

THE MISSING TOOLS ARE "OFF THE SHELF"

In 1994, U.S. Marines troops were defending unruly migrant crowds at Guantanamo Bay, Cuba. These people were in custody for an extended period of time under intense heat without word of their future destination. The detainees revolted. The fences separating the troops and the Cubans nearly collapsed. Had a full-blown riot erupted, the U.S. forces would have been vastly outnumbered. The majority of the U.S. forces were predominantly young and lacked combat experience. The forces were armed with four-foot riot batons and M-16s with bayonets. As the riot swelled, the gravity of a potential international incident loomed. Although the U.S. troops had plenty of firepower, lethal force was not a viable option. Consequently, the troops were severely handicapped without effective anti-riot weapons or proper non-lethal devices in this nightmare arena. Should the troops have fired or retreated? There was no middle ground.

Fortunately, this situation did not reach the supercritical stage provoking the use of deadly force -- the use of which could have caused a serious international incident. Unfortunately, this situation was very real and continues to stymie U.S. forces. Similar situations occur with more and more frequency as attested by incidents in Cuba, Panama, Haiti, Bosnia and the humanitarian relief efforts in Somalia. Moreover, U.S. troops continue to be involved in more peacekeeping and low intensity conflict situations than ever before. These tenuous situations have become the rule and not the exception particularly since the end of the Cold War. Although the potential for full-scale war necessitates the development of precise, lethal and smart weapons, American troops now find themselves in situations where they do not have all the optimum tools that technology can provide -- especially for peacekeeping and humanitarian situations.

Police are not immune from these increasingly dangerous scenarios. A classic example of the need for non-lethal weapons is the story of a homeless man who slept across the street from the White House in Lafayette Park in 1995. National Park Police approached the homeless man. He had a knife and was well within the 21-foot kill zone of the officers. He was shot several times and killed when he did not surrender the weapon. Police were clearly in danger with the lethal knife, but adequate tools to put the man down without loss of life were not in hand.

In today's warfare abroad and on the streets of America, an individual's decision to use or not use deadly force is no longer a tactical decision. Instead, these are now strategic decisions with results that can be broadcast throughout the world in minutes. The future of soldiering presents operational situations where non-lethal weapons and capabilities are needed, but unavailable. The given scope of military operations and particularly peacekeeping missions assumes a "dirty battlefield" in which civilians and non-combatants are mixed with combatants. **American forces and law enforcement must have the capability to react with the right response and not necessarily a lethal response.**

Therefore, innovative weapons are needed to inflict little or no collateral damage to civilian bystanders, including women and children. Although non-lethal weapons imply no permanent damage to individuals, soldiers must still have lethal capability and use of the currently fielded weapons platforms. In addition, the system must have a near instantaneous effect that is accurate, effective and lightweight.

The need to arm America's professional fighting forces and law enforcement with precise, effective, easy to use and trusted lethal and non-lethal weapons is overwhelming considering the increasingly complex missions. The success of peacekeeping missions and the future of law enforcement in an increasingly litigious environment will depend on the ability of these forces to safely control civilians and non-combatants in dirty battlefields and violent American streets in order to succeed in the missions

of tomorrow. The 21st Century warrior and police officer will have access to non-lethal weapons that can easily be used alongside current lethal handguns and rifles. **With this proposed technology, the peacekeeping forces will be properly armed with the option of using either lethal or non-lethal force with current highly effective and "off-the-shelf" products at extremely low cost.**

NON-LETHALITY BACKGROUND

At the Non-Lethal Defense II Conference, the NDIA asked industry to provide non-lethal weapon capability that would minimize excess equipment requirements of the foot soldier. This technology must be lightweight, easily deployable, highly effective, reliably non-lethal, and low in cost.

Having established that the end goal is neutralization of the target's ability to retaliate, there are a limited number of fundamental approaches to achieve this end.

