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BEYOND STICKY FOAM: THE OPERATIONAL EMPLOYMENT OF NON-LETHAL TECHNOLOGIES

By

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Historically, U.S. strategists have sought to refine the lethality of weapons to better achieve objectives and military success. However, in the current strategic environment this approach has demonstrated not to be the most effective solution. In essence, no matter how accurate the conventional weapons are, a force armed with traditional military responses has two options for affecting compliance in a crisis: maintaining a presence (a threat of lethal force) or employing lethal force. These two options are at extremes with no middle ground creating an operational gap between diplomacy and lethality. Combined with the U.S.' aversion for human casualties and reluctance to impose our will through the use of lethal force has created a critical vulnerability our adversaries have quickly discerned.

Clearly, military strategists and combatant commanders must think asymmetrically about future military instruments to retain operational flexibility and utility. Non-lethal technologies can effectively fill the gap between *diplomacy* and *lethal* and act as an effective force multiplier for traditional military warfare across the spectrum of conflict.

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Introduction

The beginning of the 21st Century has found U.S. strategists grappling for effective military options to retain operational flexibility in an ambiguous security environment. Since the fall of the Soviet Union, evolving political, societal, and operational factors have shifted the focus and nature of warfare that often limits the use of a traditional military response. The problem confronting U.S. strategists is the need for additional military options that provide an effective means of realizing U.S. security objectives and military success across the spectrum of conflict.[1] At the heart of the issue is full-spectrum crisis dominance and non-lethal technologies.

Historically, U.S. strategists have sought to refine the lethality of weapons to better achieve objectives and military success. However, in the current strategic environment this approach has demonstrated not to be the most effective solution. In essence, no matter how accurate the conventional weapons are, a force armed with traditional military responses has two options for affecting compliance in a crisis: maintaining a presence (a threat of deadly force) or actually employing deadly force. These two options are at extremes, with no middle ground, creating an operational gap between diplomacy and lethality. Combined with the U.S.' aversion for human casualties (noncombatant and military) and reluctance to impose our will through the use of lethal force has created a critical vulnerability our adversaries have quickly discerned. Military operations in Haiti, Somalia, Rwanda, Bosnia and Kosovo have served to highlight this operational gap and the difficulties of adapting traditional military warfare to the new strategic setting.

General Wesley K. Clark, Supreme Allied Commander Europe, articulated the limitations of current military options when he called for a complete rethink of traditional Western Strategy during a 2000 Senate Armed Services Committee session on military operations in Kosovo. General Clark noted that NATO could have used legal means to

blockade the Danube and the Adriatic ports, and could have used *"other methods to isolate Milosevic and his political party."* Clark added, *"The [traditional] military instruments might have never been used".*[2]

In a recent article, Michele A. Flournoy, director of the DoD working group that produced the 2001 Quadrennial Defense Review (QDR), commented, *"…that one of the Gulf War lessons learned by our adversaries is not to challenge the U.S. with a conventional force, but rather asymmetric ways that try to undermine U.S. strengths or exploit our vulnerabilities."* She further remarked that our *"opponents have learned they have the freedom of maneuver beneath the threshold of conventional warfare."*[3]

Clearly, military strategists and combatant commanders must think asymmetrically about future military instruments to retain operational flexibility and utility. Non-lethal technologies can effectively fill the gap between *diplomacy* and *lethal* and act as an effective force multiplier for traditional military warfare across the spectrum of crisis.

A Call for New Options

The end of the Cold War brought a new strategic environment characterized by increasing ambiguity, the rise of non-state actors, weapons of mass destruction (WMD), coalition warfare and greater calls for U.S. intervention to maintain order in a turbulent international environment.[4] Unmistakably, the Gulf War demonstrated the Untied States' capacity to wage traditional warfare with overwhelming lethal power that could be withstood by few adversaries. Yet, the new environment has placed the U.S. in a strategic dilemma -- Traditional U.S. military responses that are less than effective in meeting emerging

political objectives, and a strong national aversion to casualties and human suffering.[5]

