

AU/ACSC/279/1998-04

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

NON-LETHAL WEAPONRY:  
A FRAMEWORK FOR FUTURE INTEGRATION

by

Mark R. Thomas, Major, USAF

A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

Advisor: Lt Col Charles T. Clements

Maxwell Air Force Base, Alabama

April 1998

## **Disclaimer**

The views expressed in this academic research paper are those of the author(s) and do not reflect the official policy or position of the US government or the Department of Defense. In accordance with Air Force Instruction 51-303, it is not copyrighted, but is the property of the United States government.

## *Contents*

	<i>Page</i>
DISCLAIMER .....	ii
LIST OF TABLES .....	v
PREFACE.....	vi
ABSTRACT .....	viii
THE RESEARCH.....	1
Problem Significance .....	1
Research Methodology.....	2
Scope and Limitations.....	3
THE HISTORY .....	4
Definitions .....	4
Operations.....	5
Policies .....	6
Technology .....	7
THE MOTIVES.....	10
A Changing Threat.....	10
The Need For Options .....	11
Reduction in Lethality.....	12
Force Protection.....	13
Other Perspectives.....	14
THE SCENARIOS.....	16
Conflict Spectrum .....	16
Tactical .....	17
Operational .....	18
Strategic.....	19
THE CRITERIA .....	21
Technical Feasibility .....	21
Operational Utility .....	22
Policy Acceptability.....	23
Safety Issues .....	24

THE RECOMMENDATIONS .....	26
Policy.....	26
Legislation .....	28
Doctrine .....	29
Architecture .....	30
Acquisition.....	31
THE FINALE .....	33
Summary of Findings .....	33
Closing Thought .....	35
APPENDIX A: THE INVENTORY.....	36
GLOSSARY .....	39
BIBLIOGRAPHY.....	41

*Tables*

	<i>Page</i>
Table 1. Non-Lethal Technologies.....	36

## *Preface*

In this report I have sought to explore the nature of non-lethal weaponry in the Department of Defense (DOD) as a framework for future actions related to their successful integration into the United States (US) military arsenal. I selected non-lethal weapons (NLWs) as a topic of research with the hope that military planners, developers, and operators alike would benefit from a report on NLWs in three respects: First, as a topical chronology for those familiar with the subject of non-lethality; second, as a means of concise subject indoctrination for newcomers to the field; and third, as a “calibration check” of DOD activities aimed at the advancement of non-lethal weaponry.

Beyond the ethereal notion of making an intellectual contribution to the profession of arms as one of its members, I also chose the topic because of my belief these concepts and weapons offer a promising future for those who have the vision, courage and tenacity to embrace them. As noted in my closing remarks at the conclusion of this report, America stands at the cusp of a new millennium in time and a new age in defense technology. One aspect of this new era that awaits complete manifestation is non-lethality. A distinctly new paradigm of armed conflict, it presents us with an unprecedented opportunity to forever change the face of human warfare for the better. My prayer is that as “one nation under God” we will embrace this historic opportunity to reduce the blood tax for those who follow in our wake.

The research reflected in this report was made possible through the selfless contributions of many people, only a few of which the limitations of space allow me to publicly thank. First among these is Lt Col Charles T. Clements, my Air Command and Staff College faculty research advisor. I also wish to thank Ms. Edith Williams of the Air University Library for her cheerful and dedicated support. Ms. Williams secured a multitude of resources through the interlibrary loan system on my behalf while personifying Quality Air Force and excellence in customer service. The initial listing of prospective source materials provided by Mr. Terry Hawkins (also of the Air University Library) further saved innumerable hours of grueling legwork on my part. My special thanks as well to Ms. Diane Murray of Discovery Communications and Ms. Marsha Martello of the National Tactical Officers Association for their time and kindness in providing me with valuable source materials unavailable elsewhere.

Lastly, but most importantly, I want to recognize and pay tribute to the unfailing love, devotion, and patience of my beloved bride, Diane, throughout the research process and during my brief tenure as a student at Air Command and Staff College. She has prayed diligently for my success, shouldered the burden of caring for our young son, managed our household affairs, cooked meals at odd hours for my consumption, remained steadfast through countless evening hours and weekend days of my absence without complaint, listened to me bemoan the trials of academic accomplishment, and once again conclusively demonstrated why she is God's greatest blessing in all my life.

### *Abstract*

Consideration of non-lethality and non-lethal weapons by the Department of Defense as an expression of military power is a relatively new yet growing phenomenon. This report explores four issues germane to non-lethal concepts and technologies in the DOD and makes recommendations derived from those issues concerning the integration of non-lethal weaponry into future United States military operations. The approach taken in the research centers on a modified content analysis of unclassified materials published between 1990 and 1997 related to non-lethality and non-lethal weapons.

The genesis of non-lethality in the DOD has been convoluted, involving multiple actors struggling over the definition of non-lethality along with scattered operational experiences and the erratic development of policies and technologies. Four motives now drive DOD non-lethality: A changing threat; the need for more response options; the desire to reduce lethality, and force protection. Non-lethality scenarios span the spectrum of conflict and the traditional levels of war, while the suitability criteria for non-lethals include technical feasibility, operational utility, policy acceptability and safety.

Coherent, substantiated, decisive and appropriate actions must be taken to ensure the transformation of non-lethality into an integrated component of US armed capability. These efforts require a multitude of actors engaged in policymaking, legislative, doctrinal, architectural and acquisition initiatives drawn from the history, motives, scenarios and criteria associated with non-lethality in the Department of Defense.

## **Chapter 1**

### **The Research**

*On first encounter the concept of non-lethal warfare may seem to be the most absurd of oxymorons, promising what has never been to those who should know better than to expect its realization.*

—Harvey M. Sapolsky

The successful integration of non-lethal weaponry into future United States (US) military operations hinges on actions drawn from a framework of non-lethality issues germane to the Department of Defense (DOD). Specifically, steps must be taken based on the history, motives, scenarios and criteria associated with non-lethality that are coherent, substantiated, decisive and appropriate with respect to policy, legislation, doctrine, architecture and acquisition. The rationale for researching non-lethal weaponry, the methodology employed, and the constraints placed upon the research provide the setting in which these issues and actions are presented.

#### **Problem Significance**

The concept of non-lethality, accompanied by the development and employment of non-lethal weapons (NLWs), has been a material element of civilian law enforcement for many years. However, focused consideration of non-lethality and related weaponry by the DOD as an application of the military instrument of power (IOP) is a relatively new yet growing phenomenon. In light of this burgeoning interest, the recent evolution of

non-lethality in the DOD serves as a point of departure for the future integration of related concepts and technologies in US military operations. The research reflected in this report was pursued to shed light on the nature and relevance of NLWs to the DOD as a basis for future actions directed at the seamless incorporation of non-lethal weaponry into the US arsenal.

## **Research Methodology**

The approach taken in pursuing the research centered on a modified content analysis (MCA) of unclassified materials published between 1990 and 1997 related to non-lethality and NLWs. Content analysis has its roots in the World War II intelligence community, but was widely popularized by John Naisbitt in his 1982 work, *Megatrends*. In short, it asserts that much may be learned about a dynamic, but closed system, by an examination of the forced choices made within that system over time.<sup>1</sup> The corollary to this premise, which constitutes MCA, is that individual choices within a dynamic system (whether open or closed) are of far less consequence to understanding its nature than a holistic examination of the aggregate.

In this case, MCA involved the collection, review, and analysis of more than 200 books, documents, and periodicals spanning an eight-year period representing roughly one-third of the known references on the subject of NLWs.<sup>2</sup> The analysis of these sources identified key issues related to DOD non-lethality from which recommendations were subsequently drawn regarding the integration of non-lethal weaponry into future US military operations. While all sources were used in the MCA, the majority of quotes and citations in this report were deliberately taken from primary sources rather than popular media to ensure the veracity and substance of the findings.

## Scope and Limitations

While the research methodology describes the composition of this report, it is equally pertinent to address two restrictions which bound it as well. First is the issue of length. It would be absurd to suggest that a 30 page report drawn from over 200 separate sources spanning eight years could be anything more than cursory. The breadth of this report is limited to a handful of key issues and recommendations, and the treatment of these findings is commensurately brief.

Second, it is imperative to remember the unclassified nature of this report. The research was intentionally limited to an examination of open sources to ensure the findings would reflect only those elements of non-lethality deliberately published in an unclassified forum. This report is expressly intended to convey only that information regarding non-lethal weaponry that is unrestricted in nature and not speculate on the existence or scope of any classified activities.

### Notes

<sup>1</sup> John Naisbitt, *Megatrends: Ten New Directions Transforming Our Lives* (New York, NY: Warner Books, Inc., 1982), 3-5.

<sup>2</sup> Robert J. Bunker, *Nonlethal Weapons: Terms and References*, INSS Occasional Paper 15 (United States Air Force Academy, CO: Institute for National Security Studies, July 1997), x.

## **Chapter 2**

### **The History**

*If a party has the ability to impose their will without all of the ramifications of lethal force, are they more likely to do so?*

— Charles “Sid” Heal

The first issue germane to non-lethality and the integration of non-lethal weaponry into future US military operations is history; the background events in non-lethality that have led to the current environment in the DOD. A wide range of players have wrestled with the definition of non-lethality for many years, while the DOD developmental, operational and policy experience with NLWs has been surprisingly lengthy but summarily disjointed. These elements reflect non-lethality’s convoluted genesis and illustrate the importance of coherent action to the successful incorporation of these weapons into the future US arsenal.