- A. **Lethal Force.** Effective lethal force removes the ability of the target to retaliate by permanently interrupting normal life functions. Mechanisms that disable the nervous system or physically disable use of the arms or hands (assumed to be necessary for retaliation) are most effective. Mechanisms that cause lethality by less immediate means such as blood loss are less effective as there is an intervening time period between use of force and expiration during which retaliation could occur. The costs associated with lethal weapons generally include the price of the weapon and the ammunition. However, the societal costs of litigation, international diplomacy risks and medical recovery add magnitudes of costs often not calculated in this area.
- B. **Kinetic Force:** Weapons using kinetic force simply knock down the target by imparting sufficient momentum to the body of the target to knock it to the ground or to stun severely. The simplicity and cost effectiveness of kinetic force instruments are significant advantages. However, force metering and placement of impact are significant problems. The fundamental problem with these technologies is that variances in pain thresholds and body mass make for difficult trade-offs between effectiveness and injury. For example, an impact device that can drop a 300-pound individual could easily stop the heart with a direct hit to the chest. Further, sufficient force to take down a large target could cause serious injury or death if delivered at certain impact points such as the head or central sternum.
- C. **Physical Restraint:** Weapons based on physical restraint seek to physically prevent aggressive movement by the subject. Examples of physical restraint systems are nets that wrap around the target, or the well-publicized "sticky goo" gun that entangles the target in a web of highly adhesive foam, impeding movement. Physical restraints face several implementation issues. First, for immediate neutralization, several appendages must be simultaneously immobilized to effectively prevent retaliation. Second, over-restraint poses risks of physical injury. For example, a net projected with enough force to ensure the target is bound sufficiently to prevent movement of the arms and hands could also bind around the throat, restricting breathing. Nets are typically bulky, single shot, limited in range, not deployable with current weapon platforms, time-consuming for reloading, and are capable of detaining only a single rioter per deployment. The incapacitation is for a very short period of time and requires apprehension to be fully effective. In Somalia, the U.S. Marines were unable to fully utilize the sticky foams as coating someone entirely in it could have been lethal if it covered the faces of the Somalians. In addition, the costs associated with the cleanup of these chemicals are high and very time-consuming as well.

- D. Physical Impairment:** One could also disable a target by causing an impairment of its physical systems. For example, some chemical sprays can cause sufficient swelling of the membranes around the eyes as to prevent effective sight. This approach shows promise, but current technologies have a delay to efficacy – i.e., the required reactions take time (up to 20 seconds). Further, the target may be able to retaliate without the impaired system. (For example, a blinded target may simply return fire randomly, or may be able to use other senses such as sound or touch to guide a response. Any chemical that relies on pain infliction for its result can be overcome with protective equipment and/or training and mental focus. For greatest efficiency, multiple body systems need to be simultaneously disabled.
- E. Psychological distraction:** The infliction of sufficient pain as to cause the target to focus on self-preservation rather than aggressive behavior. Again, many chemical agents operate on this principle. However, the human body's ability to suppress pain in combat situations gives certain persons, especially those with high tolerance for pain, the ability to function effectively in spite of severe discomfort. In some instances, infliction of pain on the target may incite a more vehement retaliation rather than suppressing one.
- F. Neurological Interference:** Weapons can be used to disable or block the nervous system of the target. If the central command and control system of the human body is disabled, the functioning of all potentially aggressive sub systems is irrelevant. If the target loses the ability to control his muscles, no physical response would be possible. There are two general methods to attack the nervous system: Chemical (tranquilizer darts) and electrical (stun guns or remote stun devices sold under the trade name TASER®).
- i) Chemical Neuro-Inhibition:** Nerve signals are transmitted between nerves within the body using chemical agents that are secreted from one nerve to stimulate another. Chemicals such as those used in anesthetics block the transmission of these chemical signals between nerves – hence causing impairment of neurological function and resulting in loss of consciousness. On the other end of the spectrum, chemicals used in weapons such as nerve gas cause the over excitement of neurochemical junctions. The result is a loss of neurological control as the nervous system “overheats” and gets out of control. The prime drawback in use of neurochemicals in non-lethal weapons is dosage administration. The effect of neurochemicals is dependent on their concentration in the body. Hence, an amount of neurochemical sufficient to tranquilize a large body mass would reach much higher concentrations in a person with small body size with potentially severe implications. Further, there is a necessary latency time during which the chemical must diffuse through the blood stream to the synapses (the chemical junctions between nerve endings) where the effect will occur.
- ii) Electrical Neuro-Inhibition:** Nerve signals are transmitted along a nerve cell, or nerve fiber, using an electrical charge. Hence, much as artificial electronic muscle stimulators are used to stimulate nerves and muscles for therapeutic purposes, electrical signals can be used to interfere with normal nerve signaling within the body. The key advantage over other methods is in dose administration. Neurons use only one amplitude of electrical signal – so the electrical signal used by a nerve cell in a 300-pound man would be indistinguishable from that used by a neuron in an infant. The body does not vary the amplitude of nerve signals, it is the pattern or frequency of the electrical signals which are used to communicate within the body. In effect, the human nervous system is a telegraph system, using patterns of

