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## INTRODUCTION

The United States armed forces expect to encounter a variety of military operations in the future that are unconventional in nature. Known as Military Operations Other Than War (MOOTW) they include such things as peacekeeping, humanitarian relief, covert operations, and hostage rescue. To better arm our soldiers for these type of conflicts, the military is currently pursuing an agenda of developing non-lethal weapons that incapacitate the threat instead of killing them.

U.S. Army Pfc. Brent Adams checks a driver's identification card during a stop at checkpoint in Bosnia. Non-lethal weapons could allow him to carry out his job while minimizing the risk of conflict escalation. (DoD photo by Cpl. William Lee)



This paper will discuss the criteria for use in developing non-lethal weapons. It will examine some of the weapons currently being designed or produced. Finally, it will discuss the effective application of non-lethal weapons in the future.

## CRITERIA FOR THE IDEAL NON-LETHAL WEAPON

There are many conditions under which deadly force is contraindicated by operational objectives. Unfortunately, since many low-intensity operations carry the threat of violence, the soldier, diplomat, or relief worker may still be in danger. The non-lethal weapon is an effective trade off between lethality and effectiveness. The ideal weapon must incapacitate the threat to the extent that it is not a threat anymore. This requires a careful balance between using too much force - which would reassert the weapon as lethal - or too little, thus only endangering the operator. To be an effective alternative to deadly force, the traditional mechanism for the soldier, the ideal non-lethal weapon must first meet the criteria of composition. Feasibility for use in the field depends on a weapon being portable and lightweight. It also must be somewhat gun-like and easily securable on the person. In addition, the weapon must have the ability to be used over a considerable distance so that the soldier is not endangered by having to make a last-second decision regarding the level of the threat. Although training is required to teach the circumstances for the use of any weapon, the soldier using a non-lethal weapon must be even more aware of the situation around him because employment of the weapon typically depends on the extent of the threat, as opposed to just the existence of the threat itself.

The next criteria to be examined for any non-lethal weapon is capability. The weapon must be able to stop a person effectively without causing death or permanent damage. Human beings vary in physical structure; therefore, it is possible for the same weapon to be effective on some and not on others. Even more worrisome is the fact that the amount of force might be too much, resulting in death or maiming. The possibility of abuse looms large when it is virtually impossible to measure in advance whether or not a given level of force will be effective. The flip side of this issue is also of great concern. The soldier armed with an ineffective non-lethal weapon is completely vulnerable in the face of a threat that has lethal force. In fact, the prevalence of lethal force today, incarnate primary as a conventional gun, is of grave concern. The mere fact that a soldier will be carrying a non-lethal weapon in the face of a potentially lethal threat lends itself to the tendency to err towards more power than less.

The limitations stated above directly applies to the final attribute essential for creating a feasible non-lethal weapon. The power must be variable. The soldier must determine when to set a weapon on maximum level if put in the position of an attacking mob, or when to adjust it to a lower level to be used against children grabbing for his sidearm. The best power setting will neutralize the threat immediately, completely, and temporarily, with little or no side effects. "Set phasers to stun" may sound like science fiction, but the ability is essential if a non-lethal weapon is to be effective.

Unfortunately, no weapon has yet been developed that encompasses all of the above criteria. There are various trade-offs with each weapon, and each has a different application and is thus relatively restrictive in application. This is an inherent weakness of any weapon in that having access to all the variations of weapons for the situations that may arise is virtually impossible. The key must be to limit the uncertainty that may arise in a scenario, therefore narrowing the potential threats and ensuring the soldier has the proper weapon of choice.

## A VARIETY OF WEAPONS

The following list of weapons is by no means all inclusive. One limitation of this research paper is that I do not have access to classified information and am relegated to the information world of periodicals and the Internet. While it is possible to speculate on the development of weapons that are not yet public, the scope of this paper is adequately fulfilled in that, if developed, the weapons listed here would prove to be an invaluable asset for the soldier in military operations other than war.

### *Weapons That Stun*

The first classification of non-lethal weapons is weapons that stun. These weapons are already through the developmental stage and are in use in municipal police forces as well as being stocked in military arsenals.

Stun grenades have been around for the past several decades. Often known as "flash-bangs," they operate primarily by creating a blinding flash of light followed by a loud explosion. The concussion renders the threat stunned, at least temporarily. The weakness of this weapon is that if it is used too close to the threat, it will kill them; and if used at too great a distance, it will be ineffective and only make the operator vulnerable to counter-attack. The ideal situation for the use of this weapon is crowd dispersal and riot control. Also, the flash-bang will often be more effective in less-developed countries, as they tend to be more vulnerable to unexpected and unnatural noises.