### **Definitions**

Defining non-lethality and NLWs has been an inextricable element of their gestation, and nearly everyone linked to the subject has offered to amend the emerging lexicon. In 1991, the US Army defined non-lethal technologies as having “the potential for development into weaponry that can disable or destroy an enemy’s capability without causing significant injury, excessive property destruction, or widespread environmental

damage.”<sup>1</sup> Experts from a prominent defense think tank added multiple dimensions to the term by asserting non-lethal technologies are those “which can anticipate, detect, preclude, or negate the use of lethal means, thereby minimizing the killing of people.”<sup>2</sup> Non-lethality was later described as “something more than the application of diplomatic pressure and something less than widespread slaughter.”<sup>3</sup> Non-lethals may also be defined in terms of offensive vs. defensive capability, and Miguel Walsh noted in his early Pentagon report they do not absolutely preclude fatalities.<sup>4</sup>

The term “non-lethal” itself has been widely debated. Although the DOD has settled on “non-lethal” as its term of choice, alternatives have included disabling, disruptive, less lethal, less-than-lethal, low collateral damage, low lethality, minimum force, mission kill, non-injurious incapacitation, special operations technologies, strategic immobility, and soft kill. The official DOD definition of NLWs was published in 1996 as “weapons 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.”<sup>5</sup>

## **Operations**

Although the DOD operational experience with NLWs dates back to the turn of the century with the invention of tear gas, it has become increasingly focused in recent decades. In the 1960s, “US forces used riot control agents...and dumped emulsifiers onto the Ho Chi Minh trail in hopes of turning [it] into a slippery morass.”<sup>6</sup> Across the Atlantic, the employment of the Laser Dazzle Sight (LDS) system by the British during the 1982 Falklands campaign was watched closely by DOD and contributed to an overall operational perspective of NLWs during the late Cold War era.<sup>7</sup>

The landmark employment of NLWs in the post-Cold War era was demonstrated by the US in the 1991 Persian Gulf war when “Tomahawk cruise missiles with special carbon-fiber filled warheads were used to disable electric power plants, blinding Iraqi command, control and air defenses.”<sup>8</sup> Another milestone in the DOD non-lethal experience came with Operation UNITED SHIELD in Somalia. For the first time, US forces (the US Marine Corps’ (USMC) 13<sup>th</sup> Marine Expeditionary Unit (MEU)) were trained and equipped to employ principally non-lethal means (e.g., chemical adhesives, barriers and irritants; non-penetrating projectiles; and optical munitions) in countering the threat posed during military operations other than war (MOOTW).<sup>9</sup> Most recently, some of these same weapons were deployed with US troops in Bosnia... “[to] protect peacekeepers from throngs of civilians without risking civilian casualties.”<sup>10</sup>

## **Policies**

The embryonic nature of non-lethality and NLWs in US military operations is the result of three intermittent DOD policy initiatives accompanied by seemingly interminable delays. In his 30 March 1991 memorandum to the Secretary of Defense (SECDEF), then Under Secretary of Defense for Policy (USD(P)) Paul Wolfowitz recommended creating “an internal DOD group...to assess alternative non-lethal defense strategies.”<sup>11</sup> The recommendation was approved and the DOD Nonlethal Strategy Group was convened. The findings of the group, along with those of a related panel led by the Joint Staff, were respectively readied for presentation to the SECDEF and to the Chairman of the Joint Chiefs of Staff (CJCS) the following March. However, they apparently fell victim to concerns regarding security classification, along with an intense dispute between Wolfowitz and then Under Secretary of Defense for Acquisition

(USD(A)) Donald Yockey over “the nature and scope of the non-lethal effort and...who should be responsible for planning, budgeting and implementing the program.”<sup>12</sup>

Two years later under a new Administration, then Deputy Secretary of Defense (DEPSECDEF) John Deutch commissioned what became the Non-Lethal Weapons Steering Committee (NLWSC).<sup>13</sup> A number of significant documents emerged over the following months, including a report by the Defense Science Board (DSB) pertaining to MOOTW and the role of non-lethality along with a draft DOD policy on NLWs. Once again, subsequent actions were pursued intermittently and the process languished.

DOD Directive (DODD) 3000.3 was signed 9 July 1996 as the seminal DOD policy statement on NLWs. It formally established policies and assigned responsibilities for the development and employment of NLWs within the Department, including the designation of the Commandant of the Marine Corps as Executive Agent for the DOD Non-Lethal Weapons Program.<sup>14</sup> Serving as the definitive springboard for subsequent activities within DOD, the directive also mandated certain characteristics, objectives, operational boundaries and acquisition guidelines for NLWs.

## **Technology**

Three communities have nurtured prominent non-lethality technology programs in the perpetual absence of an agreed upon acquisition structure over the past decade, albeit for different reasons. Drawing from a sampling of earlier work done by the Defense Advanced Research Projects Office (DARPA), the Army’s Armament Research, Development, and Engineering Center (ARDEC) has explored more than a dozen NLW technologies. Their Low Collateral Damage Munitions (LCDM) program has sought to produce non-lethal weaponry that negates an adversary’s combat capability while

increasing tactical flexibility, enhancing performance effectiveness, reducing individual soldier logistics and improving target accuracy.<sup>15</sup>

Since the dawn of the post-Cold War era, the three national laboratories (Lawrence Livermore, Los Alamos, and Sandia) have been forced to grapple with the harsh reality of shrinking defense budgets coupled to the demise of the former Soviet Union. These former purveyors of nuclear weapons have sought, in part, to reinvent themselves in the unlikely world of non-lethal weaponry. From urban warfare applications of existing materials originally intended for the protection of nuclear facilities to advancing the state-of-the-art in physics and chemistry, their efforts have been represented across the spectrum of promising non-lethal technologies.<sup>16</sup>

A 1985 US Supreme Court ruling on the use of deadly force to prevent the escape of an unarmed burglary suspect led to the formation of a “less-than-lethal” development program within the Department of Justice’s (DoJ) National Institute of Justice (NIJ).<sup>17</sup> By 1993, the NIJ had expanded its mission to include the examination and transfer of existing and emerging technologies within the defense and intelligence establishments under an initiative known as the Technology Assessment Program (TAP).<sup>18</sup> In 1994, the DOD and DoJ formalized their desire to cooperatively pursue non-lethal weaponry, and have developed several prototypes to help law enforcement and military personnel close “the wide and dangerous gap [that] exists in the range of tools available to them.”<sup>19</sup>

From arguments about semantics to political turf wars over funding, the DOD’s recent history of non-lethality is a case study in the hazards of bureaucracy. If the military is to seamlessly integrate NLWs into the future US arsenal, coherent action must be taken in stark contrast to this notorious past.

## Notes

<sup>1</sup> Army Training and Doctrine Command Pamphlet (TRADOC PAM) 525-5, *Airland Operations: A Concept for the Evolution of Airland Battle for the Strategic Army of the 1990s and Beyond*, 1 August 1991, 48.

<sup>2</sup> Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the Twenty-First Century* (Boston, MA: Little, Brown & Company, 1993), 127.

<sup>3</sup> Harvey M. Sapolsky, *Non-Lethal Warfare Technologies: Opportunities and Problems* (Cambridge, MA: Massachusetts Institute of Technology, March 1995), 1.

<sup>4</sup> Miguel D. Walsh, *Non-Lethal and Discriminate Weapons and Technologies* (Washington, DC: Office of the Under Secretary of Defense for Policy, June 1991), 4.

<sup>5</sup> DOD Directive 3000.3, *Policy for Non-Lethal Weapons*, 9 July 1996, 1.

<sup>6</sup> David C. Morrison, "Bang! Bang! You've Been Inhibited!" *National Journal* 24, no. 13 (28 March 1992): 758.

<sup>7</sup> Fermin Gallego and Mark Daly. "Laser Weapon in RN Service," *Jane's Defence Weekly* 13, no. 2 (13 January 1990): 48.

<sup>8</sup> David A. Fulghum, "Secret Carbon-Fiber Warheads Blinded Iraqi Air Defenses," *Aviation Week & Space Technology* 136, no. 17 (27 April 1992): 18.

<sup>9</sup> Frederick M. Lorenz, "Less Lethal Force in Operation United Shield," *Marine Corps Gazette* 79, no. 9 (September 1995): 70.

<sup>10</sup> Mark Walsh, "Nonlethal Weapons Are Sent to Bosnia," *Air Force Times* 58, no. 8 (29 September 1997): 27.

<sup>11</sup> Paul Wolfowitz, Under Secretary of Defense for Policy, memorandum to the Secretary of Defense and the Deputy Secretary of Defense, subject: Do We Need a Nonlethal Defense Initiative, 30 March 1991.

<sup>12</sup> Barbara Opall, "Pentagon Units Jostle over Non-Lethal Initiative," *Defense News* 7, no. 9 (2-8 March 1992): 6.

<sup>13</sup> Malcolm H. Wiener, *Non-Lethal Technologies Military Options and Implications: Report of an Independent Task Force* (New York, NY: Council on Foreign Relations, 1995), 3.

<sup>14</sup> DOD Directive 3000.3, *Policy for Non-Lethal Weapons*, 9 July 1996, 1.

<sup>15</sup> Bill Harris, "Less-Than-Lethal Munitions to Give Army Greater Flexibility," *Ordnance* 9, no. 2 (May 1993): 22-23.

<sup>16</sup> Mark Nollinger, "Surrender or We'll Slime You," *Wired* 3, no. 2 (February 1995): 90-100.

<sup>17</sup> David Hemenway and Douglas Weil, "Phasers on Stun: The Case For Less Lethal Weapons," *Journal of Policy Analysis & Management* 9, no. 1 (Winter 1990): 97.

<sup>18</sup> TAP involves grants and cooperative/interagency agreements to research NLWs.

<sup>19</sup> David G. Boyd, "NIJ Enhances Weapons Technology," *Corrections Today* 56, no. 2 (April 1994): 160-162.

## Chapter 3

### The Motives

*To win one hundred victories in one hundred battles is not the acme of skill. To subdue the enemy without fighting is the acme of skill.*

—Sun Tzu

The second issue germane to non-lethality and the integration of non-lethal weaponry into future US military operations is motive; the impetus behind developing and employing NLWs in the DOD. Four dominant and interrelated themes justifying DOD involvement have emerged: The nature of the adversaries and conflicts facing the US; the accompanying need for a wide berth of response options; an overt US desire to reduce human and material lethality in the course of warfare; and the responsibility to ensure US forces are not vulnerable to an adversary equipped with non-lethal weaponry. Together, these motives provide a basis for substantiating DOD actions to fully integrate non-lethal concepts and technologies into future operational systems.

### A Changing Threat

What remains in the wake of both the Cold War and the Persian Gulf war are US adversaries who may not have the conventional military capability or the desire to engage our forces on the open battlefield, yet seek to successfully undermine US interests. “Few will dare to oppose us in open warfare in which we bring our full military might to bear.

Instead, we can predict indirect approaches and a rise in terrorism and low intensity conflicts. It is in these scenarios that highly ambiguous situations arise making the application of force extremely difficult.”<sup>1</sup> Existing US weaponry was designed for direct conventional lethal conflict, not the increasingly frequent realm of MOOTW and indirect warfare. Thus, they may prove painfully inadequate in responding to this environment.

