Disposable Restraint Technical Report

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June 2, 2009

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This research was supported by a Bureau of Justice Assistance Grant (2008-DDBX-0187), Office of Justice Programs, and U.S. Department of Justice. Points of view in this document are those of the authors and do not necessarily represent the official position or policies of the US Department of Justice.

Introduction

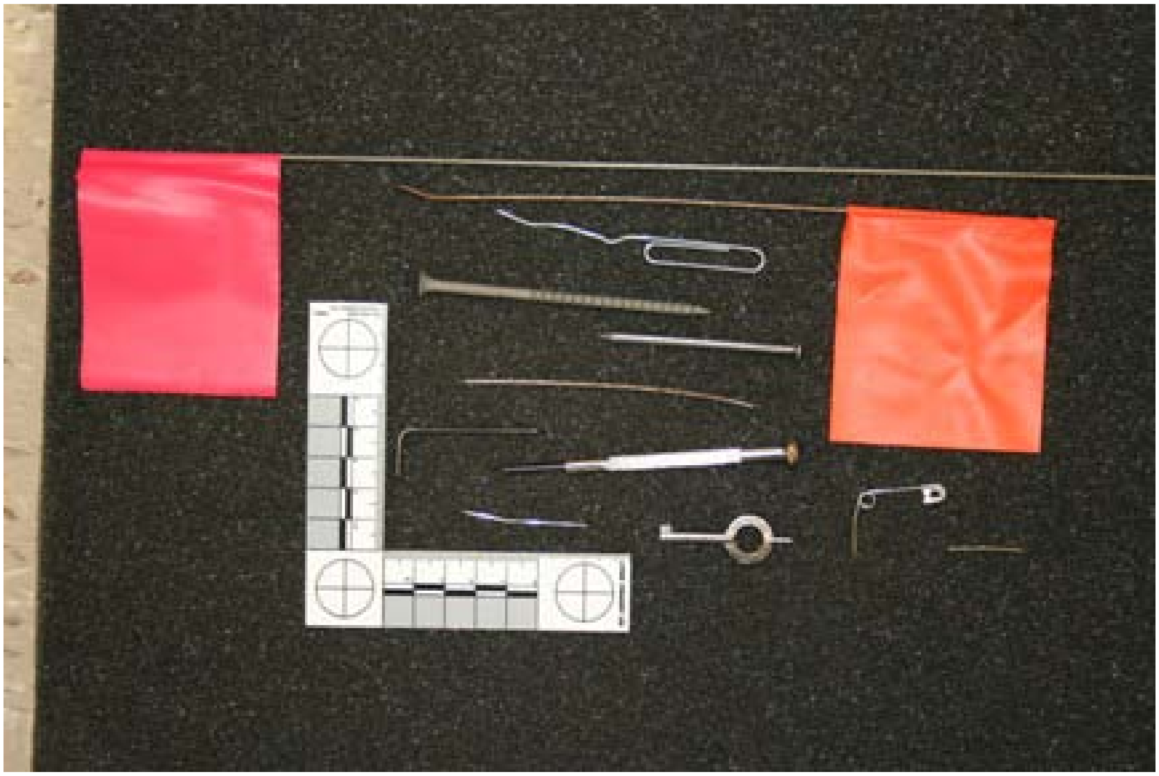
With the large number of restraints available in the public safety marketplace, it is decidedly becoming more difficult to discern the quality of specific products. Particularly disturbing, it was noted that substantial resources exist on the internet devoted to defeating disposable restraints. While some appear to be little more than You-Tube showmanship, others provided substantial off-site training in urban escape and evasion. Regardless of the intent, considerable doubt was raised in the reliability of these systems.

The purpose of this study is to examine various disposable restraint systems and evaluate their performance. To this end, the Weapons and Equipment Research Institute purchased seven different models with funds from a BJA grant. The overall goal was to create an unbiased review of the restraint systems to allow law enforcement and corrections agencies data beyond that of factory literature.

Methodology

The initial step was to create a research design to evaluate each restraint. As there were no known protocols, the researchers relied upon grounded theory to develop the research questions. Utilizing this approach, a theory must emerge from the data. “The grounded theory approach is a qualitative research method that uses a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon" (Strauss & Corbin, 1990:24).

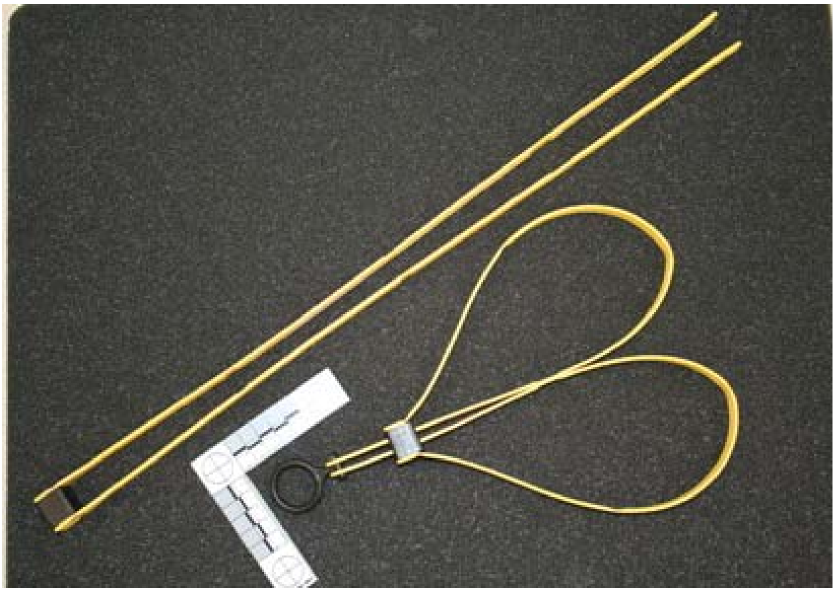
Although internet sources placed the weakness of the restraint in the cuff, cord or strap, we were fairly certain after our examinations that the locking mechanism was the most at risk. Consequently, we strove to identify countermeasures that would defeat these mechanisms and release the cuff.