Plastic bullets have been used by the Israeli military with limited success. The goal of the rubber bullet is to inflict the right amount of pain to cause the threat to decrease charging, or to disperse a crowd. At close ranges, the muzzle velocity of the round is fatal; yet, without significant velocity the bullet is widely inaccurate and often drops to the ground. Because of this, there is a very narrow distance in which they are effective as a deterrent. Also, the rubber bullet can cause serious damage if it hits anywhere other than the chest. A shot to the face or the groin area can cause permanent damage or even death.

Another type of alternate projectile is the bean-bag bullet. Fired from a shotgun-like air-powered device, the bean-bag bullet is a fabric container filled with either plastic or rubber shot. The effects and limitations are similar to those of the rubber bullet. Another variation of this type of projectile is the 40-mm non-lethal sponge grenade. Developed in direct response to an urgent request from U.S. Southern Command, the projectile has a plastic body equipped with a foam rubber nose. It is part of the ongoing Soldier Enhancement Program initiative begun in FY96. Fired from the M203 grenade launcher, the weapon allows the soldier to maintain a considerable standoff distance and still have knock-down power, but with limited lethality consequences.

The next area of research for weapons that stun is the chemical arena. The use of chemical weapons in military operations other than war is extremely limited because chemical weapons are strictly controlled by several international treaties. However, since the use of some chemical weapons is allowed to resolve internal problems, an overview of the options available is relevant for this paper because U.S. forces often work in conjunction with a foreign nation's military for various MOOTW.

CS gas, commonly referred to as tear gas, is used by police and riot control forces. The gas affects a person's external and internal membranes, proving to be a considerable irritant to the eyes, throat, and lungs. While usually not fatal, nausea and faintness are potential side effects. The weakness of any chemical weapon is that adequate protection must be provided for the operator, lest they too fall victim to its effects.

A type of non-lethal chemical weapon currently in development is a kind of sleeping gas. A chemical spray that makes people fall asleep before noticing what's happening would be ideal in a terrorist/hostage situation. Although this weapon is not currently available, the prospect for a prototype is promising.

An area of research that may be of great value to operations done at night is the blindingly bright xenon flashlight. Coupled with a computer chip that controls the micro-second timing of the flash with goggles that become opaque to protect the operator, this weapon could prove to be very effective. Unfortunately, along with stunning the threat, the flash may cause the eyeball to explode or permanently blind the individual. Because of this, the U.S. recently banned use of this type of device. Research is still ongoing though, and it is possible that a safer version of this weapon to emerge soon. Peripheral areas of research from this technology include flashes or lasers that will destroy aiming, optic, and sighting equipment of the enemy.

### *Weapons That Immobilize*

Weapons that immobilize include nets, sticky foam, and super lubricants. The net is a very basic type of non-lethal weapon that usually includes a harmless smoke screen to disorientate the threat to enable the operators to get close enough to capture him. The obvious downfall of such a device is the operator must come in close range with the threat. To work properly, the use of nets must be conducted by more than one individual, usually three or four. Because of this, the net is not an extremely effective weapon in military operations.

A weapon that is not only feasible but which has already been carried into a conflict is sticky foam. Carried on the backs of some Marines when they entered Somalia, sticky foam is dispensed from a high powered, self-contained backpack not unlike a flame-thrower. The operator shoots the foam at the legs of the threat and immobilizes it. The inevitable weakness is that the threatening individual still has the use of his hands, in which he may be carrying a weapon. The natural response to this, enveloping the entire body in foam, is not recommended because if inhaled it would kill the individual by suffocation. To circumvent this, it is possible to add more punch to the foam by lacing it with irritants such as pepper spray. This would combine the goal of immobilizing as well as deterring others and still causing significant irritation to the restrained individual so that he would be less likely to counterattack. One downside to this weapon is the apprehension of the individual. The foam is difficult to remove and requires solvents to get it off completely. If the foam was pulled off the body quickly, it would remove skin. This weapon, while proven to be effective by law enforcement agencies, could pose a problem in areas of the world where solvents are not available. The individual could seriously hurt himself if he attempted to remove the hardened foam. If left in a constrained position for a long

period of time, he could conceivably die. Since both of these are contrary to the purpose of non-lethal weapons, there may be a reluctance to use foam in a less developed country.

A type of foam that immobilizes without being sticky is super foam. Dispensed from a portable generator type device with a 275 gallon tank, the foam covers an area about 200 feet long by 20 feet wide and 4 feet high. The foam is often laced with irritants and its primary purpose is to serve as a barrier. While it looks like soap suds, the consistency is denser and does not blow away in the wind. Used for crowd control or to block the entrance to an embassy or other building, the foam is quite effective. Although portability of the generator is a question, this foam has excellent potential in limited applications.

