STRATEGY RESEARCH PROJECT

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AN ANALYSIS OF THE STRATEGIC APPLICATION OF NON-LETHAL WEAPONS TO PROVIDE FORCE PROTECTION

BY

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ABSTRACT

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The working principles of the U.S. National Security Strategy are to shape the international environment, to respond to threats and crises, and to prepare for an uncertain future. The U.S. continues to respond to a variety of contingencies by using its military capability across the spectrum, including peace operations and humanitarian assistance. U.S. forces are manned, trained, equipped to deter and, if necessary, to fight and win conflicts when this nation's vital interests are threatened. The application of lethal force is the ultimate option for the military element of power. However, some situations warrant options short of lethal force. This study analyzes one available option: the application of non-lethal force to provide force protection. It will describe strategic, operational, and tactical applications of non-lethal weapons during past conflicts, and then preview non-lethal capabilities for the future, including challenges to their use. It concludes with recommendations for the use of non-lethal weapons in selected U.S. military operations.

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AN ANALYSIS OF THE STRATEGIC APPLICATION OF NON-LETHAL WEAPONS TO PROVIDE FORCE PROTECTION

There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain of success than to take the lead in the introduction of a new order of things, because the innovator has for enemies all those who have done well under the old condition, and lukewarm defenders in those who may do well under the new.

—Niccolo Machiavelli[1]

From A. D. 1200 to 1500 a group of mercenaries on the Italian peninsula called the *condottieri* waged what has often been regarded as a form of nonlethal warfare. They were hired by the various mercantile city-states to protect vital interests. Many of the major engagements between these city-states' condottieri were almost ludicrous for their lack of casualties.

According to Niccolo Machiavelli, the battle of Zagonara in 1424 was a "defeat, famous throughout all Italy, in which no death occurred except those of Lodovico degli Obizi and two of his people, who, having fallen from their horses, were drowned in the mire."[2] Several reasons have been given to account for this low lethality in humankind's most violent activity – open warfare. One of the more plausible reasons was the simple fact that the armor of the day was much superior to most offensive weaponry. A more personal reason was the fact that the surest way for the mercenary condottieri to lose their source of livelihood was to obliterate their enemies. As a result, mercenaries rarely sought setpiece battles, choosing instead to fight relatively minor and extended campaigns. Engagements between mounted warriors often resembled jousts, while those between infantry often turned into shoving matches.

So past, non-lethal warfare may not have relied on the use of non-lethal weapons; rather, it was the fortuitous result of the superiority of body armor over offensive weaponry or the mutual lackadaisical approach of opposing soldiers and leaders. Today, non-lethal weapons might offer the ability to wage non-lethal warfare without relying on such fortuitous circumstances. Non-lethal weapons should provide a means of keeping the level of conflict low and of dissuading belligerents from resorting to more forceful weapons. Also, the prospect of resolving conflict with low levels of lethality is especially appealing to a country that has a warfighting doctrine of minimizing friendly as well as enemy casualties.[3]

CURRENT ENVIRONMENT

The purpose and conduct of war has fundamentally changed in the 1990s. The collapse of the bipolar order that characterized the Cold War drastically altered the international security environment and obliged the United States military to reevaluate its purpose and strategies. This very different strategic environment requires new tools and tactics, yet the technology the United States is prepared to deploy remains largely the same types of technology it has relied upon in the past. To acknowledge the need for new types of weapons, we want to understand the new situations the U.S. armed forces will face in the post-Cold War world.

In the new strategic environment, the primary U.S. goal is to stabilize current balances of power and protect vital national interests. Global economic interdependence, the spread of democracy, and the dominance of American military power have all reduced the probability of large-scale war between major nations. Instead, the most pressing security threats facing the United States are:

1. The risk of low-intensity conflicts caused by ethnic or nationalist rivalries between or within states
2. Rogue behavior by nations or non-state actors that threaten fundamental American interests, and
3. Indirect threats, such as the proliferation of weapons of mass destruction, refugee flows, and humanitarian crises resulting from state failure.[4]

So, rather than preparing for all-out, "total warfare" against a clearly defined enemy, U.S. armed forces must be prepared to deal with a wide variety of peacetime and combat missions intended to divest aggressors of their ability to disrupt international security and threaten vital American interests.