Each restraint was removed from its packaging and its features examined under a magnifying device. The composition, size, and orientation of all of the significant components were scrutinized. The pawls, ratchets, and strands of each unit were analyzed for possible weaknesses. These characteristics were noted and utilized to create the testing parameters. After considerable trial and error with a number of commonly encountered items (resulting in damaging and subsequent replacement of numerous disposable restraints), it was decided that no one item was capable of defeating every restraint system. However, the commonality between these items was that they were small, easily found, straight and metallic.

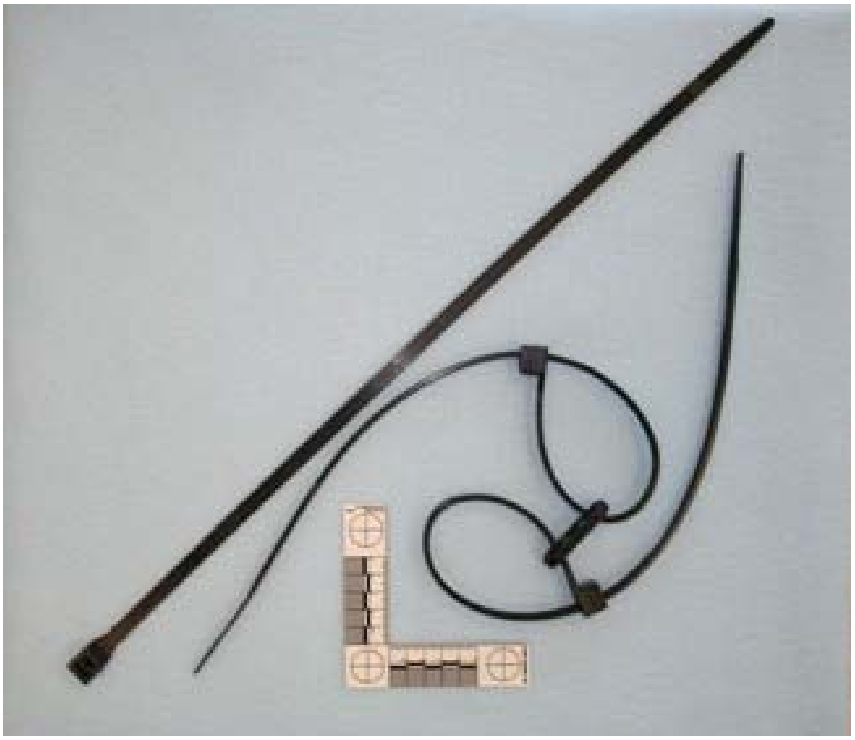
Restraints

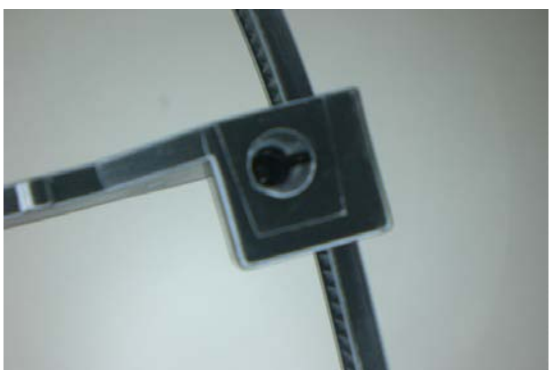
ASP Tri-Fold



The ASP Tri-Fold disposable restraint is a compact and easy to carry device composed of a high strength polymer weighing 36 grams with an average cost of $2.83. The restraint functions by inserting the strands into the pawl and then pulling the strands tightly to secure an individual. A ring allows both strands to be tightened simultaneously by pulling rapidly.