An interesting non-lethal weapon that might resemble something from a comedy movie is super lubricants. The lubricants could be applied in a building hallway to make it virtually impossible to pass through without falling. Similar applications could be used on roads to inhibit the progress of a vehicle. These super lubricants are Teflon based that may be very effective in creating a barrier that cannot be crossed quickly. This would give soldiers ample warning to respond to a threat with additional force.

The final type of weapons that immobilize are radio frequency weapons. These weapons come in a wide variety of choices; not all are designed for antipersonnel use, but categorizing them in this classification seems appropriate. The simplest type of radio frequency weapon is commonly used by the PSYOPs community: loudspeakers. These speakers, mounted on a truck, broadcast messages in an attempt to persuade or demoralize the potentially threatening population.

A more potent RF weapon currently under development is the high powered very low frequency (VLF) modulator. Working in the 20-35 KHz spectrum, the frequency emits from a 1-2 meter antenna dish to form into a type of acoustic bullet. The weapon is especially convenient because the power level is easily adjustable. At its low setting, the acoustic bullet causes physical discomfort -- enough to deter most approaching threats. Incrementally increasing the power nets an effect of nausea, vomiting and abdominal pains. The highest settings can cause a person's bones to resonate, which is very painful, as it can ultimately cause the bones to literally explode internally. Aimed at the head, the resonating skull bones have caused people to hear "voices." Researched by the Russian military more extensively than by the U.S., the Russians actually offered the use of such a weapon to the FBI in the Branch Davidian standoff to make them think that "God" was talking to them. Concerned with the unpredictability of what the voices might actually say to the followers, the FBI declined the offer. Another RF weapon that was ready for use back in 1978 was developed under the guise of Operation PIQUE. Developed by the CIA, the plan was to bounce high powered radio signals off the ionosphere to affect the mental functions of people in selected areas, including Eastern European nuclear installations.

#### *Weapons Against Machinery*

The next area of non-lethal weapons is primarily used against machinery. Often called direct energy weapons, or "Demons," these devices can either cause the machinery to stop functioning or to render it vulnerable to further, more lethal attacks. In addition to this effect, man has become very dependent upon the use of machines and is often rendered helpless in a situation when they become dysfunctional. Therefore, it is only appropriate that they are covered here. The primary anti-machinery arsenal includes the microwave weapon, the non-nuclear electromagnetic pulse, and the laser weapon.

U.S. Special Operations Command has in its arsenal the portable microwave weapon. The capability of such a weapon is varied in that it can not only disrupt enemy communications, but can also superheat internal organs. Of course, directing this type of weapon towards personnel eliminates it from the non-lethal classification. Developed in the Los Alamos National Laboratory, the weapon forms its signal similar to the RF weapons discussed above in that it directs the energy into a high-powered pulse and destroys transistors and other electrical equipment. They will allow the technologically dependent threat to be both blind and deaf to an incoming attack. Another interesting use would be to direct such a weapon towards enemy aircraft. Meant to enforce a no-fly zone or just to maintain air superiority over an airspace, the weapon is targeted on an aircraft to disrupt its instrumentation.

The non-nuclear electromagnetic pulse is currently in development. One EMP weapon stationed in space with a wide area pulse has the ability to "fry" enemy electronics in a battle area. Developed in the Los Alamos National Laboratory, a smaller scale weapon is in the testing phase. A bank of capacitors in the weapon all release their stored energy in a very short time to create a super-high powered pulse. To give an example of the directed power associated with this weapon, the generator produced a "12-16 million amp pulse with a rise time of only 400 nanoseconds. The effective power of over four trillion watts exceeded the electrical generating capacity of the rest of the planet." Capable of being mounted in the nose of a cruise missile, the generator can be focused on a 30 degree swath to concentrate on a specific target within several hundred meters of the missile. The key, officials say, is not the pure power of the pulse, but the ability to focus the output. The energy must be deposited at a certain range and accuracy to be effective. On an even smaller scale, a portable EMP weapon could be carried by ground forces to destroy the electrical components in an armored vehicle or tank. This capability is being developed with police forces to emit a pulse that would stop a car almost immediately. Similar peripheral uses include enforcing a no-fly zone by disrupting the electronics of enemy aircraft, much like the microwave weapon discussed above.

The pulsed chemical laser is used to generate "hot, high-pressure plasma to create a predictable blast wave on the surface of the target." This is a variation of another direct energy weapon currently in development. A different type of laser currently in development is the isotropic radiator. It is an explosion driven munition, capable of generating very bright, omni-directional light that would destroy the optics in enemy sensors. The inevitable side effect would be destroying the retinas in any human with his eyes open; therefore, it is necessary to have ample protection for the operator.

This concludes the research on the various non-lethal weapons available to U.S. military forces. This next section will investigate the application of this type of force in MOOTW.