The problem with traditional military responses is they afford two options: presence (do nothing) or the employment of lethal force. These two responses are at extremes with no options between “zero” and “one hundred.” This has created an operational gap beneath the threshold of lethality. The second-half of the dilemma is America’s increasing aversion to civilian casualties and human suffering. This is not a new phenomenon nor unwarranted. By the 1980s, noncombatants accounted for 80 percent of all war casualties.[6] This alarming trend has continued in the 1990s with increasing numbers of refugees, immigrants, and noncombatants caught in the crossfire of civil and ethnic strife. America’s aversion to casualties is often intensified by the “CNN effect” when the horror of war is delivered live to homes across America. These two issues culminate to create a critical vulnerability that undermines the U.S. “national will” to engage because of the inability to apply an appropriate and credible force.[7]

Our adversaries have discerned this vulnerability and will attempt to engage beneath the U.S. lethal threshold where the use of conventional weapons is too costly in terms of casualties, collateral damage and world opinion. Traditionally, the Unites States has attempted to retain flexibility and utility by increasing the lethality and precision of conventional weapons. Lethality alone may no longer be sufficient to ensure support for sustained military operations by our allies or potential coalition members.[8]

The future calls for a willingness to act, but with means calibrated and proportional to the political objective. For CINCs to remain viable in the future they must have new military options that

offer operationally flexibility and utility. The characteristics of these new options must allow the CINC to engage the enemy beneath the threshold of lethality, minimize casualties and collateral damage, and complement conventional responses across the spectrum.[9]

History of Non-Lethals

The application of non-lethal technologies is not new to America's military and can be traced throughout its history.[10] However, the catalyst for the development of current technologies began late in the 20th Century. In 1991, the U.S. demonstrated the landmark employment of NLWs during the Gulf War when "special carbon-fibers" were used to disable power grids, blinding Iraqi command and control (C2), and air defense systems.[11] This event was closely followed by another operation that would gain the attention of strategists and become the vehicle for a coherent NLWs program – Somalia.

An operation that began as humanitarian under the Bush Administration turned disastrous under the policy change of the newly elected Clinton Administration. Before it was over, U.N. forces were responsible for the deaths of over 7,000 Somali civilians.[12] At the request of the operational commander to minimize further civilian casualties, U.S. forces (the 13th Marine Expeditionary Unit) were trained and equipped to employ NLWs (e.g., chemical adhesives, barriers and irritants; non-penetrating projectiles; and optical munitions) during the withdrawal of U.N. forces from Somalia.[13]

Throughout history, NLWs have proven useful and effective in the tactical environment. However, a new class of non-lethal technologies has emerged with direct applications at the operational and strategic levels.

Defining Non-Lethal Weapons

Recent years have created a list of definitions that belies the nature of the technology. Even the terminology developed reflects the diversity: sub-lethal, less-lethal, pre-lethal, less-than-lethal, soft kill, disabling.[14] It was the recognition of the emerging strategic environment and the utility of NLWs that Department of Defense Directive 3000.0, *Policy for Non-Lethal Weapons*, was promulgated in 1996 and defined:

> Non-Lethal Weapons. Weapons that are explicitly designed and primarily employed so as to incapacitate personnel or material, while minimizing fatalities, permanent injury to personnel, and undesired damage to property. Unlike conventional weapons that destroy their targets principally through blast, penetration and fragmentation, non-lethal weapons employ means other than gross physical destruction to prevent the target from functioning. Non-lethal weapons are intended to have one, or both, of the following characteristics: They have relatively reversible effects on personnel or material, and/or, they affect objects differently within their area of influence.