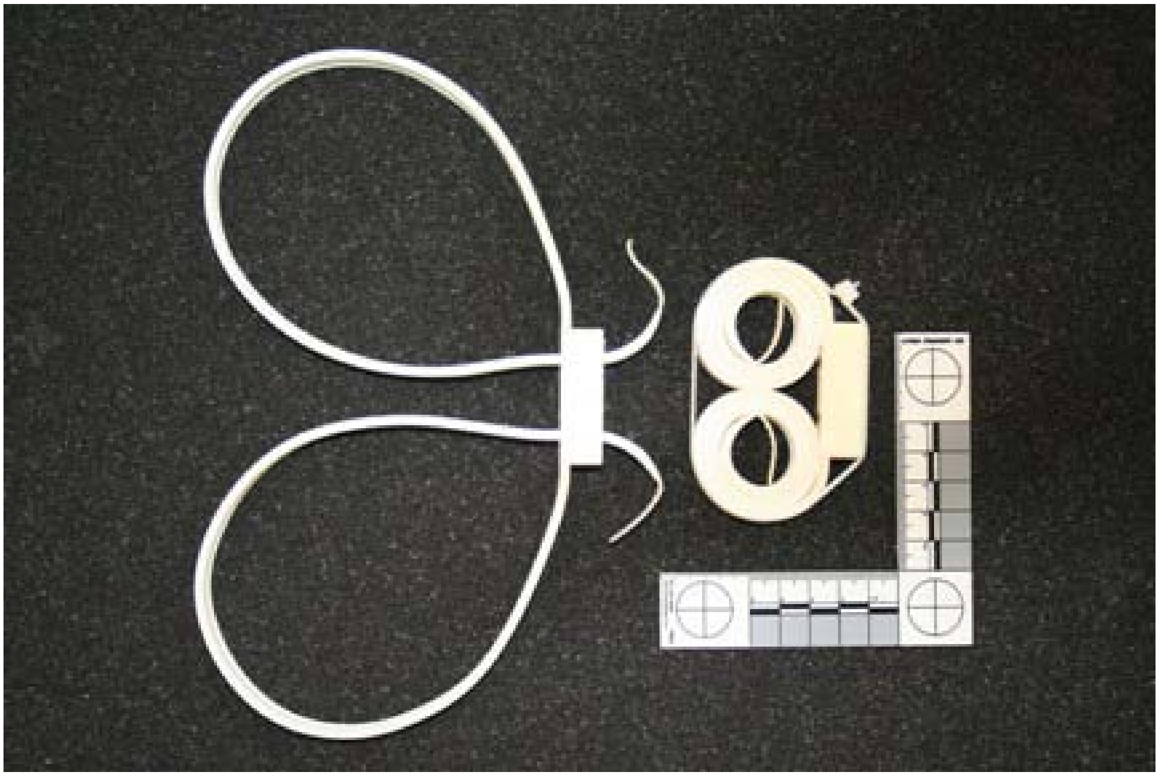
Key Cuff





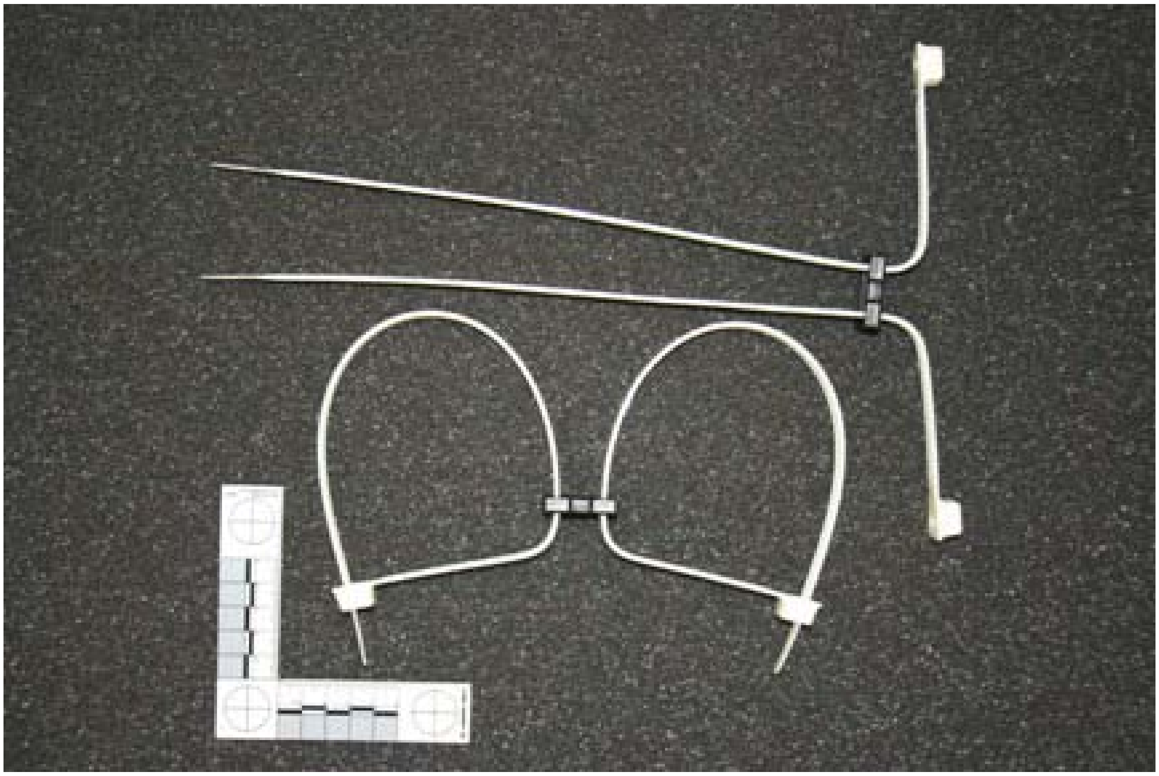
Key Cuff double reusable restraints are comprised of a lightweight nylon material. This restraint has a tensile strength of 350lbs and weighs 34 grams. The restraint functions by inserting the strands into the pawl and then pulling the strands tightly. The double strand design consists of two separate straps that have individual locking mechanisms with a key hole on each cuff for adjustments or removal. These disposable restraints are unique as they utilize a standard handcuff key to release the locking mechanism. The average cost of a single unit was $4.49.

Monadnock Double Cuff



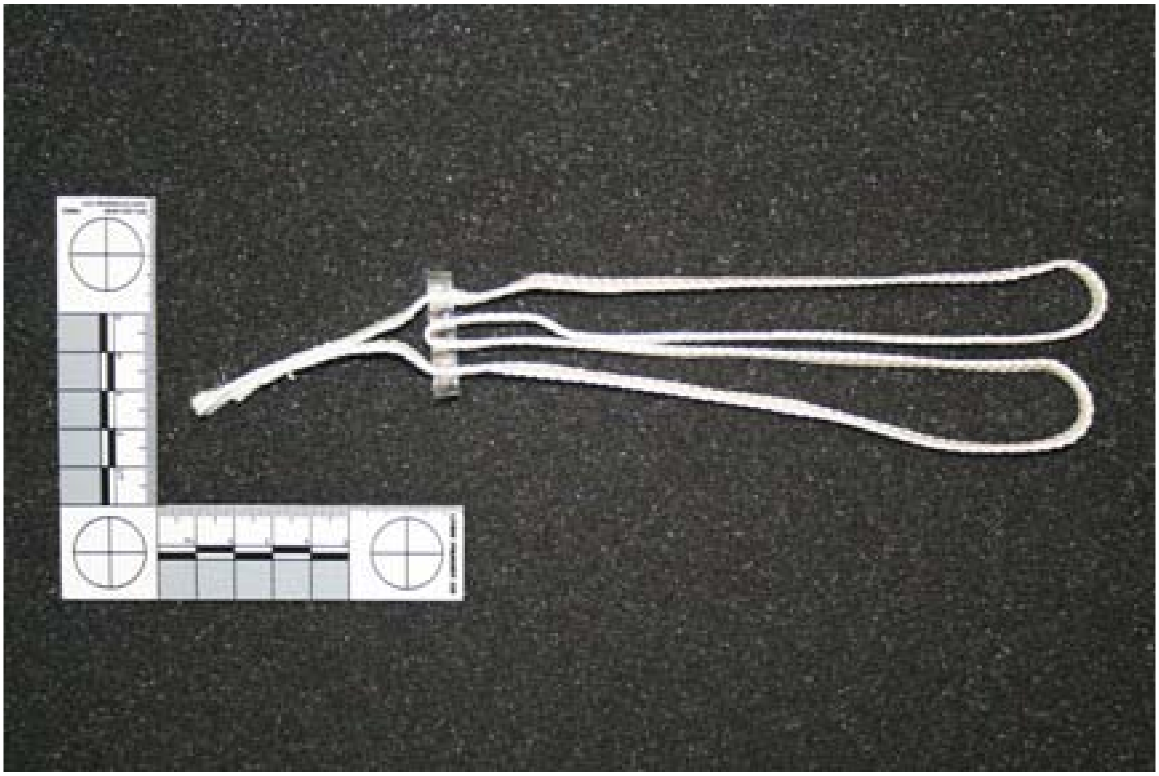
The Monadnock Double Cuff and the Monadnock Compact Double Cuff are comprised of a lightweight nylon material. Both have a tensile strength of over 400lbs and weigh 34 grams. The Monadnock Double Cuff costs $1.46 while the compact version costs $1.99. Each version functions by inserting the strands through the pawl and then pulling the strands tightly to secure. The compact version is packaged with the straps wound tightly inward and banded together for easy concealment and carry.