Another facet of the volatile threat facing the US is the very real possibility that cultural and religious context will influence and perhaps altogether drive the hostile actions of a prospective adversary. The “Great Satan” mantra espoused by radical Islamic clerics abroad reflects a growing measure of aggression facing the US by those for whom a cultural or religious cause is central to their rage. The use of lethal force against these actors, even when substantiated before an impartial intergovernmental organization (IGO) like the United Nations (UN), may only serve to exacerbate the underlying problem, intensify feelings of ill will by their populace, and lead to increased violence against US citizens at home and abroad.

### **The Need For Options**

The need for increasingly varied and flexible responses to the world situation is self-evident in light of the dynamic threat facing the US. DOD Directive 3000.3 tackles the requirement for expanded alternatives to conventional lethality as its first point of policy. “Non-lethal weapons, doctrine, and concepts of operation shall be designed to reinforce deterrence and expand the range of options available to commanders.”<sup>2</sup> This is particularly relevant in peacekeeping, where even the most judicious application of lethal force may be devastating. As General Wayne Downing bluntly stated: “It’s kind of incongruous to be someplace on a peacekeeping mission and kill people.”<sup>3</sup>

Another perspective on the employment of non-lethal weaponry as an option for the National Command Authority (NCA) is directed at the pre- and post-hostilities phases of conflict. “One important purpose [of NLWs], which accommodates policies of restraint with overwhelming power, is to expand options, complicate enemy decision-making, and thereby promote greater freedom of action in the gap between relatively benign pressures and deadly force.”<sup>4</sup> In this context, non-lethal weaponry may fill the gap between the exhaustion of diplomacy and the exercise of lethal force, providing meaningful options in place of gut-wrenching ambiguity for US decision-makers.

### **Reduction in Lethality**

The most celebrated cause for pursuing non-lethality is to reduce casualties and minimize destruction during hostilities. Perhaps in the foreseeable future “the US will only send forces to battle if our expected losses of personnel are non-existent or low.”<sup>5</sup> Irrespective of the literal veracity of the remark, recent conflicts have raised expectations in the mind of the American public and our allies regarding the cost in body bags to achieving success in war. Of perhaps even greater consequence is the public’s intolerance to casualties among those who do not pose a direct threat to friendly forces.

Cable News Network (CNN) footage from the “Highway of Death” during the Persian Gulf war may have been a milestone in the history of non-lethality and its importance to the US in future military operations. “Given the tendency to make international conflict into a television ratings game...skilled opponents will learn to exploit both our distaste for killing civilians and the gore that comes with modern combat.”<sup>6</sup> The capability of an adversary to manipulate the horror of war via television was candidly described by Marine LtCol Duane Schattle as the “CNN Factor:”

More than ever before, the success/failure of our policy as well as our ability to militarily operate around the world is going to be increasingly scrutinized and evaluated by the global village at the speed of the very microwaves and electrons used to transport live television feeds from the front...It is not inconceivable that the CNN Factor may soon hasten the day's arrival when instant replay becomes as significant to military operations and foreign affairs as it is to NFL football.<sup>7</sup>

The other half of lethality reduction is the rationale for (and benefits associated with) minimizing the damage to an adversary's equipment, facilities and infrastructure during conflict. Rendering it useless may be desirable to destroying it for two reasons: First, given an end state which proposes an improved state of peace, deliberate obliteration may lack congruence with grand strategy. Second, "the cost of rebuilding a country after war can be as staggering as the conduct of the war itself...Fiscal constraints in a country saddled with debt will not permit the expense of rebuilding a country where previous attempts at annihilation have been pursued."<sup>8</sup> Given the US history of rebuilding where it has conquered, the utility of employing NLWs seems readily apparent.

### **Force Protection**

Hand-in-glove with minimizing casualties is the recognition that NLWs must be pursued to counter the threat posed to US troops by adversaries who advance these weapons irrespective of our efforts. "They are important weapons even if we decide not to incorporate them into our [offensive] arsenal, because we will need effective countermeasures to meet similar weapons and systems entering into the inventories of military and nonmilitary organizations around the world."<sup>9</sup>

Noted non-lethality expert Dr. John B. Alexander has reflected on the assertion that if the US refuses to develop NLWs no one else will. He views this perspective as a "head-in-the-sand" approach which has been repeatedly invalidated in his discussions

with leaders from other countries. He adds further clarity to the subject of why the US must pursue a defensive capability with respect to non-lethality using the frame of reference held by a prospective adversary. “There can be no doubt that highly creative and nefarious minds are at work thinking about methods by which to attack America, while minimizing the potential for adverse consequences to themselves.”<sup>10</sup>

### **Other Perspectives**

Although not fundamental to the DOD’s interest, three divergent explanations also have been repeatedly opined regarding the move toward non-lethality: First, that non-lethality is the predestined next step in the advancement of war-making technology; second, that the US may gain a relative moral advantage in international relations during times of hostilities by employing weaponry explicitly designed to reduce casualties and destruction; and third, that development of non-lethal weaponry must become a military priority because violent crime in the US has become a matter of national security. There is little dispute that crime is an important national priority, that US leaders may gain a measure of moral benefit by promoting non-lethality in warfare, or that technological Darwinism is an intriguing construct. However, these notions are woefully inadequate as material justification for pursuing non-lethality in future US military operations. The range of DOD initiatives required to successfully integrate NLWs into the future US arsenal clearly must be substantiated by the need for options in responding to a changing threat environment given a desire to reduce lethality and the fundamental importance of force protection.

## Notes

<sup>1</sup> John B. Alexander, *National Security and the Need for Nonlethal Options*, LA-UR-93-285 (Los Alamos, NM: Los Alamos National Laboratory, March 1993), 1.

<sup>2</sup> DOD Directive 3000.3, *Policy for Non-Lethal Weapons*, 9 July 1996, 2.

<sup>3</sup> “One On One,” *Defense News* 9, no. 14 (11-17 April 1994): 30. General Downing was Commander-in-Chief United States Special Operations Command in April 1994.

<sup>4</sup> John M. Collins, *Nonlethal Weapons and Operations: Potential Applications and Practical Limitations*, CRS 95-974S (Washington, DC: Congressional Research Service, September 1995), CRS-1.

<sup>5</sup> Stanley B. Alterman, “On Kinder and Gentler Warfare,” *Journal of Electronic Defense* 15, no. 5 (May 1992): 32.

<sup>6</sup> Harvey M. Sapolsky, *Non-Lethal Warfare Technologies: Opportunities and Problems* (Cambridge, MA: Massachusetts Institute of Technology, March 1995), 2-3.

<sup>7</sup> LtCol Duane Schattle, “Urban Warfare,” lecture, Air Command and Staff College, Maxwell Air Force Base, AL, 14 November 1997.

<sup>8</sup> Paul O’Conner, “Waging Wars with Nonlethal Weapons,” in *Challenge and Response: Anticipating US Military Security Concerns*, ed. Dr. Karl P. Magyar, et al. (Maxwell AFB, AL: Air University Press, 1994), 335.

<sup>9</sup> Miguel D. Walsh, *Non-Lethal and Discriminate Weapons and Technologies* (Washington, DC: Office of the Under Secretary of Defense for Policy, June 1991), 3.

<sup>10</sup> John B. Alexander, *Non-Lethal Weapons and the Future of War*, LA-UR-95-699 (Los Alamos, NM: Los Alamos National Laboratory, March 1995), 7-8.

## Chapter 4

### The Scenarios

*However attractive developments in warfare technology may be, there is still the staggering reality that war fighting is chaotic and unpredictable.*

— Paul G. O’Connor

The third issue germane to non-lethality and the integration of non-lethal weaponry into future US military operations relates to scenarios; the environment into which NLWs may be placed and the expectations regarding their employment. The roles played by non-lethals may be defined in the context of the spectrum of military conflict and the traditional levels of war when viewed as a matrix of armed hostility. Brought together, they characterize the need for decisive actions to fully incorporate non-lethal systems into the future US arsenal.

### Conflict Spectrum

The scope of prospective US military operations is staggering; from short-term, low-budget security assistance (SA) programs in tiny, third-world countries to long-standing, theater-level campaigns involving joint and multinational operations. While MOOTW is a growing arena of operations favorable to non-lethality, is it not the only point along the spectrum of conflict where NLWs may be employed.

The governing DOD policy on NLWs defines their viability as an important tool for use by combatant commanders in terms of their contribution to mission objectives across the spectrum of conflict. “Non-lethal weapons should enhance the capability of US forces to accomplish the following objectives: Discourage, delay, or prevent hostile actions; limit escalation; take military action in situations where use of lethal force is not the preferred option; better protect our forces; [and] temporarily disable equipment, facilities, and personnel.”<sup>1</sup> The underlying message reflects a foundational principle in warfighting regarding the employment any operational resource: Match the tool to the objective and employ it accordingly to accomplish the mission. Thus, NLWs may be employed as stand-alone weapons during pre- and post-hostilities; as adjuncts to lethal systems during low-intensity conflicts; and as a means of enhancing strategic lethality during high-intensity combat and major warfare.<sup>2</sup>

## **Tactical**

When pictured in the context of missions such as peacekeeping, counter-narcotics or counter-terrorism, the utility of stand-alone NLWs at the tactical level of war is readily apparent. Urban warfare expands this image to include a wide variety of combat operations where “enemies [in the cities] will oppose US forces by conducting asymmetric warfare in order to negate US technological superiority.”<sup>3</sup> This is precisely the future tactical scenario in which our troops are likely to find themselves and one for which they are ill-equipped to face with existing lethal weaponry.

As noted by Ray Cline of the US Global Strategy Council, “the use of minimum, non-lethal force would be particularly effective in conflicts where the enemy is hard to identify, frequently blends in with civilians, and may have a value system that rewards

death and martyrdom.”<sup>4</sup> NLWs are well suited to addressing the threat posed by an ill-defined or ulteriorly motivated adversary in a tactical environment, especially when a lethal exchange holds potential for unacceptable consequences. Whether thwarting an attempt by hostile religious extremists to overrun an embassy, dispersing armed constituencies of rival warlords attempting to steal humanitarian supplies, or rescuing prisoners of war (POWs) from their captor’s compound, the use of non-lethal force may fulfill mission objectives with less potential for causing undesired death or serious injury. This is an attractive alternative to conventional lethality at the tactical level of war.

