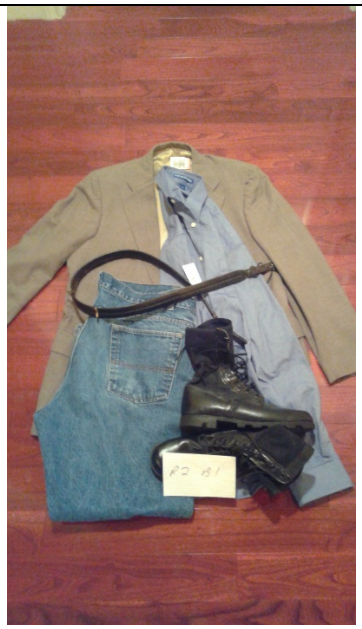
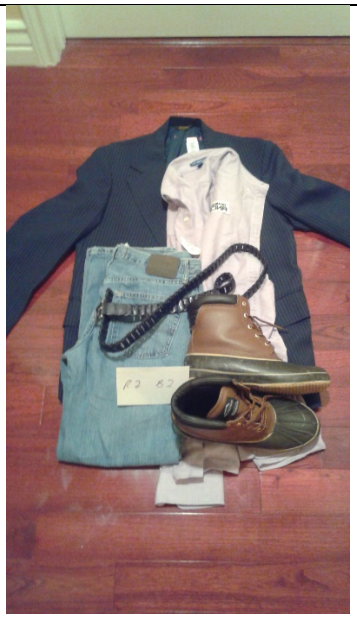
Photo/Graphics (*please keep the file size to a minimum)*:

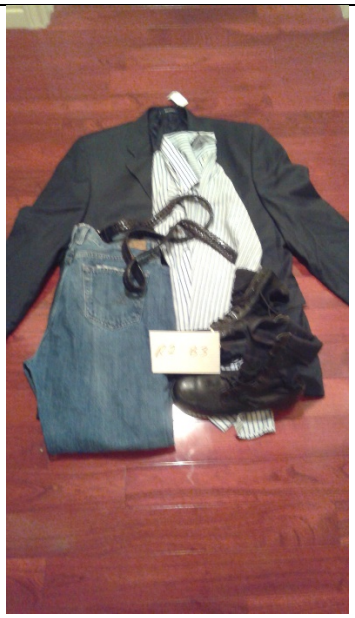
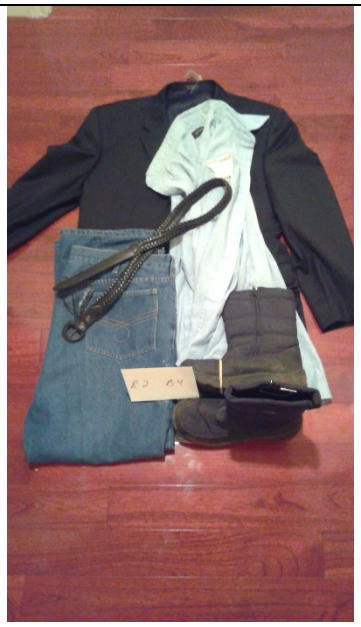
A. Images and materials description of the clothing that was cut during the experiment:

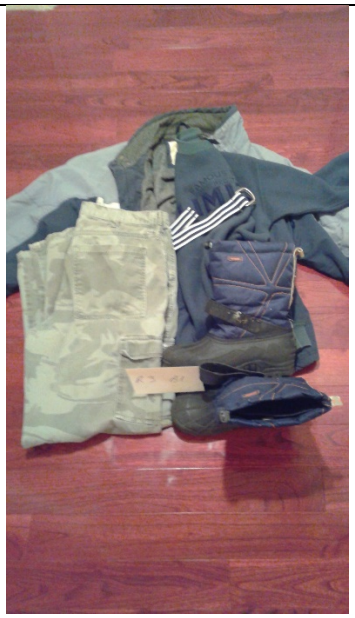
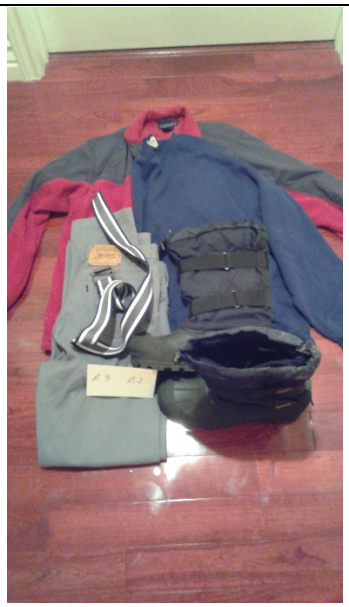
JIFX 17-3 Cutting Tool Experiment Clothing details and images