EZ Cuff



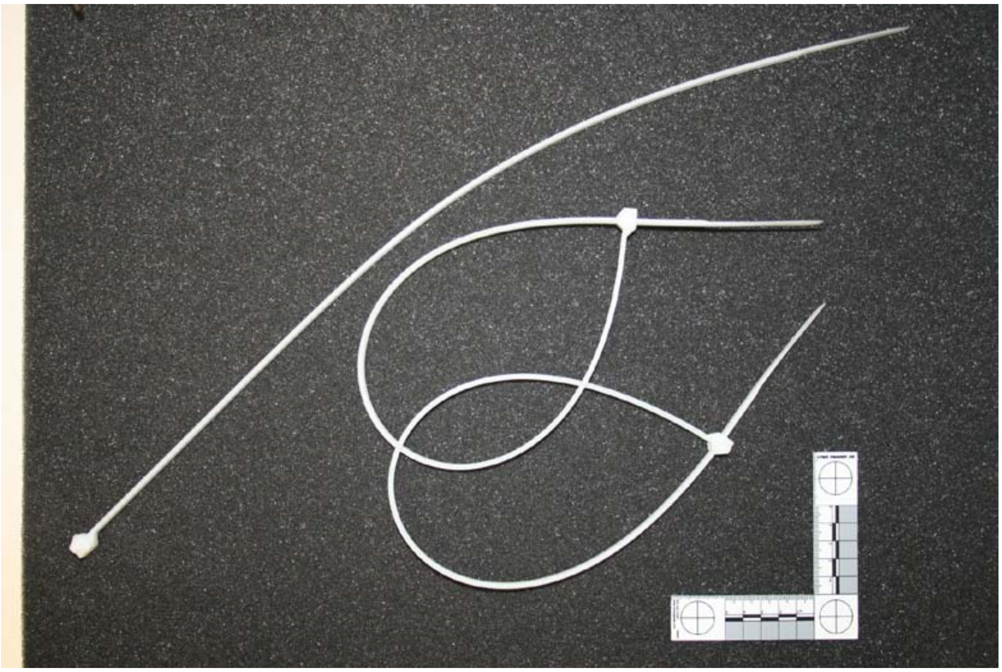
The EZ Cuff Model 500D Double Loop restraint is comprised of lightweight nylon material. The restraint has a tensile strength of 600lbs and a weight of 24 grams with a cost of $1.34. Each strand is secured by a connecting bridge and functions by inserting the strands into the pawls and pulling tightly to secure an individual.

Tuff Tie



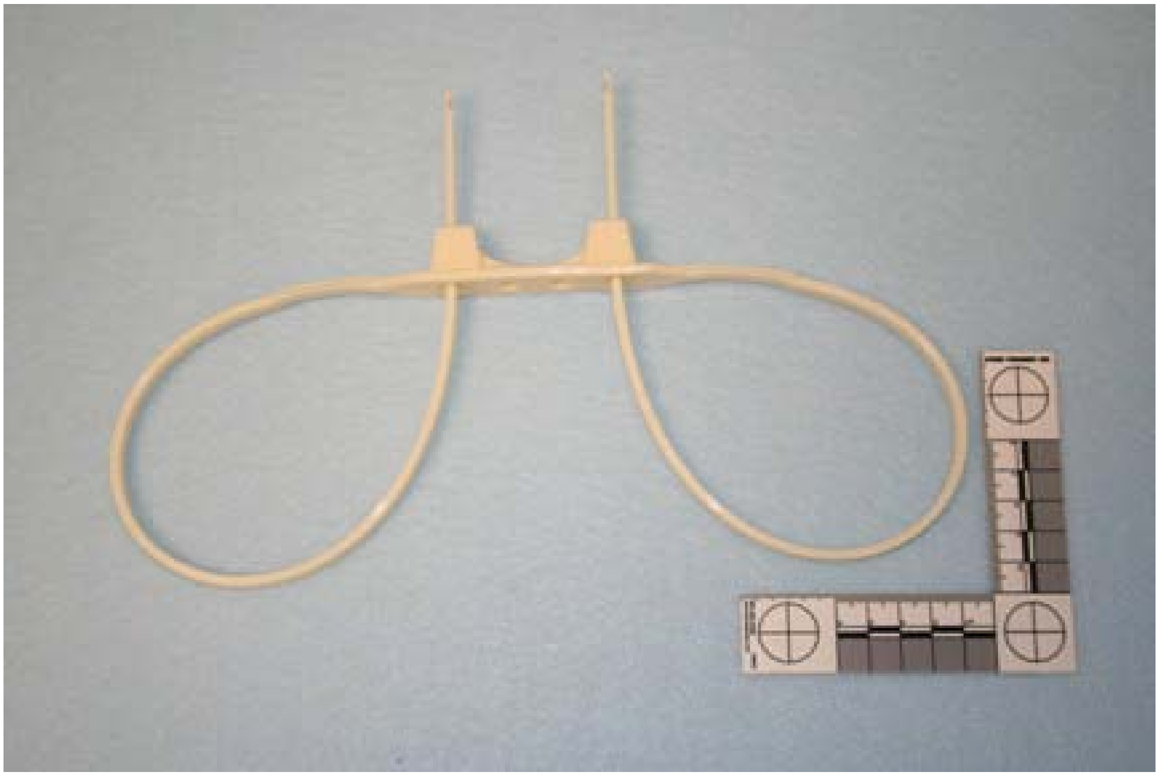
The Tuff Tie Hand restraint is comprised of braided nylon cords while the pawl is made of a polycarbonate locking block. The tensile strength is 500lbs with a weight of 8 grams and costs a $1.30. The restraint comes fully assembled and the pig tail designed cord allows for a knot to be tied once the restraint is locked for added security.