Since the end of the Cold War, the United States has faced an important strategic question: When, and with what means, should the United States intervene in civil and ethnic conflicts? Our entire approach to these conflicts—how we think about them and what actions we take—is enormously affected by our capabilities to quell them by diplomatic, economic, and military means. To date, the United States has been trapped between classic diplomatic table-thumping and indiscriminate economic sanctions on the one hand, and major military interventions on the other hand.[5] But there may be a new and effective middle option in the future, one that could lend credibility to U.S. crisis diplomacy and offer new capabilities for pressuring adversaries or fighting wars with minimal loss of life. This potential new option could come in the form of non-lethal warfare conducted with a new kind of arsenal.

DEFINITION

What precisely do we mean when we use the term "non-lethal weapon" (NLW)? Why does such a term generate great emotion and debate? NLWs are referred to by many names: "Soft-kills," "less-than-lethals," "disablers," and "incapacitors," are just a few descriptors used in recent literature. Likewise, there are as many definitions as there are names for these weapons.

Today, Department of Defense (DOD) policy defines non-lethal weapons as "weapon systems that are explicitly designed and primarily employed so as to incapacitate personnel or materiel, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment."[6] This definition does not include information warfare, electronic warfare, or any other military capability not designed specifically for the purpose of minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment, even though these capabilities may have non-lethal effects. Emotions are often aroused when many NLWs critics and supporters claim terms such as "non-lethal" and "soft kill" are misleading because even NLWs can result in death. Clearly, the NLW debate then leads to such familiar controversies as those that concern hypocrisy and political correctness.

It is important to note that DOD policy does not require or expect non-lethal weapons "to have a zero probability of producing fatalities or permanent injuries."[7] Rather, non-lethal weapons are intended to significantly reduce the probability of such fatalities or injuries as compared with the lethality of traditional military weapons, which achieve their effects through the physical destruction of targets.

A proper definition of non-lethal weapons must include the fact that they are indeed designed to disable or incapacitate a person or inanimate object, but with no intent to kill. Incorporation of intent into the definition of non-lethal weapons is critical. "Legally and historically, intent carries a great deal of weight...and it accurately represents our objectives."[8] Commanders must remember that any weapon, even if properly employed, may cause death or permanent injury. When commanders integrate the use of non-lethal weapons into their operations, it must be understood that grave responsibilities accompany that integration.

For the purpose of this study, non-lethal weapons are defined as instruments used by armed forces "designed to disable enemy forces or incapacitate combatants and others without killing them or causing permanent harm".

POLICY

The Quadrennial Defense Review (QDR) and the 1999 National Security Strategy (NSS) for a New Century, cite three tenets for U.S. national security:

- Shaping the international environment
- Responding to threats and crises
- Preparing for an uncertain future[9]

Since a military peer competitor for the U.S. is highly unlikely in the near future, a shift from the philosophy of overwhelming power will be required in order to promote regional stability and shaping of the international environment. Even though confrontational states will continue to use overwhelming force and lethality to their advantage, there will be times where a response of overwhelming U.S. force is inappropriate. Additionally, U.S. society seems reluctant in the matter of U.S. forces taking or inflicting casualties. Thus U.S. policy and decision-makers must find alternative tools for employment of force in order to deter the world's aggressors.

The QDR confirmed that Small Scale Contingencies (SSCs) would continue for the foreseeable future of 15 to 20 years. The United States responds to SSCs with a full range of military operations including show of force, interventions, peacekeeping and humanitarian assistance operations. Such operations minimize casualties and strictly limit collateral damage. Minimizing collateral damage in the full spectrum of threats and crises, to include Major Theater Wars (MTWs), is critical to expediting the restoration of order to the affected region or nation. The NSS notes the recent increase in asymmetrical threats and crises, declaring that our ability to respond at home and abroad means the U.S. must be selective and focused in response to challenges that directly affect our interests, engaging only in those areas where we can make a significant difference.[10]

Furthermore, DOD has established a non-lethal weapons policy, articulated in DOD Directive 3000.3. This new policy recognizes the potential of non-lethal technologies and designates a curator for the U.S. non-lethal weapons program:

1. Non-lethal weapons, doctrine, and concepts of operation shall be designed to reinforce deterrence and expand the range of options available to commanders.
2. Non-lethal weapons should enhance the capability of U.S. forces to accomplish the following objectives:
    a. Discourage, delay, or prevent hostile actions.
    b. Limit escalation.
    c. Take military action in situations where use of lethal force is not the preferred option.

d. Better protect our forces.

e. Temporarily disable equipment, facilities, and personnel.