electrical blips to communicate. It thus becomes possible to "jam" this communication system by injecting electrical blips that disrupt or mask the normal patterns to the point that effective communication within the body is no longer possible.

One potential risk would be the inadvertent stimulation of one of the body's life sustaining systems. Fortunately, the cardiac tissues respond to a different wavelength than the conscious nervous system. Hence, it becomes possible to neutralize a target's conscious nervous system without impairing functionality of the cardiac system. If the impairment is administered correctly, breaks can be given which assure respiratory function. Further, because electricity travels at a speed approximating the speed of light, the time to effect is extremely short - the nervous system can be effectively disabled before it can formulate a reaction. Electrical interference offers an extremely fast efficacy for disabling the aggressive potential of a human target in a manner that does not affect vital life support systems.

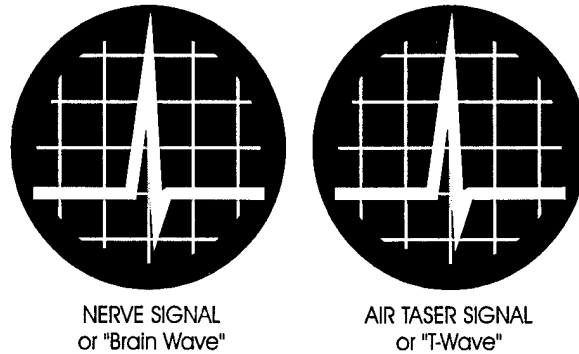
Each of these approaches to non-lethal weapon technology offers trade-offs of effectiveness versus potential injury during use and can be high in actual cost and associated cost in their use. However, based on the above analysis of these technologies, electrical neuro-inhibition offers the greatest potential for fast, complete neutralization with minimal trauma and at the lowest cost. In fact, it is possible to calibrate this electrical energy for different systems achieving results such as dropping a 1,500-pound buffalo to the ground in less than one second without injury.

Currently, there are methods that utilize high voltage, low amperage electrical signals against the nervous system for temporary incapacitation. However, as with the other non-lethal options available, these products have some undesirable limitations. With stun guns, for example, the high voltage signals are applied by physically placing the device directly to the skin. Contact with the skin does not cause full incapacitation, but it does inflict uncomfortable to moderate localized pain. Although this can keep someone at bay, it does require hand-to-hand contact, thereby severely limiting the value of these devices for military application.

A more powerful approach uses an off-the-shelf TASER type weapon that provides 15 feet of standoff capability. Formed in 1993, AIR TASER, Inc., implemented electrical neuro-inhibition technology for use in the field in a product called the AIR TASER®. The AIR TASER uses compressed air to disperse two probes connected by wire back to a hand-held power supply. The probes attach to either skin or clothing. Properly calibrated pulses are then transmitted along the wires and into the nervous system of the target, achieving neutralization without physical injury. The resulting jamming of the nervous system's communication prevents coordinated action and requires several minutes for recovery.