Flex Cuff



The Flex Cuff disposable restraint is comprised of a strong nylon material with a tensile strength of 300lbs and costs $1.15. This restraint has a unique strength barb system which is a small piece of metal within the pawl making the restraint more difficult to escape. The Flex Cuff functions by looping two strands together and feeding the strands into the pawl.

Tuff Cuff



The Tuff Cuff Disposable Double Restraint is comprised of a double nylon material with a tensile strength of 400lbs and a cost of $1.26. This restraint has a double locking system that prevents the restraint from over tightening on the individual. The Tuff Cuff works by inserting the strands into the pawl, and then pulling the strands to tighten them securing the individual.

Findings

The most significant finding of this report was that the majority of restraints were susceptible to extremely low tech countermeasures. As we predicted, the locking mechanisms of many products were easily compromised by a thin wire. Although these mechanisms varied in design, they failed for the simple reason that they were often composed of a plastic material.

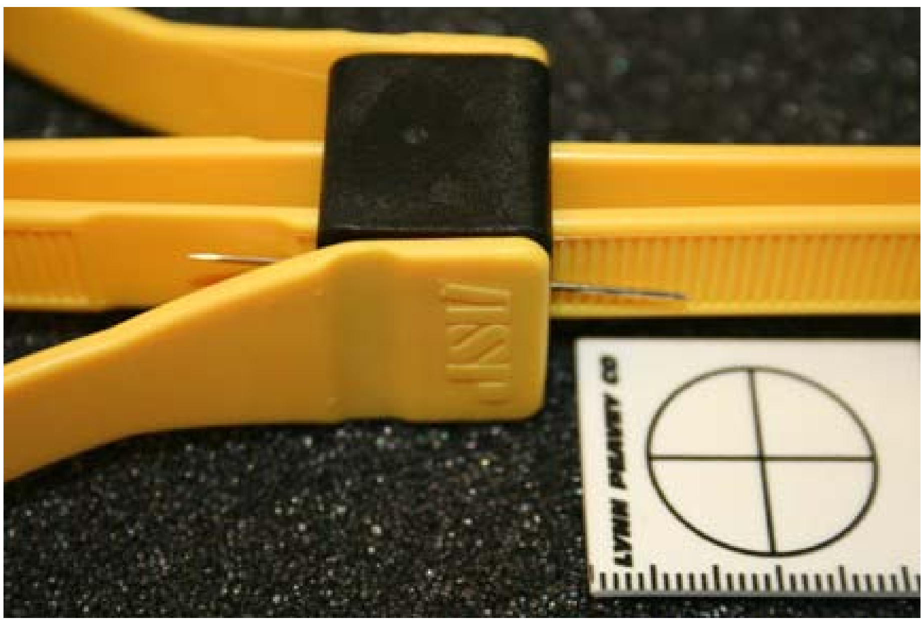
Once inserted, a wire was often able to manipulate the locking mechanism through one of two methods. First, the plastic locking mechanism (pawl) would often retain a “memory” and not spring back into its original position after it had been forced from its original position. Consequently, the cuff would release from the locking mechanism. Second, disruption of contact between the pawl and teeth (ratchet) would frequently allow the strand to move freely. This was accomplished by sliding a needle into the locking mechanism.

These countermeasures were only possible if the handcuff position allowed the wearer access to the locking mechanism or had the assistance of another arrestee. The following section examines the specific methods identified for defeating each of the disposable restraints under examination.

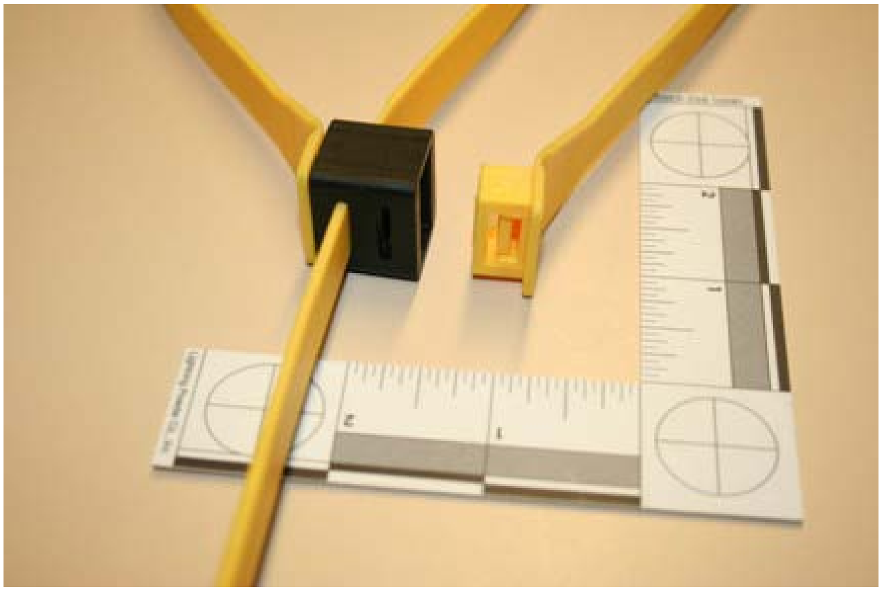
Restraint Countermeasures and Design Weaknesses

ASP Tri-Fold Disposable Restraints

After the strands were locked into the pawl, a small sewing needle was inserted into the top of the pawl. Then the sewing needle was pushed back against the ratchet itself preventing it from locking. This then allowed the strands to move without locking.