Implicit in this definition are three important points. First, it is the intent of non-lethals that separates this class of weapons from conventional munitions. NLWs, when properly employed should significantly reduce lethal effects. However, there is no guarantee of "zero" fatalities or permanent injuries.[15]

Second, non-lethal technologies include communications, information, and psychological warfare. Communication warfare can involve jamming, interrupting, or destroying enemy communications, and transmitting desired radio and television programs. Information warfare generally refers to destroying or interfering with computer systems, including financial and credit facilities. Psychological warfare is the use of propaganda and other psychological actions to influence the opinions, emotions, and behavior of hostile populations in support of national objectives.[16]

The third point is non-lethal employment is not limited to the lower spectrum of crisis such as Peacekeeping, Peace Enforcement, and Humanitarian missions. They apply across the full spectrum of military operations.[17]

The Joint Non-Lethal Weapons Directorate's 2001 "Technology Taxonomy Document" has defined NLWs in five broad categories that are briefly described below:[18]

- *Electromagnetic* technologies cover a wide range and include directed energy in the ultraviolet, visible and infrared light spectrum as well as electromagnetic energy in the millimeter wave, microwave, radio frequency and direct current bands.

- *Chemical* technologies include organic and inorganic compounds developed to react with other compounds/substances and/or produce desired effects in counter-personnel as well as counter-material applications.

- *Acoustic* technologies refer to “sound” energy at both the audible and inaudible frequencies transmitted through specific media for the purpose of producing desired effects on human targets and or material.

- *Mechanical / Kinetic* refers to technologies using mechanical structural properties of materials and the effects due to their motion, such as barriers or devices that produce blunt force trauma due to their mass and velocity.

- *Ancillary* groups a variety of technologies that can enable or augment the storage, delivery, deployment, and dispersion of payload technologies. It also includes classes of devices or payloads that overlap several of the categories listed above.

NLWs Characteristics

NLWs have unique characteristics that differentiate them from precision-guided munitions (PGMs) or conventional weapons: selectivity, precision and radius. For conventional weapons or PGMs, there are two methods of controlling the amount of collateral damage incurred – improve the precision of delivery and the size of the warhead. For example, conventional weapons or PGMs indiscriminately destroy everything within the kill radius of the selected warhead. To minimize

collateral damage, PGMs attempt to control their destructiveness by the precise delivery of the warhead kill radius on the desired target. In most cases, the target to be destroyed will determine the size of the warhead. So in essence, the only method left to minimize collateral damage is the precision of the delivery. However, as recently as Bosnia and Kosovo, even if the right target was identified, less than 50 percent of PGMs hit their intended mark.[19] The unintended consequences of hitting the wrong target or extensive collateral damage can prove politically devastating. The bombing of the Chinese Embassy proves case and point.

Conversely, NLWs can attack selected components of the enemy's infrastructure or military force and control the effective radius of the weapon. For example, an electromagnetic pulse (EMP) can defeat C2 electronic equipment within a large radius while having minimal impact on other infrastructure or people. The ability to select specific components (not indiscriminate destruction) within a selectable radius allows the combatant commander the precision to target areas where the risk of casualties or collateral damage is too great for conventional weapons. Joseph Siniscalchi shows the relative advatanges of NLWs compared to conventional methods in 11 potential missions outlined in Table 1, Appendix A. The key characteristic of NLWs is their "rheostatic or tunable" nature.[20] It allows the combatant commander to tailor the pressure to obtain his objectives

Peacetime Operations (From Diplomacy to…)

The 2001 QDR defines Peacetime Operations as those missions short of major theater war that execute the U.S. National Security Strategy (NSS).[21] It is essential to recognize that the use of NLWs is an act of force -- an attempt to impose the U.S. "national will" on an adversary. Therefore, NLWs can support the CINC's requirements of shaping, responding and preparing by providing a credible and proportional force across the spectrum of conflict. NLWs offer a significant advantage over conventional responses especially between diplomacy and lethality

and at the lower end of conflict.[22] They can provide flexible options to avert emerging crisis by creating time, space and control the level of violence. NLWs can provide an environment more favorable for diplomatic resolution and favorable world opinion by minimizing casualties and permanent collateral damage.[23]

Emerging Conflicts and Flexible Deterrent Options (FDOs). The premise behind early intervention with NLWs is the potential to avert crisis and the basic principle that NLWs will leave an adversary more vulnerable to lethal attack if the adversary continues his actions.[24] Non-lethal FDOs represent a visible demonstration of intent or disruption of warfighting preparations without significant casualties and material damage to the enemy.[25] NLWs can inhibit further movement toward conflict by raising the costs of aggression without putting U.S. personnel at significant risk.[26]