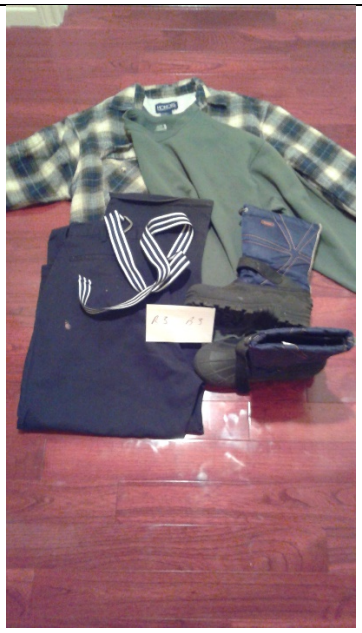
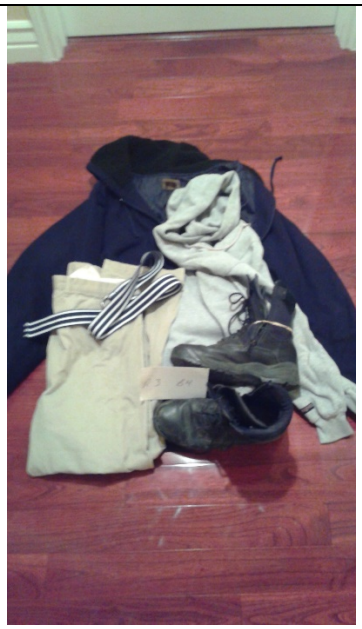
Sports Coat – 100% wool Button down long sleeve shirt – 100% Cotton Leather Belt – 1.5” Blue Jeans Pair of dress shoes - 100% Leather upper	
Sports Coat – Material label missing Button down long sleeve shirt – 100% Cotton Leather Belt – 1.5” Blue Jeans Pair of dress shoes – Material label missing	

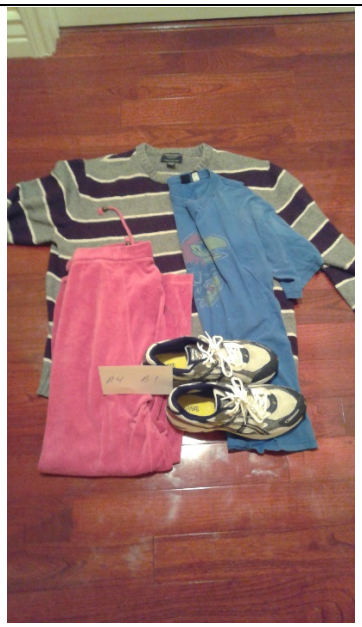
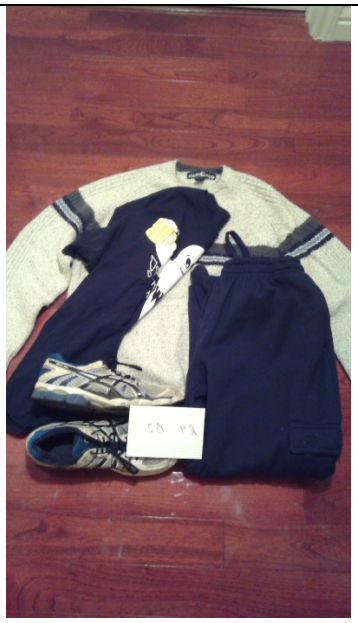
Sports Coat – 100% wool Button down long sleeve shirt – 100% Cotton Leather Belt – 1.5” Blue Jeans Pair of dress shoes - 100% Leather upper	
Sports Coat – 100% wool Button down long sleeve shirt – 100% Cotton Leather Belt – 1.5” Blue Jeans Pair of dress shoes – Material label missing	