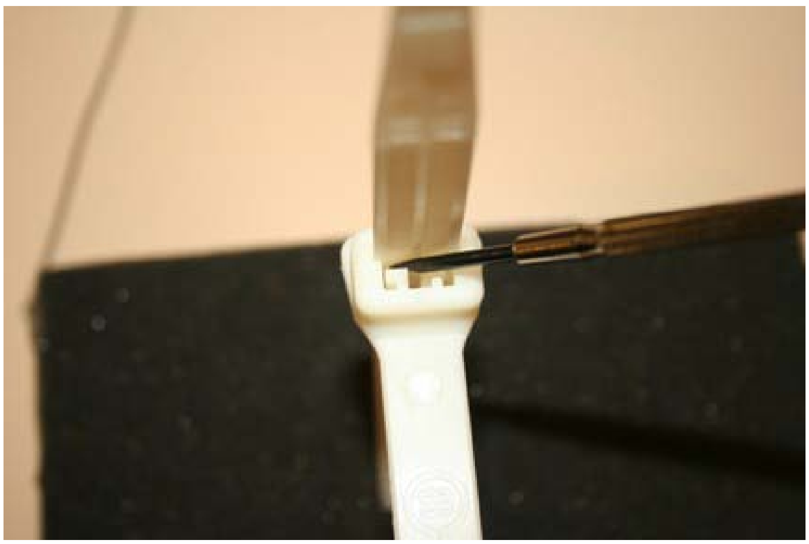
Additionally, the Tri-Fold failed a basic durability test as it was possible for one of the investigators to actually break free using only brute force. As shown below, one locking mechanism separated from the rest of the restraint. However, the second locking mechanism also failed by allowing the strand to slide through the pawl.

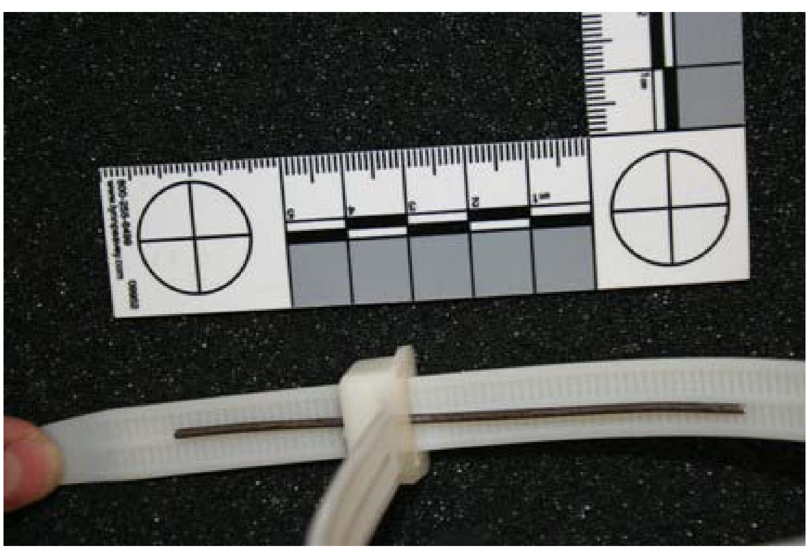


Given the dynamic nature of this failure, we replicated this test by applying the restraints in both the front and the rear of the tester. Each time, the tester was able to cause the restraint to fail by pulling the strands in opposite directions. The locking mechanism appeared to be unable to maintain traction on the “teeth” of the ratchet and the strand was able to slide free.

EZ Cuff

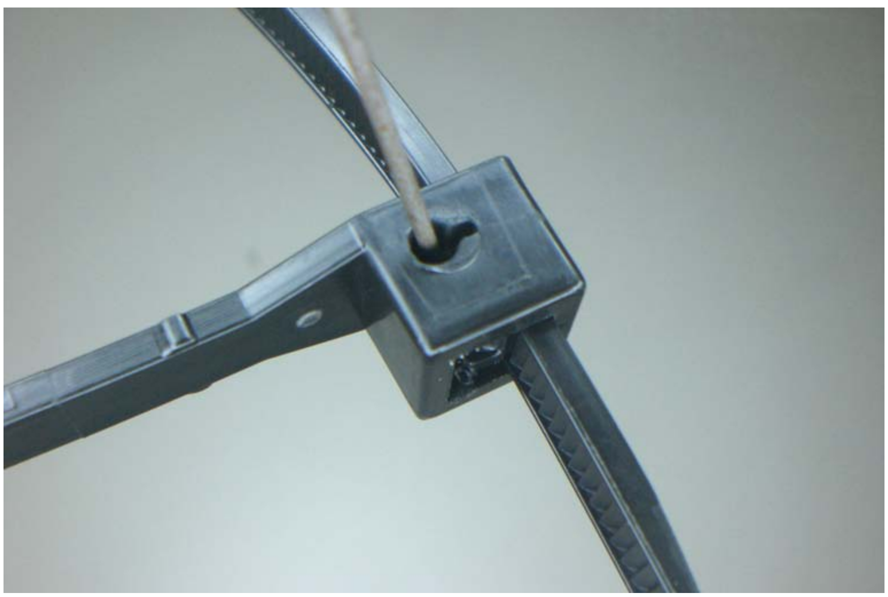
After the strand had been locked, a wire was inserted into the front of the pawl. The wire was pressed on each of the two heads for ten seconds. These plastic heads retained memory from this action and did not immediately return to their original position. Consequently, they were unable to “grip” the ratchet and the strand was able to move freely.