3. Non-lethal weapons should also be designed to help decrease the post-conflict costs of reconstruction.
4. The availability of non-lethal weapons shall not limit a commander's inherent authority and obligation to use all necessary means available and to take all appropriate action in self-defense.
5. Neither the presence nor the potential effect of non-lethal weapons shall constitute an obligation for their employment or a higher standard for employment of force than provided for by applicable law. In all cases, the United States retains the option for immediate use of lethal weapons, when appropriate, consistent with international law.[11]

JOINT NON-LETHAL WEAPONS PROGRAM

The Joint Non-lethal Weapons Program (JNLWP) was established to provide warfighters with a family of Non-lethal Weapon systems with a range of optional non-lethal capabilities across the full spectrum of threats and crises. The JNLWP began in 1996 as a Congressional initiative. DoD Directive 3000.3, (9 Jul 96) established the policy and assigned responsibilities for the JNLWP. This directive applies to all NLW development and acquisition programs, as well as the employment of fielded NLWs. The Commandant of the Marine Corps was designated as the Executive Agent for the program. In 1999, Commandant General James L. Jones made the following statement concerning non-lethal weapons:

> Today, world events mandate a need to project non-lethal force across all levels of war to enable our warfighters and leaders to effectively deal with a host of traditional, as well as non-traditional threats. Now more than ever, the minimal level of public tolerance for collateral damage and loss of human life, coupled with the tendency for the typical adversary to exploit our rules of engagement to his benefit, necessitates an effective and flexible application of force through non-lethal weapons.[12]

The keystone of the JNLW vision will be the joint development and fielding of a family of NLW systems applied across the full spectrum of military operations, matched to the warfighter's requirements for the 21st Century. "The primary task of the Armed forces will remain to deter conflict but—should deterrence fail—to fight and win the nation's wars" (JV2020). As the force stands ready to fight and win with lethal force, it is certain that the

services will also continue to be called upon to execute a wide range of contingency operations. In characterizing such operations, the 31st Commandant of the Marine Corps, General C.C. Krulak, used the "Three Block War" analogy to describe the complexity, difficulty, and changes of urban warfare at the small unit level. Within the space of three city blocks, a small unit may be providing humanitarian assistance in one block, enforcing peace in another block, and engaging in open combat in a third block.[13]

NON-LETHAL CAPABILITIES

Non-lethal weapons are being developed in numerous categories. This study focuses on non-lethal weapons designed to protect people and assets, and to prevent entry to important areas and resources. Such weapons enhance core capabilities that enable us to achieve desired operational outcomes. A non-lethal capability provides a flexible means of response, enabling us to protect friendly forces, to influence the actions of potential adversaries and noncombatants without resorting to lethal force, and to minimize collateral damage. Non-lethal weapons may neutralize the adversary's personnel or his equipment.

COUNTERPERSONNEL CAPABILITIES

Non-lethal counterpersonnel capabilities allow the application of military force to accomplish a mission with reduced risk of fatalities or serious casualties among noncombatants- or even, in some instances, among enemy forces. Non-lethal capabilities facilitate for crowd control by influencing the behavior and activities of a potentially hostile crowd as well as a rioting mob. While there are many similarities in these two groups, each presents unique challenges, which may require radically different solutions. Non-lethal weapons may also incapacitate individual personnel. This capability provides a means to capture specified individuals, such as those inciting a mob to violence or enemy combatants, without affecting nearby individuals. Non-lethal weapons can deny personnel access to an area (land, sea, or air) a critical capability. Such weapons may create physical barriers or cause discomfort to those seeking to enter the denied area. Finally, non-lethal weapons may be used to clear facilities and structures of personnel. This capability will facilitate military operations in urbanized terrain (MOUT) by reducing the risks of noncombatant casualties and collateral damage, while denying enemy advantages in defending a built-up area.[14]

COUNTERMATERIEL CAPABILITIES

Non-lethal countermateriel capabilities enhance U.S. operations by reducing or eliminating the enemy's ability to use his equipment. A robust nonlethal countermateriel capability will facilitate the employment of military force to defuse potentially volatile situations under circumstances in which more destructive conventional military means might prove counterproductive. For example, preemptive strikes using conventional weapons against troublesome, aggressive nations may be politically unacceptable, with their attendant high risk of personnel casualties. Non-lethal countermateriel capabilities, however, may greatly reduce an aggressive nation's ability to threaten its neighbors with far less political risk, by attacking only weapons and their supporting infrastructure.[15]

The U.S. military non-lethal weapons approach focuses on two specific countermateriel capabilities. The first is an area-denial capability. It denies land areas to vehicles. This requirement applies to wheeled, tracked, and surface-effects vehicles. It may include physical barriers; systems that render vehicles temporarily inoperable within the systems' zone of influence, and systems that reduce the trafficability of terrain.[16]