## **Operational**

The nature of applying NLWs at the operational (i.e., theater) level of war returns to the description of non-lethal warfare as “something more than the application of diplomatic pressure and something less than widespread slaughter.” The scenario is one of erupting regional instability with all the trappings in place for full-blown theater warfare. The geographic Commander-in-Chief (CINC) has prepared and refined a detailed course of action that addresses the theater situation, ranging from early flexible deterrent options (FDOs) to decisive combat through post-hostilities. Perhaps an adversary must be isolated and disarmed, or the activities of a hostile transnational group residing in a host support nation must be emasculated. The CINC’s aim is to restore stability to the region in the most non-intrusive manner possible following the collapse of diplomatic initiatives. Limiting the scope of conflict with an eye toward de-escalation is inextricably tied to the minimization of lethal force.

At the operational level of war, the NCA and CINC need to span the gap between rhetoric and rockets. Dubbed “coercive diplomacy” or “technological sanctions” when

applied at this level of war, non-lethal weaponry offers “new, in-between alternatives; ones that place pressure on the adversary’s leadership without intentionally crossing the “Death Barrier,”...a term coined by retired US Army Chief of Staff General E.C. “Shy” Meyer [who] stated there are many options you can employ until you kill someone. Then the calculus changes.”<sup>5</sup> The judicious use of these weapons may demonstrate a degree of political and military resolve beyond traditional diplomacy yet short of conventional warfare, perhaps bringing about a decisive and timely resolution to the existing crisis while averting the employment and consequences of lethal force altogether.

## **Strategic**

The two most common strategic scenarios envisioned for NLWs relate to the distinct but complementary goals of strategic paralysis and lethality enhancement. Strategic paralysis emerged from a model of systems analysis proffered by retired Air Force Colonel John Warden. His model asserts the most effective means of paralyzing an adversary’s strategic capability is to conduct simultaneous attacks against decisive elements of his leadership, system essentials, and infrastructure.<sup>6</sup> As framed by Dr. Alexander, “the attacks are conducted in such a way that the aggressor is deterred or dissuaded from an undesirable course of action. Failing that, his war-fighting capability is degraded to the point that prolonged armed conflict is clearly not viable.”<sup>7</sup> The thrust of non-lethal employment at this level is to impact an adversary’s military force potential and prevent mobilization; severely restricting his strategic war making capability.

The opposite side of the strategic coin is lethality enhancement. According to DOD Directive 3000.3, “non-lethal weapons may be used in conjunction with lethal weapon systems to enhance the latter’s effectiveness and efficiency in military operations. This

shall apply across the range of military operations to include those situations where overwhelming force is employed.”<sup>8</sup> To immobilize priority targets via NLWs and then destroy them with a “hard kill” system is an effective means by which to prosecute warfare. However, according to opponents, the use of non-lethal weaponry for this purpose is reprehensible and has its roots in Southeast Asia.

During the Vietnam War, the United States began to argue the wartime use of tear gas was permitted by international law, and the Pentagon claimed that it used tear gas for humane purposes—employing it when combatants were intermingled with civilians. In fact, more than 8,000 tons of tear gas was dropped by helicopters or fired in artillery projectiles to “soften up” populated areas before bombing strikes were launched.<sup>9</sup>

This isolated controversy aside, the actions of US leaders to integrate non-lethality into future military operations clearly must be decisive; drawn from a framework of intimate familiarity with the utility and effects of NLWs at the three levels of war and across the spectrum of conflict.

### Notes

<sup>1</sup> DOD Directive 3000.3, *Policy for Non-Lethal Weapons*, 9 July 1996, 2.

<sup>2</sup> John B. Alexander, *Non-Lethal Weapons and the Future of War*, LA-UR-95-699 (Los Alamos, NM: Los Alamos National Laboratory, March 1995), slide 2.

<sup>3</sup> LtCol Duane Schattle, “Urban Warfare,” lecture, Air Command and Staff College, Maxwell Air Force Base, AL, 14 November 1997.

<sup>4</sup> Barbara Amouyal and Neil Munro, “Labs Rush Nonlethal Arms for Mideast Deployment,” *Defense News* 5, no. 45 (5 November 1990): 37.

<sup>5</sup> John B. Alexander, *National Security and the Need for Nonlethal Options*, LA-UR-93-285 (Los Alamos, NM: Los Alamos National Laboratory, March 1993), 2.

<sup>6</sup> John A. Warden III, “Air Theory for the Twenty-first Century,” in *Challenge and Response: Anticipating US Military Security Concerns*, ed. Dr. Karl P. Magyar, et al. (Maxwell AFB, AL: Air University Press, 1994), 311-332.

<sup>7</sup> John B. Alexander, *Nonlethal Weapons as Force Options for the Army*, LA-UR-94-861 (Los Alamos, NM: Los Alamos National Laboratory, March 1994), 6.

<sup>8</sup> DOD Directive 3000.3, 2.

<sup>9</sup> Linda Rothstein, “More Roadblocks to Chemical Treaty?” *Bulletin of the Atomic Scientists* 48, no. 5 (June 1992): 7.

## Chapter 5

### The Criteria

*As an Army officer I debated many times about whether violence is part of the human makeup or a learned behavior...I can only say that I remember clearly a time when I knew nothing of war and violence, and later how I had worked hard to learn to become capable of it.*

— David A. Morehouse

The fourth issue germane to non-lethality and the integration of non-lethal weaponry into future US military operations is criteria; how prospective weapons may be evaluated to determine their appropriateness as an instrument of national security. Because non-lethals are a new class of weaponry with limited “real world” history, DOD policy identifies “technical feasibility, operational utility, and policy acceptability” as the principal suitability criteria for their development and employment.<sup>1</sup> Together with safety, these criteria define the appropriateness of DOD actions to ensure the successful integration of NLWs into the future US arsenal.

#### Technical Feasibility

Translating weaponry concepts into viable systems requires technology maturation, operational weaponization, and the development of a supporting infrastructure. These steps contribute to overall life cycle cost (LCC) which generally increases as a function of development time and technical risk. Thus, both factors must be included in the

technical feasibility of prospective non-lethal systems. Likewise, adequate and stable funding is essential to controlling these factors. The absence or fluxuation of appropriated funds may delay key research, development, test and evaluation (RDT&E) milestones and increase technical risk by curtailing research efforts and forcing program extensions.

Also intertwined in technical feasibility is near-term vs. far-term balance. Concepts using commercial-off-the-shelf (COTS) equipment that provide low-cost, near-term solutions are attractive, but do not negate the need for follow-on systems to meet evolving mission requirements. Concepts that require ten to twenty years of painstaking effort to field, along with a sizable and sustained investment of financial resources, promise an important measure of longevity for this emerging class of weaponry.

### **Operational Utility**

Non-lethal weapons must: (1) Achieve an appropriate balance between the competing goals of having a low probability of causing death, permanent injury, and collateral material damage, and a high probability of having the desired anti-personnel or anti-materiel effects. (2) Not be easily defeated by enemy countermeasures once known; or if they could, the benefits of a single opportunity to use the weapons in a given context would be so great as to outweigh that disadvantage. (3) Achieve an effect that is worth the difficulty of providing the intelligence support required for mission planning and damage assessment.<sup>2</sup>

The above guidance from DOD Directive 3000.3 highlights effectiveness, countermeasures, and battle damage assessment (BDA) in assessing the suitability of prospective non-lethal weaponry. While NLWs are explicitly designed to minimize casualties and destruction, their ultimate worth is determined by their effectiveness in meeting overall mission objectives. Furthermore, because NLWs may be brought to the fight as a substitute for other lethal weapons, their employment demands sensitivity to the threat posed by countermeasures. Lastly, the intelligence support required to assess battle

damage may be considerable given the often less-visible effects of NLWs, especially anti-materiel attacks at the operational and strategic levels of war.

Beyond what is spelled out in the directive, many other issues may be explored with respect to operational utility. Is the weapon capable of multiple anti-materiel and/or anti-personnel applications? Does the potential exist for expanding mission applications or is capability limited to a single application? What are the limitations associated with range, rate of fire, chamber capacity, reloading, human factors, climate, and collateral and secondary effects? How reliable is the weapon? How difficult is it to “field strip” and maintain? These questions may help to frame the operational utility of prospective NLWs for US decision-makers.

### **Policy Acceptability**

While DOD Directive 3000.3 does not define “policy acceptability,” it does mandate a legal review of NLWs to “ensure consistency with the obligations assumed by the US Government under all applicable treaties, with customary international law, and, in particular, the laws of war.”<sup>3</sup> This is one of the most contentious and hotly debated aspects of non-lethals by opponents of biological and chemical weapons.

The use of chemical agents...is seen as a Trojan Horse to circumvent the Chemical Weapons Convention since the convention applies only to military uses. Similarly, the use of bacteria to destroy fuel supplies would directly contravene the Biological Weapons Convention, which forbids the development, production or stockpiling of biological weapons. Two of the major arms control agreements that emerged from the end of the Cold War are thus directly threatened by the introduction of non-lethal weapons.<sup>4</sup>

From this perspective, the entire notion of NLWs smacks of deceit and moral sabotage; where advocates of non-lethality seek to subvert provisions of international law with complete disregard for humanity. Irrespective of the debate, the directive is clear:

The law cannot be ignored—development and employment of NLWs must “ensure consistency” with applicable international statutes and provisions. However, several tacks may be taken in terms of compliance with the policy.

It has been opined that existing US non-lethal weaponry and those technologies or concepts under development must simply exclude any means restricted or prohibited by international statute or treaty without exception. Formal DOD guidance notwithstanding, another school of thought is that US efforts to procure and field a suite of NLWs ought to be loosely guided (but not rigidly constrained) by international standards of humaneness, with legal conventions modified accordingly. Lastly, Janet Morris’ widely quoted “life conserving, environmentally friendly, and fiscally responsible” definition of non-lethals may also serve as a unifying theme and common basis for those seeking a pragmatic and morally sound criteria by which to judge the policy acceptability of emerging technologies within the context of international convention.<sup>5</sup>

## **Safety Issues**

While not explicitly declared as an element of suitability criteria by DOD Directive 3000.3, safety may be included as a facet of either operational utility or policy acceptability. Although the importance of evaluating a prospective weapon with respect to safety is self-evident, the primary concern with NLWs relates to any inadvertent and/or secondary effects arising from their employment. The horrifying portrayals range from children dying in hospitals that have lost electricity derived from a power grid targeted by a disabling burst of microwave energy intended to shut down an adversary’s surface-to-air missile (SAM) site, to the screams of a bloodied bystander clutching at what remains of her right eye following the impact of a deflected rubber bullet during an urban

skirmish between a terrorist faction and government troops.<sup>6</sup> The overt goals of reduced casualties and minimal destruction aside, “weapon” is what first and foremost defines non-lethals in any military operation.