NLWs can substantially increase the effectiveness of economic sanctions. NLWs can provide an effective means to stop or inspect shipping and posses the ability to selectively distrupt key ports and transportation networks. These tasks can be accomplished in close proximity to noncombatants without unnecessary risk to the civilian population. For example, commanders could employ EMPs via airburst or mines to disrupt shipping in designated areas. Selected ports and their activities can be disrupted by EMPs to disable electronic components of the infrastructure and the electronic ignition of port related vehicles. Key transportation networks can be further disrupted by the employment of anti-traction agents or super-adhesives to selected roadways or rail networks.

NLWs also create a new category of sanctions available to the commander. John Siniscalchi refers to these as “technological

sanctions, ” and it’s the ability to disrupt public power grids, communications, or transportation systems in selected areas or the entire region.[27] These “technological sanctions” acting alone or in combination with economic sanctions can prove decisive by denying critical infrastructure and isolating the leadership with greater speed. For example, disrupting radio, television and commercial communications can quickly isolate the adversary’s leadership, or denying electrical production can crush an economy. General Clark speaks of these issues in his address to the Senate Armed Services Committee (SASC) on Kosovo. The advantage of technical sanctions is the immediate increase in economic cost and vulnerability to the adversarial force. To escalate the sanctions the commander only needs to expand the radius of effects.

Non-lethal options can provide a firewall between adversaries minimizing conflict, thus allowing space and time for diplomacy.[28] In this scenario, NLWs could be employed to interdict the marshaling of military resources and personnel, thus keeping adversaries separated. For example, an EMP could deny essential communications or navigational control at airports, railheads or ports. To increase the effects, the EMP attack could be combined with agents making the runways or road surfaces unusable for normal operations.

NLWs can facilitate effective conflict termination. Current operational doctrine emphasizes the destruction of enemy leadership, infrastructure, and war-making capabilities to achieve an operational paralysis. Assuming post-conflict that the CINC’s objective is to re-establish regional stability, it will become necessary to assist the failed state in restoring economic and political stability.[29] A non-lethal strategy provides a viable option. The reversibility of most non-lethal effects limits the duration of “damage” incurred. When

compared to conventional weapons, the "reversibility of effects" will facilitate a quicker, less costly recovery of the failed state. This ability to support a faster recovery will enhance a quicker return of regional stability

Major Theater War (MTW).

At the higher end of the spectrum of conflict, NLWs provide a significant complement to lethal force during MTW and Peacetime Operations that utilize lethal force. Often there is a thin line that separates the characteristics of Peacetime Operations involving force-on-force (combat) and MTW. Generally, the primary difference between the two is only separated by the size and scope of the operation. It cannot be overlooked that if not checked, some Peacetime Operations have the potential to escalate into MTW. As previously mentioned, what makes NLWs unique is the "rheostatic or tunable" quality. In this regard, what can be applied to MTW can also be de-tuned and tailored to the specific requirements of Peacetime Operations.

NLWs provide a natural complement in attacking the adversary's center of gravities – leadership, infrastructure and war-making capabilities. The precise effects and tunable nature of NLWs can support a synergistic attack against high value targets, while limiting the physical violence. The larger radius of NLWs can enable devastating, simultaneous effects on a countrywide scale. For example, a sea-launched ballistic missile armed with EMP munitions could achieve substantial disruption to a nation's centers of gravity with a single strike. During OPERATION DESERT STORM, to achieve the same results required numerous sorties measured in days.[30]

The employment of NLWs will allow a smaller conventional force to apply overwhelming force to an enemy's leadership and warfighting capabilities with minimal risk to U.S. forces. In several mission areas (see Table 1, Appendix A) NLWs have a significant advantage over traditional means. The ability of NLWs to delay, disrupt and disorient

can make enemy forces highly vulnerable to a follow-on lethal attack.[31] For example, air delivered EMPs and conductive particle munitions can neutralize power grids that support military facilities and logistics. Other EMPs could neutralize satellite communications along with command and control (C2) nodes to distrupt military actions.[32] Additionally, EMPs can neutralize computer systems, disable aircraft and vehicle electronics, and render other sophisticated electronic equipment useless. Other non-lethal embrittling substances and corrosive agents could be applied to bridges, aircraft, vehicles and weapons systems.