Second, a non-lethal capability can disable or neutralize specific types of equipment and facilities. This capability encompasses a wide range of subcategories based on the variety of equipment types to be targeted. Many technologies may be useful in this area. For example, systems have been produced to alter the combustion properties of fuels, the viscosity of lubricants, or the ability of vehicles to gain traction. Other technologies may cause the embrittlement or decay of rubber, thereby disabling tires, hoses, gaskets, and insulation. Some countermateriel nonlethals may act as adhesives, gluing doors and hatches shut or tires and tracks to road surfaces. Chemical, electronic, or acoustical systems may be designed to shut down or burn out vehicle, vessel, or aircraft electrical systems or to fuse the metal parts in key equipment without harming its human operators.[17]

TYPES OF NON-LETHAL WEAPONS

The types of NLWs available are limited only by a lack of imagination and funding. Military forces already have at their disposal a variety of antipersonnel and antimaterial NLWs to enhance force protection. Consider the following non-lethal antipersonnel weapons under development or already in use:

ANTIPERSONNEL TECHNOLOGY

Acoustics

- High-intensity Sound: These NLWs set the eardrum in motion. Such vibrations cause the inner ear to initiate nerve impulses that the brain registers as sound. The inner ear regulates the spatial orientation of the body.
- Sonic Bullets: These are packets of sonic energy propelled toward the target. The Russians apparently have a portable device that can propel a 10-Hertz (Hz) sonic packet the size of a baseball hundreds of yards. Employed against humans, the energy can be modulated to produce non-lethal or lethal damage.
- Infrasound: This powerful ultralow frequency sonic weapon can penetrate buildings and vehicles. It is both directional and tunable. After being exposed to high intensity Infrasound, a subject suffers from disorientation and reduced ability to perform simple sensory motor tasks.
- Sensor-Nonimaging Portable Radar: This radar unit weighs less than 10 pounds, uses rechargeable batteries, is small enough to fit into a briefcase, and can detect motion through nonmetallic walls and floors. Tracking sounds instead of images, it detects motion and can transmit to a receiver up to a distance of 200 feet.[18]

Chemicals

- Sticky Foam: Fired from a shoulder-slung dispenser, strings of sticky foam expand on contact and literally stop someone in their tracks, immobilizing them in a gooey mess in a matter of seconds.
- Aqueous Foam: Aqueous foam, a soapy foam, expands up to 500 times its original volume. It prevents people from seeing, hearing, or moving, thus disorienting and immobilizing them.
- Polymer Agents: These adhesives or "superglues" immobilize the enemy; people can be "glued" to objects or to other people.
- Calmative Agents: These sleep-inducing drugs mixed with dimethyl sulfoxide (DMSO), are instantly absorbed through the skin. They can be dispersed in volume by aircraft (like crop dusting), or by an aerosol spray container. These agents were allegedly used by the Soviets in Afghanistan. The reports indicated that the mujahideen would lie down and sleep, later awaking in Soviet custody.[19]

Electromagnetic

- Taser: This low-powered hand-held device can operate up to 15 feet away from a suspect. It runs on a 7.2-volt battery and fires two dart-like electrodes into the suspect. The darts are connected to the Taser gun by tiny wires. When the Taser's trigger is pulled and the darts connect to the victim's skin or clothing, a pulsating current of 50,000 volts is released, causing spasms and eventual immobilization.
- Stun Belts: A recent innovation is the stun belt, an elastic belt used to control prisoners (in court or in transit). The belt is placed around the person's waist with the battery pack situated next to the kidney. If the prisoner becomes violent, the stun belt is activated by a handheld transmitter and "zaps the wearer with 50,000 volts of electricity for eight seconds". This jolt is sufficient to knock a victim down and temporarily incapacitate them.[20]

Opticals

- Lasers: As a NLW, low energy lasers can be used to blind people temporarily, or an infrared laser can sufficiently heat the skin to cause pain, but not to burn the skin. A recently developed argon laser beam aimed at windows and windshields, turns the glass opaque green.
- Bucha Effect: High intensity strobe lights that flash at near human brain wave frequency causing vertigo, disorientation, and vomiting.[21]

ANTIMATERIAL TECHNOLOGY

Antimaterial NLWs also have great potential for use in military force protection and civilian police situations. Many antipersonnel NLWs also serve as antimaterial NLWs.