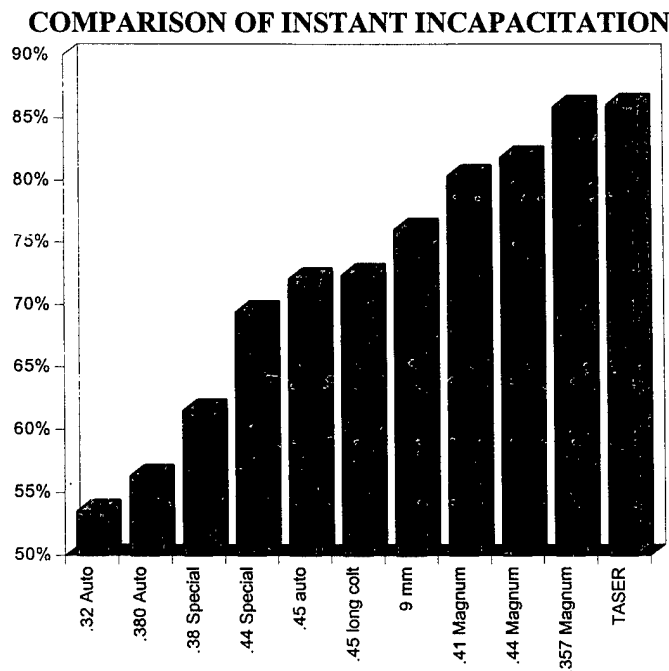


The AIR TASER is effective because it overrides the nervous system of the human body. As previously mentioned, the human nervous system communicates by means of simple electrical impulses. Illustrated schematically below, the AIR TASER sends a series of discrete electrical impulses (called Taser-Waves or T-Waves™) quite similar to those used by the human body for communication (for illustrative purposes, these nerve signals are called “brain waves”).



The AIR TASER’s T-Wave output overpowers the normal electrical signals within the nerve fibers. Very similar to “radar jamming,” the nerve communication blips are washed out in a sea of “white noise” created by the T-Wave electrical impulses. The human target loses control of the neuromuscular system, as coordinated action is severely impaired.

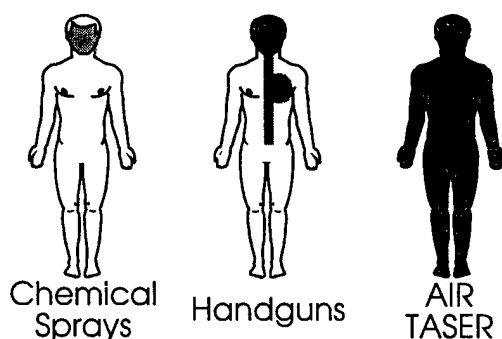
The following graph compares actual field data of the TASER to a variety of handguns based on percentage of targets that are immediately incapacitated.¹ The actual effectiveness in use of the TASER matches or surpasses those for handguns with an 86% instant incapacitation rate.



Notice that this sample is biased **AGAINST** the TASER in that the vast majority of the people who were shot by a TASER (86% in one study) were on phenylcyclohexylpiperidine (PCP). Note that people on PCP frequently break their own bones without notice and are infamous for their ability to absorb bullets without going down.

The reason that the TASER is so highly effective is that the electrical signal penetrates the nervous system regardless of the placement of the probes. The entire human body is covered by a neural net that the AIR TASER uses to knock out its target. The probes do not have to penetrate the flesh or cause bodily harm to be effective because the AIR TASER T-Waves can penetrate approximately two cumulative inches of clothing.

■ Effective Target Areas



For a bullet to be instantly effective, it must hit a vital organ such as the heart or brain. Similarly, chemical sprays and pepper sprays must hit an assailant in the face -- no easy task in fast moving confrontations or windy environments. However, the AIR TASER can be used more effectively and with less training than other non-lethal weapons. In fact, the TASER is the Los Angeles Police Department's weapon of choice for those on PCP and the mentally deranged.