EMP munition's greater radius of effects offer a significant capability over conventional methods for electronic attack or suppression of enemy air defenses. The greater radius of effects provides an ability to disable dispersed air defense equipment more efficiently than PGMs. An EMP attack on air defense system can achieve a hard electronic kill of all radar and support equipment associated with an air defense site. The attack would be equivalent to multiple missions with conventional weapons and provides more sustained results than electronic jamming. Also, NLWs offer a greater flexibility in targeting. Since the risk of collateral damage is reduced, NLWs can attack the "higher risk" targets usually located in populated areas. In this scenario, NLWs provide an acceptable alternative minimizing collateral damage.

The use of NLWs is not limited to land, air or space, but can also make significant contributions against maritime forces. EMPs could render navigational, communication, fire control and ship's directional control systems inoperable. Embrittling substances, corrosive agents, adhesives and anti-traction agents could be useful against a ship's external structures such as deck surfaces, gun platforms, missile

launchers and radar or communication masts. Fracturing or corroding key weapons systems, sealing vital openings, disrupting automated systems or fouling rail track surfaces would significantly complicate the ability to employ the weapons platform.

NLWs can significantly contribute to counter-proliferation of Weapons of Mass Destruction (WMD). One of the major dilemmas in counter-proliferation is the ability to act early when there may be inadequate domestic or international support for lethal options. Operating beneath the threshold of lethality, NLWs can provide a means to counter the threat. An Unmanned Aerial Vehicle (UAV) delivered EMP and/or corrosive agents could destroy navigation, guidance and detonation circuits in the WMD munitions or their delivery systems. In coordination with the EMP strike, multiple UAVs could air-deliver polymer foam agent to render the facility temporarily inaccessible. In this case, the denial of WMD is temporary, but sufficient to deter an immediate or near-term strike.

The operational applications for a MTW are significant. NLWs present more than an adjunct to lethal options because they provide the ability to strike early, significantly disrupt military actions, and increase the vulnerability of the adversary's military force. The combination of these elements will enable decisive intervention with a smaller military force. In essence, the attributes of NLWs may allow technology to substitute for mass. The new Administration has called for a more effective and flexible force to meet the demands of U.S. security interest.[33] The current and future capabilities of NLWs and the ability to intervene earlier may help resolve the issues of insufficient resources to meet the nation's security requirements.

NLWs in Perspective

There are many misconceptions regarding NLWs, especially among those who argue against their use. Their arguments have remained consistent. Some believe they offer the promise of bloodless war while others see them as a means of intervention where minimal U.S. interests

are of concern. There is also a group that voices concern that NLWs can pose excessive pain and suffering. Issues of legality abound. Few of those articulating opposition have bothered carefully to think through their positions. Research would indicate both those espousing panaceas and gloom are equally wrong.[34] Missing from most arguments is educated and deliberate discourse about the factual versus emotional issues related to non-lethal weapons.[35] The intent of NLWs is to preserve lives while using the minimal force necessary.

The Council on Foreign Relations 1995 Independent Task Force has captured the six significant problems or inherent risks related to NLWs.[36]

- Legal Precedence. For all their horror and devastation, lethal weapons have a long and established history of legal precedence. The same cannot be applied to NLWs. There are unintended consequences of previous treaties and laws that may prevent the use of some NLWs. From a societal and legal perspective, things chemical and biological are bad by definition. Several treaties, including the 1925 Geneva Protocol, the 1972 Biological Weapons Convention, and the 1993 Chemical Weapons Convention, prohibit or strictly limit the use and stockpiling of chemical and biological substances. The early treaties were a result of the devastation and indiscriminate use of chemical warfare in WW I. The treaties in the latter half of the 20th Century were a means to limit or eradicate potential chemical and biological weapons of mass destruction. Technologically limited at the time of recent treaties, little thought was given to the human treatment or intent to minimize casualties through use of NLWs. There are hosts of complicating factors regarding NLWs, some of which make no sense. For example, riot control agents may be used in a domestic situation, but are outlawed in military conflict.