Chemicals

- Supercaustics: These chemicals can be more caustic than hydrofluoric acid. They can "eat" vehicle tires, hoses, shoe soles, rooftops, and asphalt road surfaces.
- Coating-Slick Barrier: Chemical lubricants, also known as "slick'ems," can be sprayed over pavement; stairs, and other surfaces, making them so slippery vehicles cannot get any traction or progress anywhere.

- Smoke-Cold Barrier: A thick, disorienting "cold smoke" can be generated in areas from 2,000 to 50,000 cubic feet. It restricts an intruder's eye-hand coordination and disrupts interactions among members of an intruding group.[22]

Electromechanical

- Auto Arrestors: Targeted vehicles receive short pulses of electric current which burn out the electronic component of a vehicle's ignition. Since only the ignition system is damaged, the driver can maintain control of the vehicle as it coasts to a stop.
- Electrical Fence: This fence delivers a non-lethal electrical shock. It can be employed as an effective barrier against intruders.[23]

Mechanical

- Vehicle Shrouds: Metallic vehicle shrouds are fired from cannons to ensnare and immobilize vehicles.
- Vehicle Barrier Strips: Police have long needed some kind of device to minimize the dangers of high-speed chases. Barrier strips equipped with retractable hollow steel spikes can be placed across roads in advance of the vehicle under pursuit. The hollow spikes are mechanically extended as the targeted vehicle approaches. Once the vehicle runs over the strip, the hollow spikes become embedded in the tire, puncturing it and causing a flat rather than a blow-out.
- Caltrops Barrier: This personnel and vehicular barrier device consists of four projecting spikes so arranged that when three of the spikes are on the ground, the fourth points upward. Marines used Caltrops in Somalia during United Shield to supplement key barrier systems at night during the final hours of the withdrawal.[24]

STRATEGIC FUNCTIONS OF NON-LETHAL WEAPONS

Despite increasing and diverse threats to national security, the United States has often been unable or reluctant to take the lead in resolving regional crises and addressing sub-national threats. There is no question that the U.S. possesses an overwhelming and unique capability to enforce its vision of the international order. But despite its military dominance, the sole remaining global hegemon has often been ineffective in wielding traditional instruments of power. Sanctions and diplomacy have failed in North Korea, Iraq, and Bosnia, yet the use of lethal force in these situations is often politically unacceptable, both domestically and

internationally. It is clear that the United States lacks effective tools to deal with a wide variety of global crises, the solutions to which fall somewhere between diplomacy and lethal force.

Non-lethal weapons can fill this gap. NLWs can perform six strategic functions to increase the effectiveness of the United States military:

1. Limit collateral damage to civilian populations and infrastructure
2. Remove constraints on early preventive action in international crises
3. Enhance deterrence and coercive measures
4. Complement the use of lethal force
5. Support military operations in urban terrain (MOUT)
6. Aid military operations other than war (OOTW), particularly peacekeeping and humanitarian assistance operations.[25]

Limit Collateral Damage to Civilian Populations and Infrastructure

Modern military missions require greater attention to effects on non-combatants and civilian infrastructure. In humanitarian operations, for example, soldiers will be injected into socially and politically chaotic environments where application of force may be necessary to operate effectively or to protect U.S. forces. Yet the purpose of a military presence in these instances is to protect civilians and restore order. The conflict between self-defense and civilian protection can produce hectic situations. Consider Somalia, where between 7,000 and 10,000 civilians were unfortunately killed as a result of peacekeeping efforts.[26] Non-lethal weapons can resolve this issue by giving soldiers a way to simultaneously protect themselves and their mission while limiting the danger to non-combatants.

Remove Constraints on Early preventive Action in Crises

Non-lethal weapons can overcome some of the barriers to earlier intervention in humanitarian crises. In general, lethal military action is a last resort option, to be employed only in the most serious instances. Risks of escalation and high costs mitigate against using lethal force in a timely manner. Moreover, the American public's intolerance of casualties limits decision-makers' willingness to risk political capital on military interventions, even when moral or strategic arguments favor such action. The lessons of Rwanda and Bosnia for some planners is that it is better to intervene early rather than late in complex ethnic and regional conflicts. At the least, the option of early non-lethal intervention would expand the range of options available to decision-makers, once again improving the flexibility of American response.[27] Non-lethal

options could likewise more quickly clear political hurdles by producing an appropriate option in the earlier stages of a crisis, when lethal force is not yet clearly warranted.