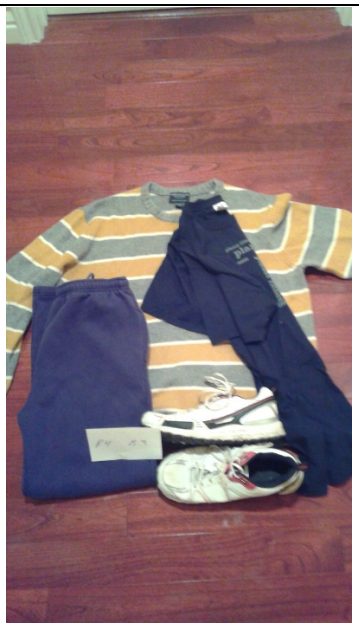
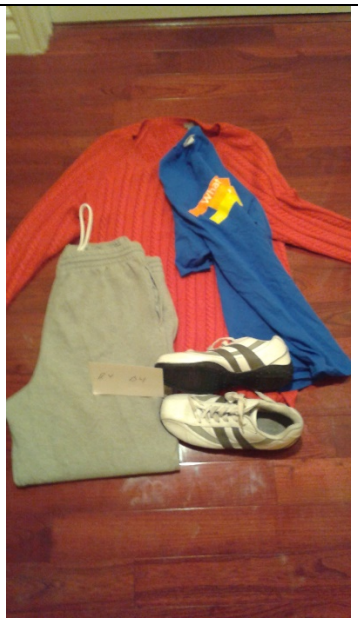
Sports Coat – 60% Wool, 40% Polyester Button down long sleeve shirt – 60% Cotton, 40% Polyester Leather Belt – 1.25” Blue Jeans Pair of boots – Material label missing, mixed material	
Sports Coat – Material label missing Button down long sleeve shirt – 60% Cotton, 40% Polyester Leather Belt – 1.25” Blue Jeans Pair of boots – Material label missing, mixed material	

Sports Coat – Material label missing Button down long sleeve shirt – 35% Cotton, 65% Polyester Leather Belt – 1.25” Blue Jeans Pair of boots – Material label missing, mixed material	
Sports Coat – 100% Wool Button down long sleeve shirt – Material label missing Leather Belt – 1.25” Blue Jeans Pair of boots – 100% man made material	

Jacket – Wool & man made material Pullover sweater – 80% Cotton, 20% Polyester Cloth belt 1.5” Pants – 100% Cotton (military style) Boots – Multilayer man made material	
Jacket – 100% Polyester Pullover sweater – 50% Cotton, 50% Polyester Cloth belt 1.5” Pants – 100% Cotton Boots – Multilayer man made material	

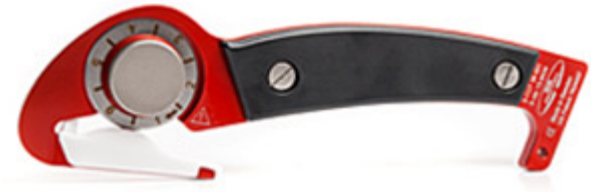
Jacket – Mixed Wool, Ramie, cotton, polyester, nylon Pullover sweater – 50% Cotton, 50% Polyester Cloth belt 1.5” Pants – 100% Cotton Boots – Multilayer man made material	
Jacket – 100% Polyester Pullover sweater – 55% Cotton, 45% Polyester Cloth belt 1.5” Pants – 100% Cotton Boots – Multilayer man made material & leather	

Sweater – 30% Cotton, 70% Wool T-Shirt Warm up pants – 80% Cotton, 20% Polyester Tennis shoes – Polyester & Synthetic leather	
Sweater – 30% Cotton, 20% Wool, 45% Acrylic T-Shirt Warm up pants – 100% Polyester Tennis shoes – Mixed material	