According to the law of land warfare it is legal to use a weapon against an appropriate adversary provided the intent is to kill. Weapons that maim or cause "needless suffering" are precluded from use. While incineration has been deemed appropriate, perforation of eyes with a laser is unacceptable. Totally missing from the legal debate is the issue of intent to minimize casualties. In most cases, NLWs are used when the intent is to preserve lives while using the minimal force necessary. If America's military is to maintain its utility, policymakers need to revisit the validity of applicable treaties and consider modifications where appropriate.[37] If the wrong law exists – change it.[38]

- The Slippery Slope. NLWs can enable intervention at earlier stages of a crisis. A critical element of the debate is whether this represents a more effective means to manage a crisis or if it is a "slippery slope" to more frequent interventions in areas of marginal national interest. While this is possible, intervention and force employment is a separate matter for policymakers. Clearly, a comprehensive understanding of non-lethal capabilities and limitations; careful, coherent, and integrated planning; congressional consultation; and clear identification of the enemy can obviate these concerns.[39]

- Proliferation and Retaliation in Kind. The argument goes that reliance on non-lethal technologies for operational use will generate continuing research and refinement of existing concepts. As second and third generation weapons are fielded, current generation non-lethal capabilities will diffuse throughout the world and be targeted against U.S. personnel and interests. However, no restraint the U.S. adopts will prevent the appearance of NLWs elsewhere. Russia, China, U.K., France, Italy, and Israel have been aggressively pursing non-lethal

technologies.[40] The real danger may be American vulnerabilities. The heavy reliance on advanced technology and sophisticated electronics makes the U.S. more susceptible to a non-lethal attack by a variety of hostile actors. The protection of American resources and interests will require the development of effective countermeasures or the adoption of appropriate protective measures. The development of these protective means must be concurrent with the development and acquisition of NLWs. The U.S. can either lead the way with non-lethal technologies and develop suitable counter-technologies, or face their wrath without the ability to defend.

- Unrealistic Expectations and Comparative Cost-Effectiveness. There is a perception by some that NLWs could produce bloodless battles and therefore the public would insist that NLWs always be used before lethal means. This expectation would lead to disappointment and unnecessary exposure to danger. On the other hand, in the proper setting NLWs employment could certainly increase the safety of U.S. troops and the effectiveness of American policy. Examples would include Somalia where the adversarial force utilized women and children as human shields to engage U.S. forces.[41] The use of NLWs in this case would allow U.S. forces to separate belligerents from its civilian populace. As to expense, some have proposed that the casualty-limiting benefits of NLWs could be achieved more quickly and at less cost by increasing the precision of lethal weapons. As discussed previously the size of the PGM kill radius will be determined by the target and the size of the conventional warhead to destroy it. Even with absolute accuracy, the size of the warhead required for a mission kill may still cause excessive collateral damage. In the final analysis, non-lethal technologies and their potential benefits are not expensive when

compared to the development, procurement, training, and operation of other weapon systems. The ability to intervene effectively without the loss of legitimacy brought about by civilian casualties and collateral damage are sufficient inducement for their continued development.[42]

Conclusion

The scope and complexity of military operations in the 21st Century requires providing combatant commanders with every possible instrument with which to accomplish national security objectives. The advantages gained by applying non-lethal technologies are clearly worth pursuing. While they do not promise to yield "war without death," they can significantly contribute to the CINC's national security requirements to effectively shape, respond and prepare. The relationship of non-lethal capabilities and the emerging strategic environment suggests that future non-lethal technologies could be decisive. The elements of the new environment are significantly different and demand new tools that operate between diplomacy and lethality. Operational use of these technologies can meet the new challenges. NLWs properly employed can create significant advantages across the spectrum of conflict by facilitating diplomacy, enhancing operational flexibility, and adding strategic options for national decision makers. Further, NLWs may represent a capable force multiplier by significantly increasing the vulnerabilities of enemy's forces while creating the means for their effective destruction by a smaller conventional force.