Enhance Deterrence and Coercive Measures

NLW can also work in situations where lethal force is excessive, but diplomacy has proven insufficient. The "gap" between diplomacy and force is evident in situations such as Iraq and Bosnia, where intransigent leaders refuse to comply with international norms, yet consensus on an appropriate response is difficult to produce. Lethal force often risks inflaming an already tense situation, yet sanctions and diplomatic opprobrium rarely produce real change.[28] Non-lethal force could function as a less escalatory alternative to lethal force in instances where non-military means have clearly failed to convince a nation to comply with international laws and norms. Non-lethal weapons simply add to the menu from which the United States may choose to influence the behavior of other nations. Marine General Anthony Zinni aptly observed that:

> Just as there is an intensity continuum across the range of warfare, there is a force continuum across the range of options for applying military force...The addition of non-lethal weapons not only adds a new category in the force continuum but also fortifies other categories previously regarded as having limited value.[29]

Increase the Effectiveness of Lethal force

NLW can effectively target command, control and intelligence infrastructure and thus disable the enemy's war-fighting capability. Electro-magnetic and microwave weapons, for example, can interfere with communications and surveillance equipment, crippling the eyes and ears of a hostile force. Corrosive agents can disable machinery and weapons systems, leaving enemy troops unprotected and unable to wage war. In many ways, non-lethal weapons can complement the use of lethal force by contributing to a "strategic paralysis" that allows time for conventional forces to succeed in their mission.

Support Military Operations in Urban Terrain (MOUT)

Military operations in urban terrain present several challenges, including exposure of dense civilian populations, as well as infrastructure barriers such as transportation networks and sewer systems. A December 1997 report from the National Defense Panel warned that the U.S. military is constrained in its ability to conduct MOUT, given current resources and training.[30] Non-lethal weapons can assist in these circumstances by helping soldiers more effectively deal

with civilian populations and facilitating more targeted use of lethal force. The ability to disable equipment and weapons systems using non-lethal electronic interference, for example, prevents the enemy from using civilian crowds as a protective shield.

Aid in Military Operations Other Than War

Often lethal force used for protection can disrupt peace negotiations or turn one party against the mission. The offended group could then demand termination of the mission. If peacekeepers in Bosnia used force in self-defense, for example, and the victims were disproportionately Serbs, this would certainly cause massive controversy even if peacekeepers intended to remain neutral.[31] Non-lethal crowd control devices can disperse threatening crowds or separate warring factions with less risk of escalation. NLW can also facilitate humanitarian missions, thereby preserving international and domestic support for such missions.

STRATEGIC APPLICATIONS OF NON-LETHAL WEAPONS

Non-lethal technology must be developed and employed with a precise understanding of their human effects. The user's intent determines what makes a weapon either lethal or non-lethal. But this is easier said than done. The TECOM Technology Symposium in 1997 concluded that non-lethal weapons could have many direct operational and strategic applications.

Desert Storm provided a glimpse of things to come. Electronic microchips corrupted by a computer virus were reportedly inserted into a printer being smuggled into Iraq via Jordan for delivery to an air defense bunker. The virus was designed to disable the computers that enabled coordination and communications between air defense batteries. According to one account, it devoured "Windows" whenever technicians opened monitor screens to check on aspects of the air defense system.[32]

A more strategic example was the use of carbon fiber in the Gulf War. Tomahawk missiles released thousands of spools of carbon fibers over Iraqi power stations. They floated down and short-circuited electrical components, ultimately disrupting electrical supplies. Such technology revealed the possibility of attacking military and civilian infrastructures without the catastrophic damage associated with conventional weaponry.[33]

The next generation of non-lethals is now emerging. We have seen that this non-lethal arsenal includes acoustics, electromagnetic pulse, lasers, and other directed energy weapons.

In the future, microwave weapons might disable communication in enemy rear areas. Lasers could degrade key sensor systems. Cruise missiles carrying electromagnetic pulse systems or microscopic carbon fibers that can penetrate almost any electrical system could shut down military and civilian infrastructures.

Such technology can serve several strategic purposes. It can support economic sanctions. To avert more lethal warfighting, it can create strategic paralysis—a pause that gives diplomacy time to work. Without doubt, non-lethals can leave an enemy more vulnerable to deadly force. If such force becomes justified, this technology can degrade and disable enemy forces until conventional force can be brought to bear.

CHALLENGES FOR NON-LETHAL WEAPONS

Non-lethals hold considerable promise but also pose tremendous challenges. They must gain acceptance in legal, social, and ethical terms. Such will again largely depend on a precise understanding of their human effects.