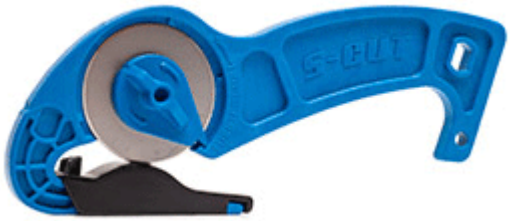
Sweater – 70% Cotton, 30% Wool T-Shirt Warm up pants – 55% Cotton, 45% Polyester Tennis shoes – Mixed material	
Sweater – 70% Cotton, 30% Wool T-Shirt Warm up pants – 60% Cotton, 40% Polyester Tennis shoes – Leather upper	

B. Tools used in experiment

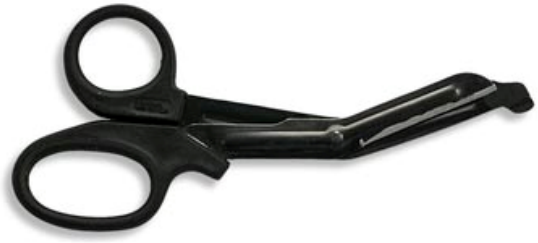
S-Cut 501 Replaceable blades and white hygienic covers. Each blade has 6 cutting edges & the tool can be broken down for decontamination. Each tool is individually serial numbered.



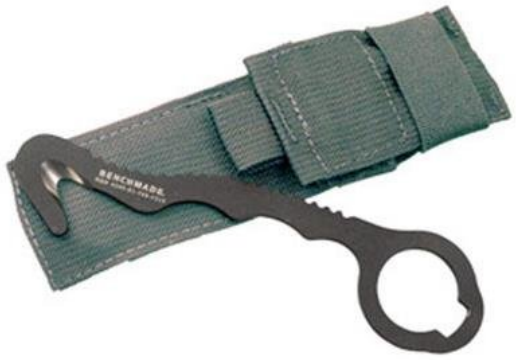
S-Cut QE Disposable unit with 5 cutting edges



TyTek Medical Piranha Trauma Shears 5.5” - Black



Strap Cutter, Combat; Benchmade Model 8 Rescue Hook NSN 4240-01-568-3219



Stakeholder Evaluation(s):

Do you consider yourself to be a Subject Matter Expert?

1. Yes
2. Yes
3. No
4. Yes

Is this Experiment Relevant?

1. Yes
2. Yes
3. Yes
4. Yes

What Areas of the RFI does this experiment relate to?

1. No response
2. K1
3. G1
4. No response

Additional areas not listed above?

1. This would be utilized for medical personnel, most likely back at a field aid station or higher.
2. Related to medical patient care
3. Patient care.
4. Patient care.

How much of an improvement is this technology over existing solutions?

1. Medium
2. High
3. High
4. High

What are the observable strengths of this technology?

1. Physical Weight, Speed of Deployment, Usability/Intuitiveness
2. Operating Endurance, Speed of Deployment
3. Operating Endurance, Usability/Intuitiveness, Training Requirements, Ease of Integration, Technological Costs

Additional strengths not listed before?

1. No response
2. No response
3. Easier to use than existing products. Cuts through tougher material easier than existing products.
4. No response

Observable weaknesses of technology?

1. Physical Size
2. Physical Size, Physical Robustness
3. Physical Size, Physical Robustness
4. Physical Size

Weaknesses not Listed Before?

1. No response
2. No response
3. No response
4. Far too bulky to be utilized outside of a field hospital.

Does this experiment aid in refining RFI elements?

1. No response
2. Yes
3. No
4. No

Does this experiment represent a new approach to bridging a capability gap?

1. No
2. Yes
3. Yes
4. Yes

Did the experimenters modify current technology for a new application?

1. No response
2. No
3. Yes
4. Yes

Did the experiments collaborate with other experiments on a potential solution?

1. No response
2. Yes
3. No
4. No

Did you attend an experiment by the participant at a prior event?

1. No
2. No
3. No
4. No

Additional Comments

1. This item was used by myself and others in a test against other similar items already on the market and in use. This item was much faster than the current items used, but it is only useful for what it is made for.
2. Worked very well and cut down on time to get patients cloths off. Extremly easy to use better then what is currently on the market ie. Bench made/sears
3. No response