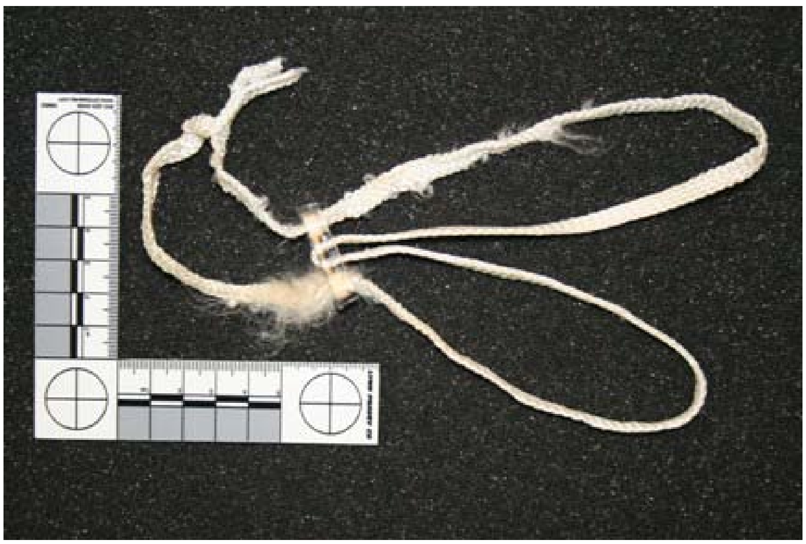
Key Cuff

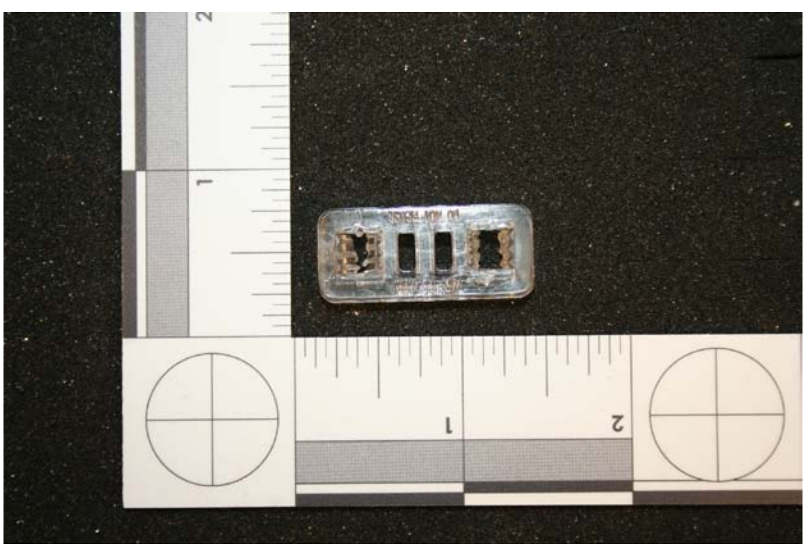
Utilizing a key release system that did not provide double-lock capability, it was possible to utilize a thin piece of wire to open this restraint. The wire is inserted into the keyway and pressure is applied to the two-o'clock position within the locking mechanism. Reasonably, the same technique could be used on a pair of single-locked handcuffs. Countermeasures to this product could be eliminated by the addition of a double-lock feature or drastically reduced by handcuffing in a manner that does not allow access to the keyway.



Tuff Tie

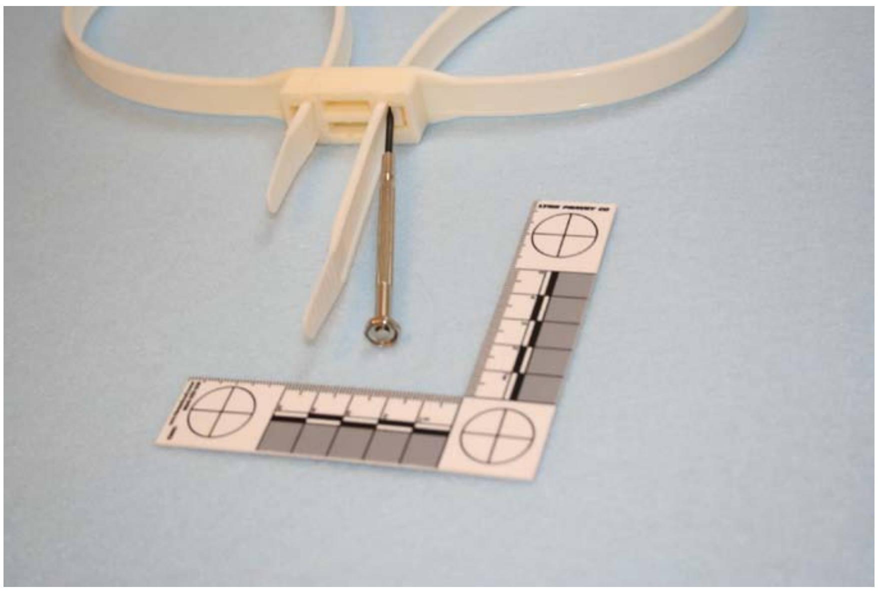
As this restraint utilizes a nylon cord, our testing attempted to fray the strand as a potential countermeasure. Although the cord was damaged, the restraint remained effective. Our second test, which attacked the locking mechanism, found the "teeth" that secure the cord could be broken with a small screwdriver but it required substantial time and effort.