Both anti-materiel and anti-personnel NLWs hold potential for lethality. Because of wide variances in human physiology and the inherent risk of an anti-materiel weapon being inadvertently applied against human beings during conflict, it may be impossible to ever develop a truly “non-lethal” NLW. As General Downing put it, “we can design a projectile that will not kill a grown man, but will kill a child, or someone who is old, infirm or sick.”<sup>7</sup> The concession by DOD Directive 3000.3 that “non-lethal weapons shall not be required to have a zero probability of producing fatalities or permanent injuries” underscores their inescapable potential for lethality and the importance of safety.

Technical feasibility, operational utility, policy acceptability and safety all require careful evaluation in the development or employment of NLWs. Efforts by the DOD to fully integrate non-lethal concepts and technologies into the future US arsenal clearly must be appropriate to a framework of suitability that includes these criteria.

### Notes

<sup>1</sup> DOD Directive 3000.3, *Policy for Non-Lethal Weapons*, 9 July 1996, 4.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid, 3.

<sup>4</sup> Nick Lewer and Steven Schofield, *Non-Lethal Weapons--A Fatal Attraction? Military Strategies and Technologies for 21st-Century Conflict* (London, UK: Zed Books, 1997), 14-15.

<sup>5</sup> Janet Morris, “Enter Nonlethal Weaponry,” *IEEE Spectrum* 28, no. 9 (September 1991): 58.

<sup>6</sup> The Learning Channel, *Non-Lethal Weapons*, Discovery Communications, Inc., 55 minutes, 1997, videocassette.

<sup>7</sup> “One On One,” *Defense News* 9, no. 14 (11-17 April 1994): 30.

## Chapter 6

### The Recommendations

*It is he, the technician, not the commander in the field, who is at the heart of the arms race...they have become the alchemists of our time, working in secret ways which cannot be divulged, casting spells which embrace us all*

— Solly Zuckerman

Taken together, the history, motives, scenarios, and criteria germane to non-lethality in the DOD provide a framework of findings foundational to the advancement of NLWs within the US. These findings mandate coherent, substantiated, decisive and appropriate actions by a multitude of actors at nearly every level to ensure the successful incorporation of non-lethal weaponry into future US military operations. From policy initiatives to acquisition partnerships, the effective transformation of non-lethal concepts and technologies into a fully integrated component of future US armed capability hinges on these actions.

#### Policy

If non-lethality is to be seamlessly blended into US military operations, several steps must be taken to lay a foundation of national policy that facilitates this transition. First, the SECDEF must seek consensus among national security leaders (military and civilian) regarding the future of non-lethal warfare against the backdrop of prevailing US global security interests. Stewardship of the public trust and the constraints of limited resources

demand disciplined forethought in the pursuit of non-lethality as a new concept in US warfare and emerging class of weaponry. The need for non-lethals in the DOD arsenal must be clearly substantiated by US decision-makers; not assumed or asserted out of a passing fancy with the notion of bloodless warfare.

Next, the SECDEF and CJCS must ensure the role of non-lethality is documented in the four national defense planning systems: the National Security Council (NSC) system; the Joint Strategic Planning System (JSPS); the Joint Operations and Planning Execution System (JOPES); and the Planning, Programming and Budgeting System (PPBS). Institutionalizing a mandate for non-lethality through the processes and products of these systems will require careful examination of many crucial issues throughout the DOD. Operational plans produced by US combatant commanders and the programming priorities advocated by the Services must be congruent with a National Security Strategy (NSS) that addresses these issues and conveys global objectives suitable to NLWs framed in the context of a highly volatile international environment.

Given these changes, the SECDEF must then partner with the Attorney General to redraw the increasingly blurred lines between military operations and domestic law enforcement in accordance with applicable statutes. Civilian leaders may be more inclined to address future domestic crisis situations using military forces (e.g., drug trafficking, terrorism, natural disasters, etc.) when a broadened military mindset toward conflict instinctively includes non-lethality and NLWs are the mainstay of a soldier's individual equipment issue. Military and civilian missions must be compared and contrasted to ensure the appropriate agent of power is tasked irrespective of the weapons employed. As non-lethal confrontation becomes second nature to US fighting forces, one

of the few remaining pragmatic objections to their use in domestic scenarios (i.e., the likelihood of lethal military force being exercised against the citizenry) will be radically diminished. This is an ominous prospect to say the very least.

Lastly is the issue of security. Because of the ramifications associated with issues ranging from countermeasure development to foreign military sales (FMS), the SECDEF and CJCS must assess the need to shroud the policies and programs of non-lethality in secrecy. Due consideration must be given to the influence of public debate (especially where biological and chemical agents are concerned), and to the benefits and drawbacks associated with the oversight of classified activities. The need for coherence in this endeavor cannot be overstated. Any discussion over the role of security classification must treat the incorporation of non-lethal concepts and weapons as a collective whole and not attempt to craft strategy in a piecemeal fashion.

## **Legislation**

The development and employment of NLWs poses unique legal challenges for the DOD. The impact of NLWs on the law of war, international standards of humaneness, and specific chemical and biological conventions is ill-defined. Yet overt prohibitions against the employment of weapons that cause undue suffering or indiscriminate casualties (as detailed in international statutes) must be fully supported. In this light, great care must also be taken to ensure well-meaning treaties do not unintentionally emasculate otherwise distinctly humane systems and practices out of ignorance or emotion.

In completing the legal review of non-lethal concepts and weapons directed by DOD Directive 3000.3, the DOD Office of General Counsel must be proactive in identifying possible areas of concern. Documents recommending ratification, exceptions, revisions,

addendum or repeal of existing conventions must be drafted and forwarded to appropriate legislative bodies for action. Further, their participation in crafting future international agreements must be sustained and enduring. Great pains must be taken to ensure the ballyhoo surrounding non-lethality (both positive and negative) does not cloud objective and reasoned judgment in the pursuit of non-lethal capabilities by the DOD.

## **Doctrine**

If non-lethality is to be a fully integrated component of US armed capability, doctrine must be created to govern their appropriate employment in future military operations. While many bitterly contentious issues divide the non-lethality community, there is nearly perfect confluence of thought on this crucial topic. A chorus of advocates and opponents alike proclaim the necessity of formulating joint doctrine to hoist a philosophical and semantical umbrella over non-lethal tactics, techniques and procedures (TTP) upon which the Services and CINCs may build. The Joint Staff must author new joint publications that articulate TTP appropriate to the application of NLWs written against the backdrop of existing capstone and keystone documents. These publications must include security, command and control (C2), rules of engagement (ROE), training and logistics support for fielded systems.

Joint doctrine must also describe the application of non-lethal weaponry from both offensive and defensive perspectives, admonishing US forces to expand their definition of “kill” and adopt a new generation of military thinking which embraces non-lethality as an integral component in the employment of armed force. US Army Training and Doctrine Command Pamphlet (TRADOC PAM) 525-73, *Nonlethal Capabilities in Army Operations*, 1 September 1996, provides an excellent starting point in this endeavor.

Lastly, related component, joint and multinational doctrinal publications must be reviewed and updated to ensure congruence with the new doctrine of non-lethality.

## **Architecture**

The effective transformation of emerging technologies into fielded weapon systems is one of the most complex and resource-intensive endeavors imaginable. As a new class of weaponry, NLWs promise unprecedented opportunities for institutional missteps as well as success. The designation of the Commandant of the Marine Corps as Executive Agent along with the recent activation of the DOD Joint Non-Lethal Weapons Directorate (JNLWD) stand as important early milestones in this groundbreaking process. To that end, the JNLWD must exercise the full scope of their authority and responsibility on behalf of the Executive Agent as the single manager for non-lethality within the DOD.

First and foremost, the JNLWD must craft an overarching architecture for NLWs—a skeletal structure of non-lethality that carefully positions concepts and technologies in context to each other and to external influences while synergistically drawing upon the relative strengths of each to compose a cohesive whole. The existing technology base, along with the policies, legislation and doctrine outlined above, must serve as the JNLWD’s raw materials in drafting this blueprint of non-lethality. Architecture in hand, joint technology roadmaps must then be developed to ensure attention and funding is appropriately focused on advancing the diverse non-lethal technology base.

The JNLWD must also mandate that the Services and USSOCOM provide master plans for their respective individual programs which draw upon these roadmaps and are fully congruent with the umbrella architecture. Furthermore, the architectures and strategic plans of concepts and technologies upon which non-lethality may impact (e.g.,

intelligence assets, delivery vehicles, conventional munitions, etc.) must be reviewed and amended as needed to ensure complementary actions across the DOD. Lastly, key non-lethal technologies must be identified in the DOD Militarily Critical Technologies List (MCTL) to focus national efforts and protect important assets from export.

## **Acquisition**

It is nearly impossible to coherently guide the course of a defense acquisition program without control of the money. Thus, the JNLWD must assert its authority over funding for all NLW programs to ensure unity of effort and unity of purpose in the acquisition process. Specifically, the program objective memorandum (POM) inputs submitted by the Services and USSOCOM for their respective NLW programs must be subject to JNLWD approval, and the disbursement of those funds must be controlled through them as well. Lastly, RDT&E and procurement program elements (PEs) must be established as needed for new programs.

NLW acquisition projects must strike the delicate balance of moving decisively toward fulfilling combatant requirements while practicing exceptional fiduciary discipline. Major new programs demand a measure of financial commitment and political consensus unlikely to be easily realized in an era of declining defense budgets. Given the competition for funding and commensurate constraints of resource scarcity within the DOD, the JNLWD must pursue opportunities to leverage their efforts within the context of the aforementioned architecture.