As the TECOM Technology Symposium in 1997 concluded regarding non-lethal weapons, "Determining the target effects on personnel is the greatest challenge to the testing community." Potential of injury and death severely limits human testing. Animal testing, which is also limited, is not always reliable. In addition, the biotechnology required for developing non-lethals does not fit within the bounds of past research disciplines. The problem is compounded by the fact that non-lethal technology cuts across the spectrum of science.[34]

Controversy already surrounds non-lethals. A number of speakers at the Symposium on the Medical Profession and the Effects of Weapons in 1996 at Montreux, Switzerland, claimed that many NLWs violated international laws and that the medical and legal communities must use medical data to counter arguments to the contrary. Subsequently, a statement presented to the U.N. General Assembly the International Committee of the Red Cross warned, "the obligations of all new weapons, including those assumed to be 'non-lethal,' must be taken with the utmost seriousness."[35]

In testimony before Congress, the director of the Defense Intelligence Agency noted that non-lethals have "the potential to dramatically alter the nature of warfare." Their application is evolving from the tactical to strategic levels. However, their complexity makes them unlike other weapons, and many of their effects remain undetermined.[36] The outcome of this evolution depends on an unprecedented multidisciplinary research and development effort. Such deliberations will make the difference between the use and misuse of non-lethal weaponry not only by the Armed Forces but by other organizations as well.

ARGUMENTS AGAINST NON-LETHAL WEAPONS

The arguments presented against nonlethal weapons are of particular interest. One that merits serious review is the idea that the use of nonlethal systems may appear more attractive to policymakers and could therefore more easily draw us into an international military confrontation. According to Professor Malcom R. Dando, these confrontations could then quickly escalate to lethal conflicts. He also addresses the "unrealistic expectations" that will likely be associated with the employment of non-lethal systems, such as those discussed recently in Toefflers' *War and Anti-War,* which devotes an entire chapter to "War Without Blood."[37]

Certainly we must ask what makes these technologies lethal or non-lethal. Then we must consider when non-lethal effects can be reversed. The answers are largely determined by their bio-effects. To some degree, the use of non-lethal technologies is like pharmacology. The difference between a drug and a poison is often the magnitude of the dose. But while safe dosages are known for most drugs, they are not known for most non-lethal technologies. As the *British Medical Journal* recently pointed out, "The precise effects of these new weapons are unknown."[38]

So it will not suffice simply to declare the intentions of non-lethal weapons. Their capabilities must be well established during development. "What distinguishes this new generation of weapon technology from its predecessors," according to Dr. Robin M. Coupland in *Revue Suisse de Medecine Militaire et de Catastrophes,*" is that its development is dependent on knowledge of pathophysiological effects,"[39]

ADVOCATES FOR NON-LETHAL WEAPONS

The official Joint Concept document emphasizes that non-lethal weapons provides a useful tool to significantly increase the local commanders' flexibility in applying levels of force in support of operational or conceivably strategic goals. Ironically, the biggest proponents of non-lethal weapons are not today's social activists. They are the Marines who watched as women and children stormed food trucks in Somalia, and the soldiers who faced rock-throwing mobs in the Bosnian towns of Banja Luka and Breko. They recognized that in these situations the use of deadly force meant mission failure and the abandonment of the moral high ground that the US seeks in peace operations. The Marine Corps, which fought long and hard for the honor of being chosen to expand "non-lethal warfare", believes that such weapons will be of great value.

They view NLWs as particularly useful in peace-keeping operations such as those in Bosnia and Somalia, where minimal force is necessary to avoid alienating the local population:

> Today, world events mandate a need to project non-lethal force across all levels of war to enable our warfighters and leaders to effectively deal with a host of traditional as well as non-traditional threats.....I intend to meet this challenge by pursuing the development of a new generation of non-lethal weapons—an effort to leverage 21st century technology to enable our warfighting CINCs to capitalize on a full-spectrum non-lethal capability.[40]
>
> Marine Corps General J.L. Jones

A 1999 Independent Task Force for non-lethal technologies strongly supports such initiatives. According to its report, "In situations in which the decision has not yet been made to use lethal force, non-lethal weapons could give policymakers a more potent weapon than economic sanctions, which tend to be both indiscriminate and ineffective. Used alone, NLWs could penalize civilian economies without high civilian casualties. NLWs could also add weight and credibility when used in conjunction with economic sanctions, thus strengthening America's diplomatic hand".[41]

CONCLUSION

Throughout history, various changes in culture and technology have influenced the character of military force and the manner in which it is employed. Non-lethal weapons offer new possibilities in warfare, especially in the arena of special operations. The US military will need to undertake significant organizational restructuring and doctrinal change in order to exploit the potential of these new weapons.