APPLICATIONS OF TASER TECHNOLOGY

The AIR TASER system is an ideal tool for the military police and peacekeepers. Imagine the results in such hostile environments as Haiti, Bosnia and Somalia. No longer would a soldier have the critical choice of firing an M-16 or not firing in a dangerous situation. The AIR TASER would simply add the proper instrument for the peacekeeping mission without removing the option of lethal force.

The challenges of modern day warfare and peacekeeping missions are also common to the law enforcement community, particularly in light of the ever increasingly dangerous and litigious times. The streets of America are armed with extremely powerful and efficient weapons and present a serious threat to public safety and officer safety. Often, these threats come from individuals who may be unstable, chemically altered or otherwise extremely dangerous. Apprehension is required, but the methods of apprehension are under the careful and strict auspices of excessive force. Moreover, just as there is a low tolerance for American casualties in warfare in our society, the same holds true for use of deadly force by law enforcement.

Law enforcement could use the advanced AIR TASER technology for street confrontations, chase and apprehension, temporary restraints (used either on the street or during incarceration), suicidal

individuals with weapons, control of individuals, breaking up riots in prisons and jails, crowd control and hostage/barricade situations. Moreover, citizens themselves are using lethal weapons against one another to commit crimes in the heat of passion, during domestic violence, gang initiations and drive by shootings. Every year, firearms kill over 35,000 Americans. The availability of a variation of this non-lethal system could save thousands of lives by giving law enforcement and consumers a viable and effective alternative to a firearm. Already tens of thousands of consumers in the U.S. have purchased the AIR TASER system. It was not available to U.S. military and law enforcement by legal agreement until today – February 25th, 1998. Most of the readers are unaware of this situation. However, today begins the opportunity to answer the NDIA's call for effective and inexpensive non-lethal weapons.

With this announcement of the availability of the AIR TASER for U.S. military and law enforcement use, there are now are multitudes of end users available that have vital interest in using this system or a variation of it. This includes the federal prison system, jails, federal and local law enforcement agencies, and the military police and its soldiers. Now there is an opportunity to join security firms, military contractors with secured facilities and the general mass consumer market in using the most effective, safest and inexpensive non-lethal system worldwide. Already, this system is used worldwide in over 50 countries for military, police and civilian use.

AIR TASER, Inc. believes that more research and development is necessary for the future advancement of non-lethal weapons and thoroughly encourages the advancements in this technology. However, it is clearly evident that the military and law enforcement community has largely been denied one of the most successful and effective systems for non-lethality. The availability of this system as an "off-the-shelf" system for under \$250 is now. While research and development continues to find the exotic and magic non-lethal bullet, the opportunities to use the AIR TASER should not be ignored now that this system is available for military and law enforcement use.

The AIR TASER system is simple, clean, lightweight, low cost, effective. The system measures less than 7.5 inches, weighs 9 ounces and requires one 9-Volt battery. Its effectiveness for instant incapacitation is 86%, equal in power to a .357 Magnum. An individual can be armed with one complete system at less than \$250. It is available with a laser sight. These are exactly the same parameters the NDIA Non-Lethal Conference II set as goals for industry to respond.

Choices must be made. The military and law enforcement cannot continue to wait empty handed for the ongoing spending of money, time, and effort on new and exotic non-lethal systems. The need to arm these soldiers and police officers with an effective and inexpensive non-lethals is immediate. The AIR TASER is available now. Each day that goes by only increases the chances of unnecessary deaths and dangerous exposure to soldiers and police officers for not having the proper tools that are available today.

REFERENCES

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- ⁱ Marshall, E.P. and Sanow, E. J. Handgun Stopping Power, The Definitive Study and Sgt. Greg Meyer, LAPD, "Ode to the TASER Gun," The Los Angeles Daily Journal, April 22, 1991.