Small projects that tailor commercially available systems, high-payoff technology demonstrations, and modifications to existing weaponry (especially delivery platforms) must be the focus of near-term efforts. Furthermore, LCC analysis, detailed examination

of cost/schedule/performance trade-offs, and alternative systems approaches must accompany prospective RDT&E programs, taking into account the spectrum of applications associated with a given technology to ensure reasoned and balanced analysis. Further, cost-sharing cooperative ventures with other US agencies, allies, academia and state law enforcement agencies must be explored.

Irrespective of whatever offensive non-lethal capabilities are pursued by the DOD in either the near-term or far-term, the JNLWD must shoulder the responsibility for the development of defensive systems adequate to address force protection concerns regarding non-lethality, remembering that friendly vulnerabilities must be understood and protected against at all times. There is also the need to advance simulation and modeling techniques. These technologies and methods must be an underlying priority for the JNLWD, as they provide an excellent forum for cost effective evaluations of existing and emerging concepts and systems. Finally, the JNLWD must partner with the national intelligence community to ensure the challenges of new BDA techniques and systems responsive to non-lethality are met in a timely and cost-effective manner.

## Chapter 7

### The Finale

*Today, a new arms race may be about to dawn on the planet—a push for weapons that minimize, rather than maximize, lethality.*

— Alvin and Heidi Toffler

This report has clearly asserted, logically examined, and factually demonstrated through MCA that the successful integration of non-lethal weaponry into future US military operations hinges on actions drawn from an understanding of non-lethality issues germane to the DOD. Specifically, it has been demonstrated that steps based in the history, motives, scenarios and criteria associated with non-lethality must be taken that are coherent, substantiated, decisive and appropriate with respect to policy, legislation, doctrine, architecture and acquisition.

#### Summary of Findings

With regard to the history of non-lethality, a wide range of actors both from within and outside of DOD have been involved in non-lethality over the years and struggled with the definition of non-lethality itself. The DOD operational experience with NLWs has been extensive but scattered, while the development of non-lethal policies, concepts and technologies by the US government has appeared largely erratic. Taken collectively, these elements compose a contextual genesis that has been highly convoluted.

Four dominant and interrelated motives drive the DOD's burgeoning relationship with non-lethality and the potential subsequent widespread incorporation of NLWs into the DOD as an application of the military IOP: The changing nature of the threat and conflicts facing the US; the accompanying need for a widened array of options in responding to this change; the overt desire to reduce human and materiel lethality in the course of warfare, and the mandate to ensure US force protection from an adversary equipped with non-lethal weaponry.

The governing DOD policy on NLWs defines their viability as an important tool for use by combatant commanders in terms of their contribution to explicit military objectives. The spectrum of military conflict and the traditional levels of war jointly compose a matrix model of military operations against which scenarios requiring non-lethality are defined. The application of non-lethal systems and the resultant effects of their employment clearly depend on the nature of the environment into which they are placed and the expectations held regarding their use.

The issue of suitability criteria is imperative to the consideration of what concepts and technologies to incorporate into the future DOD arsenal. Because non-lethals are a new class of weaponry with limited "real world" history, these criteria are largely limited by the DOD directive that governs NLWs. Before a weapon is moved off the drawing board and onto the battlefield, the criteria of technical feasibility, operational utility, policy acceptability and safety ascertain the degree to which the concept or system fits against the backdrop of prevailing US security interests.

Coherent, substantiated, decisive and appropriate actions must be taken that drawn upon the history, motives, scenarios and criteria of non-lethality in the DOD to ensure the

effective transformation of non-lethal concepts and technologies into a fully integrated component of US armed capability. These efforts require a multitude of actors engaged in policymaking, legislative, doctrinal, architectural and acquisition initiatives. From broad consensus-building to a variety of RDT&E partnerships, the successful incorporation of non-lethality into the future DOD arsenal hinges on these important actions.

### **Closing Thought**

In the pre-dawn hours of the new millenium, the US stands in the crucible of a new age in technology and geopolitics that offers unprecedented challenges and opportunities for those who will respond to the call. Non-lethality provides one means by which to respond to this emerging environment and constructively alter the face of human warfare forever. The seamless integration of non-lethal concepts and technologies into future US military operations hinges on actions drawn from issues germane to non-lethality in the DOD that subtly shifts the national paradigm of military power. If US decision-makers are willing to embrace the often contrarian precept of restraint in resolving military conflicts, NLWs hold promise as an effective and humane tool of national military policy and a means by which to extend America's legacy of leadership in global security.

## Appendix A

### The Inventory

The following table highlights a cross-section of non-lethal technologies and whether the primary target of the technology is anti-materiel (AM) or anti-personnel (AP) in nature. Commensurate delivery systems for these technologies include the use of retrofitted conventional munitions carriers, autonomous delivery vehicles, “precision guidance systems, remote detonations, remotely piloted vehicles, laser guidance and Soldier Integrated Protective Ensemble (SIPE) assisted fire-control and target lock-on.”<sup>1</sup>

**Table 1. Non-Lethal Technologies<sup>2</sup>**

Technology	Description	Target
<i>Acoustics</i>		
Audible Sound	High amplitude for point and area denial; low-level annoying sounds to disperse crowds.	AP
Infrasound/VLF	Very low frequency, high intensity sound. Disorients and frightens. Interferes with organ functions, causing nausea and bowel spasms. Disrupts metal and composite materials.	AM/AP
<i>Biologicals</i>		
Biodeteriorative Microbes	Degrades road and bridge surfaces, turns aviation fuel into jelly, “eats” rubber off vehicle wheels.	AM
Neural Inhibitors	Incapacitates personnel, paralyzing synaptic pathways. Induces reversible crippling effects.	AP
<i>Chemicals</i>		

Adhesives	Quick-setting polymer foams, sprays, fluids and powders. Immobilizes targets and requires special solvents to remove.	AM/AP
Barriers	Dense, rapidly expanding aqueous bubbles. Isolates and immobilizes to control evacuation or escape. May be used with odors, dyes, etc.	AP
Calmatives	Sedatives delivered through the lungs or skin. Calms and induces relaxation or slumber state.	AP
Caustics	Jellied agents. Changes molecular structure of materials causing rapid corrosion or evaporation.	AM
Contaminates	Gas, foam and liquid combustion modifiers. Chokes engines, neutralizes combustion of fuels.	AM
Embrittlements	Microencapsulated liquid hydrogen. Disables targets by degrading or cracking surfaces.	AM
Hallucinogens	Narcotics that disorient, confuse and incapacitate.	AP
Irritants	Pepper spray, CS and OC gases, etc. Causes temporary but intense and debilitating pain.	AP
Lubricants	Anti-traction liquids and aerosols. Turns dirt into chemical mud and makes surfaces slippery/boggy.	AM/AP
Neuroblockers	Tranquilizer darts and anesthetic bullets. Blocks neuromuscular passages causing incapacitation.	AP
Taggants	Tracks equipment, material, or personnel.	AM/AP
<b><i>Electromagnetics</i></b>		
Conductive Ribbons	Shorts-out electrical systems and power generation equipment (switches/transformers).	AM
Directed Energy/ Particle Beams	Destroys electronic systems. Changes molecular structure of weapons rendering them useless.	AM
Electronic Rifles	Includes taser, dart and stun guns. Debilitates central nervous system, short-circuiting human synoptic pathways causing incapacitation.	AP
Non-Nuclear EMP	Damages computers and electronics. Disables “fly-by-wire” aircraft, vehicle ignitions.	AM
Pulsed High Power Microwaves (HPM)	Disrupts and neutralizes electronics. Jams or scrambles C2 systems. Shuts down engines, explodes ammunition. Induces confusion, stupor or coma in personnel and animals.	AM/AP
<b><i>Kinetics</i></b>		
Ceramic shards	Damages aircraft engines and degrades air vehicle stealthiness.	AM
Entanglement munitions	Nets, meshes, cables, chains, etc. Disables treads, propellers, rotor-blades and axles trapping targets.	AM/AP

Non-Penetrating projectiles	Crushing, deforming, spalling systems, including stinger grenades; wax, wood, and plastic bullets. Effects vary with shapes, materials, and speed.	AM/AP
Water cannons	May be used with or without chemical additives to dissuade crowds from violence.	AP
<i>Optics</i>		
High Energy Lasers	Destroys optical sensors.	AM
Low Energy Lasers	Includes laser rifles and anti-air laser canons. Temporarily blinds personnel. Overloads and disables electro-optical sensors.	AM/AP
Optical Munitions	Uni-directional, isotropic, and pulsing light anti-sensor munitions, including flash-bang grenades.	AM/AP
Obscurants	Selectively inhibits air/land/sea observation; affords tailored “windows” with shaped smoke.	AM/AP
Pulsed Chemical Lasers	Projects hot, high-pressure plasma in front of targets producing high-pressure shock wave.	AM
Strobe Lights	Pulsed high-intensity light. Disorients/confuses.	AP

### Notes

<sup>1</sup> “DOD Urged To Adopt Nonlethal Warfare Strategy.” *Defense Electronics*, Vol. 24, No. 3 (March 1992): 22.

<sup>2</sup> Table largely compiled from three texts: Malcolm Dando, *A New Form of Warfare: The Rise of Non-Lethal Weapons* (London, UK: Brassey's, 1996), 11-12; Nick Lewer and Steven Schofield, *Non-Lethal Weapons--A Fatal Attraction? Military Strategies and Technologies for 21st-Century Conflict* (London, UK: Zed Books, 1997), 8-9; and David A. Morehouse, *Nonlethal Weapons: War Without Death* (Westport, CT: Praeger, 1996), 19-20.