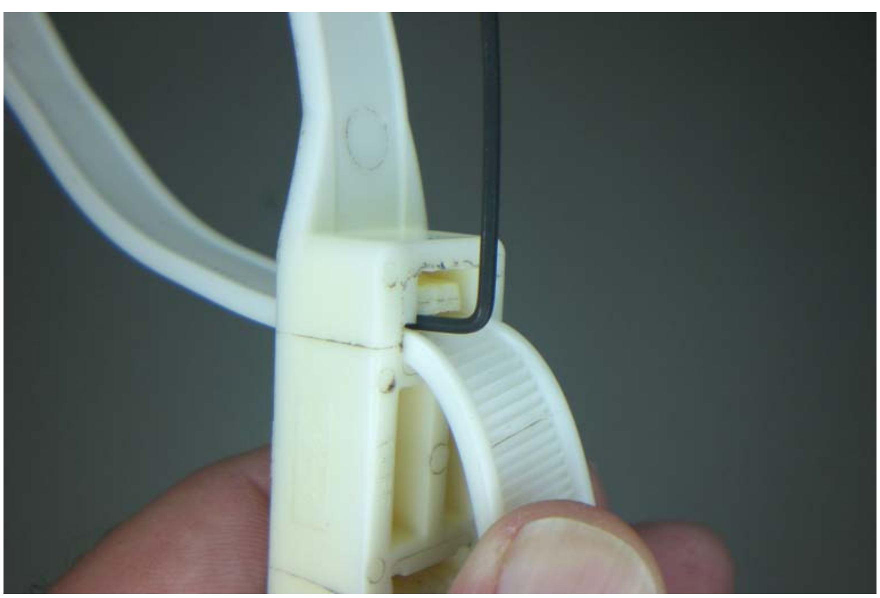




Monadnock

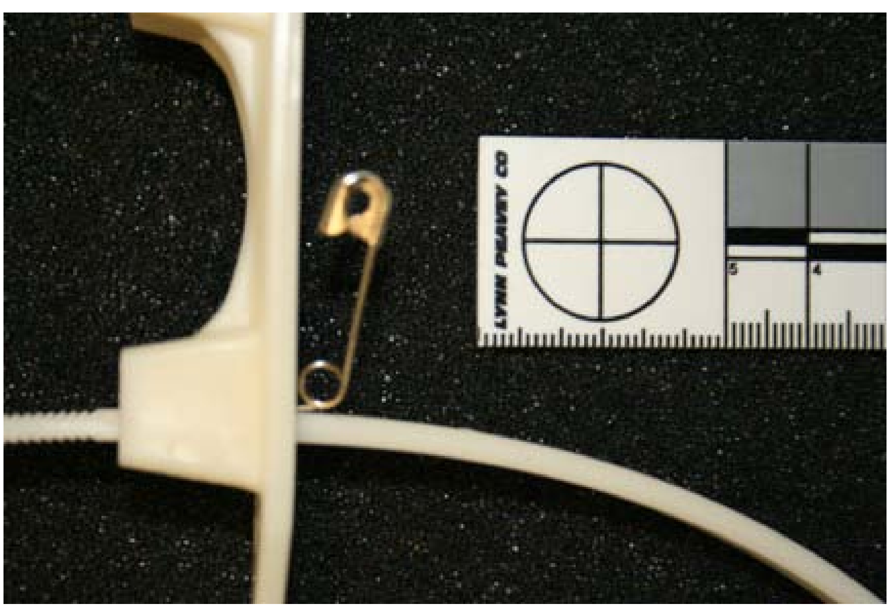
A small piece of metal or screwdriver can be inserted beneath the pawl head and used to release the strand. However, the pawl head of this product is rather thick and would probably require a clear line-of-sight to accomplish this technique.





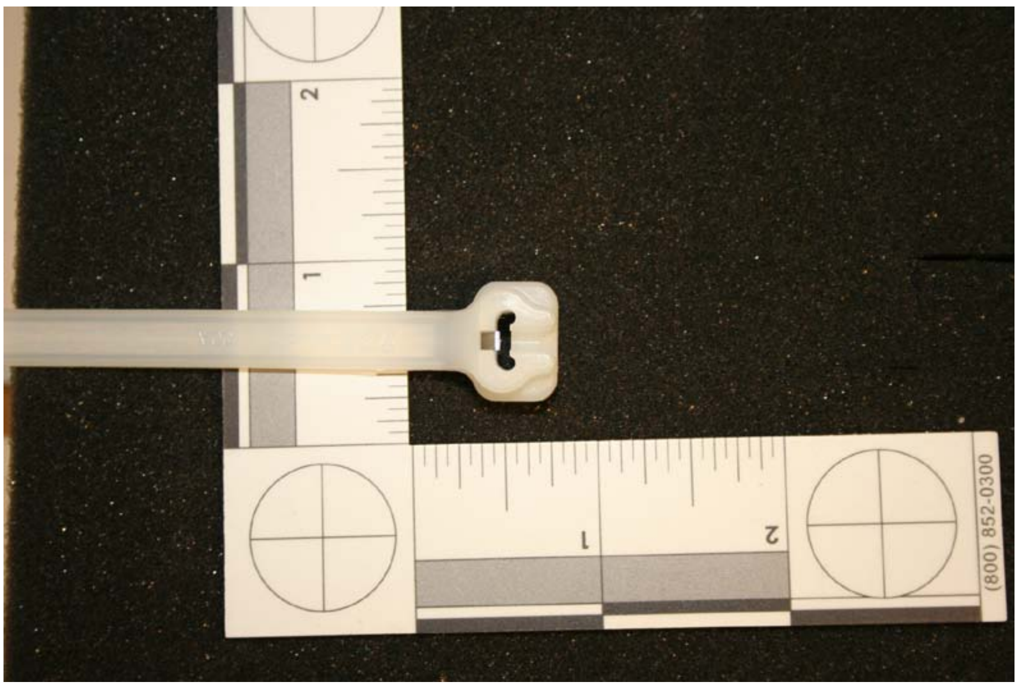
Tuff Cuff.

A safety pin was inserted between the strand and the pawl. This effectively blocked the ratchet “teeth” from becoming engaged by the pawl and allowed the strand to slide freely.



Flex Cuff

Although we utilized every technique that we were able to identify, our testing was unable to defeat this product. The manufacturer, NIK, clearly identified the potential problems and designed this product accordingly. The locking mechanism had a metal component that we were unable to manipulate. Additionally, this metallic barb (Strength Barb System) is positioned in a manner that it was impossible to interfere with its grip on the strand.



Conclusion

While there were substantial problems with the locking mechanisms of these types of restraints, it is possible that many of these issues might disappear with a modification in training and application. Handcuffing to the front, a practice frowned upon by law enforcement trainers, provides the greatest opportunity for a suspect to defeat these restraints.

In the unlikely event that a suspect's physical injury required handcuffing to the front, restraints should be placed in a manner that the backs of the suspect's hands touch one another (palms out). Handcuffing to the rear obviously reduces the suspect's ability to visualize the locking mechanism and the likelihood of defeating it. This risk can be reduced further by consistently restraining palms out.