Recommendations

First, it is important to invest in research and development of non-lethal weapons and their delivery systems. Since investment yields innovation, appropriate funding levels sufficient to maintain research of non-lethal technologies must be expanded. Consideration should be

given to reflect a broader mission and impact of non-lethal technologies. At a minimum, the executive agent must ensure core research areas maintain appropriate priority and funding to accelerate development efforts.

Second, the U.S. must establish confidence in non-lethal technologies. The future integration of non-lethal weapons in a warfighting role depends on building confidence in the reliability and repeatability of effects in combat. The level of confidence can only be achieved through extensive operational testing, exercises, and simulations of NLW concepts to build an objective database.

Third, it is time to advance the state of operational doctrine. Although Joint Doctrine is starting to take shape, services are lagging in their respective areas. History has shown that it takes twenty years to develop operational doctrine after the introduction of a new technology.[43] Without deliberate effort, the evolution of non-lethal technologies may suffer the same fate.

Finally, the U.S. can ill-afford to neglect its conventional weapons capabilities. NLWs are only a valid deterrent if backed by credible lethal means. If the capability or will to use lethal force is not present, then the employment of NLWs will be ineffective in deterring our enemies.

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APPENDIX A

Non-Lethal Missions

Table 1

MISSION	***TARGET***	*NLWS*	***ADVANTAGES***
Electronic Attack	- Disable Radar and Targeting Systems - Disable C3	- EMP	- Reduced Casualties - Greater Radius of Effects - More effective than jamming - Flexible targeting
Airborne Personnel Recovery	- Disable C3 - Disable Pursuers	- EPM - Anti-personnel - Optical Munitions - Acoustic Projection	- Disrupt Electronics and more effective than Jamming - Limit Vulnerability of Friendly Forces.

Ground Attack	- Disable Vehicles - Disable C3 and Radar - Temporarily Disable or Disperse Personnel	- EMP; Adhesives; Lubricants; Combustion Modifiers - EMP - Anti-personnel Microwave; Acoustic Projection; Adhesives	- Reduce Casualties - Flexible Targeting
Offensive Counter Air	- Disable Aircraft on the Ground - Disable Aircraft Systems - Disrupt C3	- Anti-Material Chemical Agents - EMP - EMP	- Reduce Damage to Infrastructure - Reduce Casualties - Disruption More effective than Traditional Means
Offensive Counter Space	- Disable Space Based Systems	- Lasers; EMP	- Disruption More Effective than Traditional Means
Strategic Attack	- Disable Transportation Infrastructure - Disable Industrial Infrastructure - Electrical Grids	- Anti-Material Chemical Agents (Lubricants; Adhesives, Corrosives); EMP Mines or Munitions; Combustions Modifiers - See Above - EMP munitions or conductive Devices	- Reduced Damage to Infrastructure - Reduced Casualties - Greater Radius of Effects - Flexibility in Targeting
Suppression of Enemy Air Defense	- Disable Sensors	- Lasers (optical sensors); EMP (electronics)	- Disruption More Effective than Traditional Means - Flexibility in Targeting - Reduced Casualties
Air Defense	- Disable Sensors, Navigation Systems, Guidance Systems	- EMP - Lasers (optical)	- More Effective than Jamming - Limit Vulnerability of Friendly Forces (to detection)
Advance Force Operations	- Disable C3 Systems	- EMP	- Limit Vulnerability of Friendly Force
Force Protection	- Deny Access	- Anti-personnel EMP; Acoustic Weapons; Optical Weapons; Entanglement; Adhesives (foam)	- Reduced Casualties

Interdiction	- Disable Shipping and Transportation	- Anti-Material Chemical Agents; Combustion Modifiers; EMP; Lubricants	- Reduced Damage to Infrastructure - Reduced Casualties - Flexible Targeting

Source: Joseph Siniscalchi, “Non-Lethal Technologies: Implications For Military Strategy,” Maxwell Air Force Base, AL: Air War College, Center For Strategy and Technology, 1998.