## *Glossary*

ARDEC	Armament Research, Development and Engineering Center
BDA	Battle Damage Assessment
C2	Command and Control
CINC	Commander-in-Chief
CJCS	Chairman of the Joint Chiefs of Staff
CNN	Cable News Network
COTS	Commercial Off-The-Shelf
DARPA	Defense Advanced Research Projects Office
DEPSECDEF	Deputy Secretary of Defense
DOD	Department of Defense
DODD	Department of Defense Directive
DOE	Department of Energy
DOJ	Department of Justice
DSB	Defense Science Board
EMP	Electromagnetic Pulse
EW	Electronic Warfare
FDO	Flexible Deterrent Option
FMS	Foreign Military Sales
IGO	Intergovernmental Organization
IOP	Instrument of Power
IW	Information Warfare
JNLWD	Joint Non-Lethal Weapons Directorate
JOPEX	Joint Operations and Planning Execution System
JSPS	Joint Strategic Planning System
LANL	Los Alamos National Laboratory
LAPD	Los Angeles Police Department
LCC	Life Cycle Cost
LCDM	Low Collateral Damage Munitions
LDS	Laser Dazzle Sight
LLNL	Lawrence Livermore National Laboratory

MCA	Modified Content Analysis
MCTL	Militarily Critical Technologies List
MEU	Marine Expeditionary Unit
MOOTW	Military Operations Other Than War
MOU	Memorandum of Understanding
NATO	North Atlantic Treaty Organization
NCA	National Command Authority
NIJ	National Institute of Justice
NLW	Non-Lethal Weapon
NLWSC	Non-Lethal Weapons Steering Committee
NSC	National Security Council
NSS	National Security Strategy
OSD	Office of the Secretary of Defense
PE	Program Element
POW	Prisoner Of War
PPBS	Planning, Programming and Budgeting System
RDT&E	Research, Development, Test and Evaluation
RMA	Revolution in Military Affairs
ROE	Rules Of Engagement
SAM	Surface-to-Air Missile
SAMP	Small Arms Master Plan
SECDEF	Secretary of Defense
SNL	Sandia National Laboratory
TAP	Technology Assessment Program
TRADOC	US Army Training and Doctrine Command
TTP	Tactics, Techniques and Procedures
UN	United Nations
US	United States
USA	United States Army
USAF	United States Air Force
USD(A)	Under Secretary of Defense for Acquisition
USD(P)	Under Secretary of Defense for Policy
USMC	United States Marine Corps
USN	United States Navy
USSOCOM	United States Special Operations Command
USSR	Union of Soviet Socialist Republics
WMD	Weapons of Mass Destruction

## ***Bibliography***

### **Books**

- Anderberg, Bengt, and Myron L. Wolbarsht. *Laser Weapons: The Dawn of a New Military Age*. New York, NY: Plenum Press, 1992.
- Dando, Malcolm. *A New Form of Warfare: The Rise of Non-Lethal Weapons*. London, UK: Brassey's, 1996.
- Goldblat, Jozef. "Land-Mines and Blinding Laser Weapons: The Inhumane Weapons Convention Review Conference." In *Stockholm International Peace Research Institute (SIPRI) Yearbook 1996*. New York, NY: Oxford University Press, 1996.
- Kokoski, Richard. "Non-Lethal Weapons: A Case Study of New Technology Developments." In *Stockholm International Peace Research Institute (SIPRI) Yearbook 1994*. New York, NY: Oxford University Press, 1994.
- Lewer, Nick, and Steven Schofield. *Non-Lethal Weapons--A Fatal Attraction? Military Strategies and Technologies for 21st-Century Conflict*. London, UK: Zed Books, 1997.
- Morehouse, David A. *Nonlethal Weapons: War Without Death*. Westport, CT: Praeger, 1996.
- Naisbitt, John. *Megatrends: Ten New Directions Transforming Our Lives*. New York, NY: Warner Books, Inc., 1982.
- O'Conner, Paul. "Waging Wars with Nonlethal Weapons." In *Challenge and Response: Anticipating US Military Security Concerns*. Edited by Dr. Karl P. Magyar, et al. Maxwell AFB, AL: Air University Press, 1994.
- Toffler, Alvin, and Heidi Toffler. *War and Anti-War: Survival at the Dawn of the Twenty-First Century*. Boston, MA: Little, Brown & Company, 1993.
- Warden, John A. III. "Air Theory for the Twenty-first Century." In *Challenge and Response: Anticipating US Military Security Concerns*. Edited by Dr. Karl P. Magyar, et al. Maxwell AFB, AL: Air University Press, 1994.

### **Documents**

- Alexander, John B. *National Security and the Need for Nonlethal Options*. LA-UR-93-285. Los Alamos, NM: Los Alamos National Laboratory, March 1993.
- Alexander, John B. *Non-Lethal Weapons and the Future of War*. LA-UR-95-699. Los Alamos, NM: Los Alamos National Laboratory, March 1995.
- Alexander, John B. *Nonlethal Weapons as Force Options for the Army*. LA-UR-94-861. Los Alamos, NM: Los Alamos National Laboratory, March 1994.
- Alexander, John B. *Potential Non-Lethal Policy Issues*. LA-UR-92-3206. Los Alamos, NM: Los Alamos National Laboratory, 1992.

- Alexander, John B. *Rethinking National Security Requirements and the Need for Non-Lethal Weapons Options*. LA-UR-92-3773. Los Alamos, NM: Los Alamos National Laboratory, 1992.
- Alexander, Lexi R., and Julia L. Klare. *The Role of Non-Lethal Technologies in Operations Other Than War*. IDA-D-1868. Alexandria, VA: Institute for Defense Analyses, June 1996.
- Barry, John L., Michael W. Everett, and Allen G. Peck. *Nonlethal Military Means: New Leverage for a New Era*. National Security Program Policy Analysis Paper 94-01. Cambridge, MA: John F. Kennedy School of Government, Harvard University, 1994.
- Bunker, Robert J. *Nonlethal Weapons: Terms and References*. INSS Occasional Paper 15. United States Air Force Academy, CO: Institute for National Security Studies, July 1997.
- Bunker, Robert J., and T. Lindsay Moore. *Nonlethal Technology and Fourth Epoch War: A New Paradigm of Politico-Military Force*. The Land Warfare Papers No. 23. Arlington, VA: The Institute of Land Warfare, Association of the United States Army, February 1996.
- Casagrande, E.E. *Non-Lethal Weapons: Implications for the RAAF*. Fairbairn, Australia: Royal Australian Air Force Air Power Studies Centre, November 1995.
- Collins, John M. *Nonlethal Weapons and Operations: Potential Applications and Practical Limitations*. CRS 95-974S. Washington, DC: Congressional Research Service, September 1995.
- Kirkwood, David B. *Non-Lethal Weapons In Military Operations Other Than War*. Newport, RI: Naval War College, June 1996.
- Linder, James B. *Non-Lethal Weapons: Direct Employment Against Non-Combatants in Military Operations Other Than War*. Newport, RI: Naval War College, June 1995.
- Lynch, Gregory R. *The Role of Non-Lethal Weapons in "Special Wars"*. Master's thesis. Monterey, CA: Naval Postgraduate School, March 1995.
- Lyon, David H. *Less-Than-Lethal Weapons Development for Law Enforcement*. ARL-TR-51. Aberdeen Proving Ground, MD: US Army Research Laboratory, February 1993.
- Morehouse, David A. *A New Strategic Era: A Case for Nonlethal Weapons*. Master's thesis. Fort Leavenworth, KS: US Army Command and General Staff College, June 1992.
- Pope, Stephen R. *Nonlethality and Peace Operations*. Master's thesis. Fort Leavenworth, KS: Army Command and General Staff College, June 1995.
- Sapolsky, Harvey M. *Non-Lethal Warfare Technologies: Opportunities and Problems*. Cambridge, MA: Massachusetts Institute of Technology, March 1995
- Sizemore, Frank R. *Airpower, Non-Lethal Weapons and Future National Security Policy*. Maxwell AFB, AL: Air War College, April 1996.
- Swett, Charles F. *Strategic Assessment: Non-Lethal Weapons*. Washington, DC: Office of the Assistant Secretary of Defense (Special Operations and Low-Intensity Conflict), 9 November 1993.
- US Army Training and Doctrine Command Pamphlet 525-5. *Airland Operations: A Concept for the Evolution of Airland Battle for the Strategic Army of the 1990s and*

- Beyond*. Fort Monroe, VA: US Army Training and Doctrine Command, 1 August 1991.
- US Army Training and Doctrine Command Pamphlet 525-73. *Nonlethal Capabilities in Army Operations*. Fort Monroe, VA: US Army Training and Doctrine Command, 1 September 1996.
- US Department of Defense. *The Militarily Critical Technologies List*. Washington DC: Office of the Under Secretary of Defense for Acquisition and Technology, June 1996.
- US Department of Defense Directive 3000.3. *Policy for Non-Lethal Weapons*. Washington, DC: Office of the Assistant Secretary of Defense (Special Operations and Low Intensity Conflict), 9 July 1996.
- US Senate. *Improving the Prospects for Future International Peace Operations*. Washington, DC: Office of Technology Assessment, 1995.
- Walsh, Miguel D. *New Technology War and International Law*. Washington, DC: Office of the Under Secretary of Defense for Policy, June 1991.
- Walsh, Miguel D. *Non-Lethal and Discriminate Weapons and Technologies*. Washington, DC: Office of the Under Secretary of Defense for Policy, June 1991.
- Wiener, Malcolm H. *Non-Lethal Technologies Military Options and Implications: Report of an Independent Task Force*. New York, NY: Council on Foreign Relations, 1995.
- Wolfowitz, Paul., Under Secretary of Defense (Policy). Memorandum. To the Secretary of Defense and the Deputy Secretary of Defense. Subject: Do We Need a Nonlethal Defense Initiative? 30 March 1991.

### **Lectures And Addresses**

- Schattle, Duane. "Urban Warfare." Lecture. Air Command and Staff College, Maxwell Air Force Base, AL, 14 November 1997.
- Sheehan, John J. "Nonlethal Weapons – Let's Make Them Happen." Address. Nonlethal Defense Conference II, Washington, DC, 7 March 1996.

### **Periodicals**

- "Aerospace Laureates." *Aviation Week & Space Technology*, Vol. 140, No. 4 (24 January 1994): 19-20.
- Aftergood, Steven. "Monitoring Emerging Military Technologies." *Journal of the Federation of American Scientists*, Vol. 48, No. 1 (January-February 1995): 1-20.
- Aftergood, Steven. "The Soft-Kill Fallacy: The Idea of Non-Lethal Weapons Is Politically Attractive and Purposely Misleading." *Bulletin of the Atomic Scientists*, Vol. 50, No. 5 (September-October 1994): 40-45.
- "AIA Urges Eximbank Dual-Use Export Support" *Electronic News*, Vol. 40, No. 2021 (4 July 1994): 38.
- Alderman, Lesley. "In Your Face." *Money*, Vol. 22, No. 4 (April 1993): 15.
- Alexander, John B. "Non-Lethal Weapons Demand Expands as Missions Change." *National Defense*, Vol. 80, No. 516 (March 1996): 34-35.