The 1999 Independent Task Force on Non-lethal Weapons was sponsored by the Council on Foreign Relations to assess the current status of non-lethal weapons development and their availability within the DoD, in light of their potential to support U.S. military operations and foreign policy. The Task Force concluded that there is a high probability of major benefit from a large, urgent investment in non-lethal weapons and technologies, carried out under the commandant of the Marine Corps as the DoD executive agent. To jump-start the development and acquisition of non-lethal weapons, the Task Force recommended the Clinton administration provide forceful and continued leadership to ensure that these capabilities are understood and fully exploited. They strongly recommended three key actions:

1. The Office of the Secretary of Defense, together with the armed services, must ensure that the Joint Non-lethal Weapons Directorate becomes the single focal point for all NLW activity.

2. The Department of Defense must seek and the Congress must provide substantial additional funds for research and development. The armed services should not sacrifice specific existing procurement or development programs to fund what promises to be a highly effective investment in non-lethal technology.
3. The development and procurement community and the regional military force commanders in chief (CINCs) must consult with one another via the Joint Non-lethal Weapons Directorate to determine non-lethal technology employment.[42]

Non-lethal weapons expand the number of options available to commanders conducting operations in which the use of deadly force poses problems. They provide flexibility by allowing U.S. forces to apply measured military force with reduced risk of serious noncombatant casualties, yet adequate to provide force protection and effect compliance. Because we can employ non-lethal weapons at a lower threshold of danger, commanders can respond to an evolving threat situation more rapidly. Rapid response allows U.S. forces to retain the initiative and reduce their own vulnerability. Furthermore, acquisition of non-lethal technologies will enable the military to respond effectively to the multitude of new roles and missions that are defining early twenty-first century military operations.

WORD COUNT = 5992

ENDNOTES

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[3] Ibid.

[4] Center for Strategic and International Studies (CSIS), Strategy & Policy Working Group: The Case for Strategic Nonlethal Weapons. (Washington, D.C.: Policy and Strategy Panel, October 1998), 3.

[5] Council on Foreign Relations, "Nonlethal Technologies: Progress and Prospects Report," 1999; available from http://www.foreignrelations.org/public/pubs/Non-ViolentTaskForce.html; Internet; accessed 16 January 2001.

[6] M.R. Steele, "A Joint Concept for Nonlethal Weapons," 3 March 1999; available from http://www.192.156.75.102/nonleth.html; Internet; accessed 1 November 2000.

[7] Ibid.

[8] Cook, Fiely and McGowan, 2.

[9] William J. Clinton, A National Security Strategy for a New Century (Washington, D.C.: The White House, December 1999), 5.

[10] William S. Cohen, Report of the Quadrennial Defense Review (Washington, D.C.: Department of Defense, May 1997), 5.

[11] Department of Defense, Policy for Non Lethal Weapons, DoD Directive 3000.3 (Washington, D.C.: U.S. Department of Defense, 9 July 1996).

[12] Department of Defense, Joint Non Lethal Weapons Program: Master Plan (Washington, D.C.: U.S. Department of Defense, June 2000).

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[14] Steele, 10.

[15] Ibid, 12.

[16] Ibid.

[17] Ibid.

[18] Robert J. Bunker, "Non-Lethal Weapons: Terms and References," December 1996; available from http://www.zarc.com/english/non-lethal_weapons/nlt-usaf.html; Internet; accessed 1 November 2000.

[19] Ibid, 19.

[20] Ibid, 13.

[21] Ibid, 15.

[22] Ibid, 19.

[23] Ibid, 13.

[24] Ibid, 10.

[25] CSIS, 5.

[26] Ibid, 6.

[27] Ibid.

[28] Ibid.

[29] Ibid, 7.

[30] Ibid.

[31] Ibid.

[32] Dennis B. Herbert, "Non-lethal weaponry: From tactical to strategic applications," Joint Force Quarterly, no. 21 (Spring 1999): 89.

[33] Ibid.

[34] Ibid, 90.

[35] Ibid, 91.

[36] Ibid.

[37] Malcolm Dando, "New Form of Warfare: The Rise of Non-lethal Weapons," Marine Corps Gazette 82, no. 6 (June 1998): 73.

[38] Dennis B. Herbert, "Safe Dosages: Determining the Human Effects of New Non-lethal Weapons Is an Essential Step," Armed Forces Journal International 135, no. 9 (April 1998): 21.

[39] Ibid.

[40] Department of Defense, Joint Non Lethal Weapons Program: Master Plan.

[41] Council on Foreign Relations, 15.

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