#### APPLICATION OF NON-LETHAL FORCE

One of the primary objectives of military operations other than war is to prevent a conflict or resolve it quickly. Escalating the violence and contributing to instability are 180 degrees removed from that goal. Under the MOOTW principle of "restraint," commanders will need to employ the minimum force necessary to accomplish the mission.

Lethal force is not desirable in a peacekeeping scenario because of the possibility of escalating the situation. This is not to say that the neutral forces are not in danger, though. Radical factions present the dilemma of attempting to escalate the threat by forcing the peacekeeping detachment to fire upon a side. This can be detrimental to the operation; once the peacekeepers start taking sides, or even give the appearance of doing so, the situation escalates, putting the peacekeeping force in further danger and significantly changing the nature of the operation. To prevent this, effective non-lethal weapons are needed. To suppress a rioting mob throwing rocks at soldiers, the military could employ a variety of measure. This would include laying down a coat of super lubricant in the street and combining it super foam laced with the irritant pepper spray. This would effectively prevent anyone from getting hurt while subduing the threat and blocking an area from the mob.

A rioter charging before these measures can be deployed presents another problem. To handle this scenario, the soldier can immobilize him with sticky foam. Aiming at the legs, the threat would be mediated.

Another possible measure that could be used in crowd dispersal includes rubber bullets and foam grenades. Rubber bullets fired at the ground in the immediate distance before a mob would ricochet off the ground and strike the individuals in the legs. This has proven to be a safe and effective use of rubber bullets. In the face of a more serious threat, the foam tipped grenade can be shot at an individual who is not easily deterred. By knocking the victim to the ground with powerful blunt force, the soldiers are able to mediate the threat at a distance. CS gas (tear gas) is also an effective and proven non-lethal weapon in the riot scenario.

In a humanitarian mission such as Operation SEA ANGEL conducted in Bangladesh (a multinational response after a cyclone killed well over 100,000 people in 1991), the concern is not so much the escalation of the situation, but the protection of the relief workers. Soldiers in these missions do not wish to hurt the people they have come to help; however, the situation may arise in which the people are rioting for food or mischievous children are reaching for a sidearm. Certainly, shooting in a crowd is not the recommended course of action; therefore, non-lethal weapons provide the needed effective deterrent to protect the soldiers. Super foam deployed in an area to prevent rushes to a food supply or super lubricants placed on the roads in front of military barracks would limit the access points to these sensitive areas. A safe, but effective, xenon bright light could also be used to deter people from getting to close to soldiers. Finally, the use of CS gas will aid in the dispersal of an unruly mob without causing any permanent damage.



An American mother and her child are escorted to a U.S. Marine helicopter in Albania during Operation SILVER WAKE in March 1997. Non-lethal weapons can protect forces while minimizing the risk to hostages and innocent civilians. (DoD photo by Sgt. Mark Oliva, USMC)

The development of non-lethal weapons is of particular concern to U.S. Special Operations Command. Inserted into a foreign country with a very specialized mission, special ops personnel prefer low key weapons that do not leave a residue. Modulated radio frequency weapons can immobilize a threat without killing him or leaving any traces or making any noise. Furthermore, the weapon can be used at a distance to prevent the special ops members from being detected. Chemical weapons such as sleeping gas could render a threat harmless for just enough time to complete a mission. Neutralizing an enemy before an insertion is also advantageous. An electromagnetic pulse directed towards an enemy encampment would render them electronically blind and deaf to the special ops insertion, increasing the likelihood for an undetected entrance. If detected, they could use the xenon light to temporarily blind the enemy, without leaving any residue or making any noise. These are just a few possible scenarios in which non-lethal weapons could be incorporated into special operations.

Hostage rescue is a situation that also lends itself extremely well for the use of non-lethal weapons. Killing the terrorists is not necessarily a concern; killing the hostages is. To circumvent this, measures such as a high-powered direct energy weapon would instantly kill them with no lateral damage. Mentioned before, a sleeping gas would be effective to overcome the terrorists before

they realized what was happening to safely extract the hostages. Another weapon that would be of some use is CS gas. Designed to create a diversion long enough to get in better position to kill the terrorists, the CS gas does not have any lasting effect on the hostages.

This guide to non-lethal weapons and the manner in which they can be used should be of use to a student of military affairs. Realizing that the United States has involved itself in a great many situations that fall into MOOTW, the development and creation of the weapons examined in this paper is of vital military necessity. The U.S. soldier in the 21st century is bound to find himself in an altercation where some type of non-lethal action is required; this paper will let him know what his choices are and how he can deploy the best weapon for a particular operation. Officers in the military have a responsibility to learn of the technologies available and provide the most effective training for their people. Learning the information in this paper is the logical first step, for it provides the best culmination of the publicly available information concerning non-lethal weapons and their applications in MOOTW.

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