- Alexander, John B. "Shoot, But Not to Kill: Non-Lethal Weapons Have Yet To Establish a Military Niche." *Jane's International Defense Review*, Vol. 29, No. 6 (June 1996): 77-78.
- Alexander, Lexi R., and Julia L. Klare. "Nonlethal Weapons: New Tools For Peace." *Issues in Science and Technology*, Vol. 12, No. 2 (Winter 1995): 67-74.
- Alterman, Stanley B. "On Kinder and Gentler Warfare." *Journal of Electronic Defense*, Vol. 15, No. 5 (May 1992): 32-49.
- Amouyal, Barbara, and Neil Munro. "Labs Rush Nonlethal Arms for Mideast Deployment." *Defense News*, Vol. 5, No. 45 (5 November 1990): 1-37.
- Amouyal, Barbara. "Use of Nonlethal Weapons May Alter Military Strategy." *Defense News*, Vol. 5, No. 47 (19 November 1990): 7.
- Anderberg, Bengt, Ove E. Bring, and Myron L. Wolbarsht. "Blinding Laser Weapons and International Humanitarian Law." *Journal of Peace Research*, Vol. 29, No. 3 (August 1992): 287-297.
- Andrews, Andrew E., and John B. Alexander. "Softer Response Required as Global Threats Change." *National Defense*, Vol. 78, No. 491 (October 1993): 23-24.
- Arbetter, Lisa. "A Pepper Pinch." *Security Management*, Vol. 38, No. 6 (June 1994): 14-15.
- "Army Prepares for Non-Lethal Combat." *Aviation Week & Space Technology*, Vol. 138, No. 21 (24 May 1993): 62.
- Asker, James R. "Hecker's Hackers." *Aviation Week & Space Technology*, Vol. 143, No. 5 (31 July 1995): 19.
- Atwal, Kay, and Mark Tapscott. "Non-Lethal Laser Rifle Testing at Fort Bragg." *Defense Electronics*, Vol. 25, No. 5 (April 1993): 18-19.
- Bailey, William C. "Less-Than-Lethal Weapons and Police-Citizen Killings in US Urban Areas." *Crime & Delinquency*, Vol. 42, No. 4 (October 1996): 535-552.
- Baker, David. "Wizard Wars & Air Power in the 21st Century--Part 2". *Air International*, Vol. 47, No. 4 (October 1994): 214-217.
- Barry, John, and Tom Morganthay. "Soon, Phasers on Stun." *Newsweek*, Vol. 123, No. 6 (7 February 1994): 24-26.
- Becker, Jon B., and Charles Heal. "Less-Than-Lethal Force: Doctrine Must Lead the Technology Rush." *Jane's International Defense Review*, Vol. 29, No. 2 (February 1996): 62-64.
- Bernstein, Amy. "Non-Lethal Weapon." *US News & World Report*, Vol. 110, No. 19 (20 May 1991): 17.
- Boyd, David G. "NIJ Enhances Weapons Technology." *Corrections Today*, Vol. 56, No. 2 (April 1994): 160-162.
- Briganti, Giovanni. "Lasers, Viruses, May Rule No-Fly Zone Sky." *Defense News*, Vol. 9, No. 5 (7-13 February 1994): 1-45.
- Bunker, Robert J. "Non Lethal Defense II Conference." *Military Review*, Vol. 76, No. 3 (May/June 1996): 90.
- Capaccio, Tony. "Are Vapor Bullets in Air Force Future?" *Defense Week*, Vol. 16, No. 2 (9 January 1995): 9.
- Capaccio, Tony. "U.S. Commanders State Uses for Non-Lethal Technology." *Defense Week*, Vol. 16, No. 4 (23 January 1995): 3-14.

- Capaccio, Tony, and Mary Greczyn. "Warfare in the Information Age." *Popular Science*, Vol. 249, No. 1 (July 1996): 52-57.
- Cassidy, Peter. "Guess Who's the Enemy." *Progressive*, Vol. 60, No. 1 (January 1994): 22-24.
- Cerio, Gregory, and Lucy Howard. "Bracing for the Worst." *Newsweek*, Vol. 121, No. 9 (1 March 1993): 6.
- Cohen, Warren. "When Lethal Force Won't Do." *US News & World Report*, Vol. 122, No. 24 (23 June 1997): 12.
- Cook, Joseph W. III, Maura T. McGowan, and David P. Fiely. "Non-Lethal Weapons, Technologies, Legalities, and Potential Policies." *Journal of Legal Studies*, Vol. 5 (1994/1995): 23-43.
- Cook, Nick. "Russia Leads in Pulse Weapons." *Jane's Defence Weekly*, Vol. 18, No. 15 (10 October 1992): 5.
- Cooper, Pat. "New Policy Tells leaders When to Use Nonlethal Weaponry." *Air Force Times*, Vol. 57, No. 1 (5 August 1996): 25.
- Cooper, Pat, and Barbara Opall. "Perry Plans To Launch Nonlethal Warfare Effort." *Defense News*, Vol. 9, No. 37 (19-25 September 1994): 6.
- Cooper, Pat. "U.S. Tests Nonlethal Weapon Policy in Somalia." *Defense News*, Vol. 10, No. 8 (27 February - 5 March 1995): 28.
- "Corps Leads Nonlethal Weapons Program." *Marine Corps Gazette*, Vol. 80, No. 5 (May 1996): 6.
- Coupland, Robin M. "Non-Lethal Weapons: Precipitating a New Arms Race." *British Medical Journal*, Vol. 314, No. 7100 (12 July 1997): 72.
- Covault, Craig. "NATO Eyes Protection for Military Transports." *Aviation Week & Space Technology*, Vol. 140, No. 11 (14 March 1994): 52-53.
- Davis, Malcolm. "How To Win Wars Without Actually Killing." *Asia-Pacific Defence Reporter*, Vol. 20, No. 10/11 (April-May 1994): 36-37.
- Debban, Alan. "Disabling Systems: War-Fighting Option for the Future." *Airpower Journal*, Vol. 7, No. 1 (Spring 1993): 44-50.
- "Defence Research Group Seminar on Non-Lethal Weapons." *NATO Review*, Vol. 44, No. 6 (November 1996): 18
- "DOD To Adopt Policy on Non-Lethal Weapons by Late 1994." *Defense Daily*, Vol. 183, No. 38 (25 May 1994): 301-302.
- "DOD Urged To Adopt Nonlethal Warfare Strategy." *Defense Electronics*, Vol. 24, No. 3 (March 1992): 22.
- Donnelly, John. "Task Force Endorses Hard Look at Non-Lethal Weapons." *Defense Week*, Vol. 16, No. 27 (3 July 1995): 9-13.
- "Draft Concept for Nonlethal Capabilities in Army Operations." *Inside The Army*, Vol. 7, No. 29 (31 July 1995): 14-18.
- Dunne, Sam. "New Munitions Less Lethal--And Smarter." *Navy Times*, Vol. 46, No. 36 (9 June 1997): 70
- Evancoe, Paul R. "Non-Lethal Alternatives Weighed by Law Officers." *National Defense*, Vol. 78, No. 498 (May-June 1994): 28-30.
- Evancoe, Paul R. "Non-Lethal Technologies Enhance Warrior's Punch." *National Defense*, Vol. 78, No. 493 (December 1993): 26-29.

Evancoe, Paul R. "Tomorrow's Weapons of Choice?" *Military Technology*, Vol. 18, No. 6 (June 1994): 68-71.

Evans, Rhys A. "Non-Lethal Weapons." *Marines*, Vol. 25, No. 7 (July 1996): 22-23.

"Examples of Nonlethal Weapons." *Defense Electronics*, Vol. 24, No. 3 (March 1992): 22.

Fischetti, Mark. "Less than Lethal Weapons". *Technology Review*, Vol. 98, No. 1 (January 1995): 14-15.

Flugel, Russell A. "Chemical Company Support to Light Infantry With Non-Lethal Weapons." *Infantry*, Vol. 86, No. 5 (September/October 1996): 13-14.

Fulghum, David A. "ALCMs Given Nonlethal Role." *Aviation Week & Space Technology*, Vol. 138, No. 8 (22 February 1993): 20-22.

Fulghum, David A. "EMP Weapons Lead Race for Non-Lethal Technology." *Aviation Week & Space Technology*, Vol. 138, No. 21 (24 May 1993): 61.

Fulghum, David A. "Secret Carbon-Fiber Warheads Blinded Iraqi Air Defenses." *Aviation Week & Space Technology*, Vol. 136, No. 17 (27 April 1992): 18-20.

Fulghum, David A. "U.S. Weighs Use of Nonlethal Weapons in Serbia If U.N. Decides To Fight." *Aviation Week & Space Technology*, Vol. 137, No. 7 (17 August 1992): 62-63.

Gallego, Fermin, and Mark Daly. "Laser Weapon in RN Service." *Jane's Defence Weekly*, Vol. 13, No. 2 (13 January 1990): 48.

Garwin, Richard. "Secret Weapons for the CNN Era." *Harper's Magazine*, Vol. 289, No. 1733 (October 1994): 17-18.

Gips, Michael. "Girth Control." *Security Management*, Vol. 39, No. 6 (June 1995): 11.

Goodman, Glenn W. Jr. "Rubber Bullets and Sticky Foam: Marine Corps Jump-Starts DOD's Nonlethal Weapons Program." *Armed Force Journal International*, Vol. 134, No.7 (February 1997): 26-28.

Goodman, Glenn W. Jr. "Upping the Nonlethal Ante: Pentagon Funds a New Weapons Initiative." *Armed Forces Journal International*, Vol. 131, No. 12 (July 1994): 13.

Gourley, Scott. "Less-Than-Lethal Weapons." *Jane's Defence Weekly*, Vol. 26, No. 3 (17 July 1996): 19-21.

Green, Bryan. "Alternatives to Anitpersonnel Mines." *Engineer*, Vol. 26, No. 4 (December 1996): 11-13.

Grudowski, Mike. "Not-So-Lethal Weapons." *New York Times Magazine*, Vol. 144, No. 50152 (13 August 1995): 40-41

Gunther, Judith, et al. "The Digital Warrior." *Popular Science*, Vol. 245, No. 3 (September 1994): 60-65.

Harris, Bill. "Less-Than-Lethal Munitions to Give Army Greater Flexibility." *Ordnance*, Vol. 9, No. 2 (May 1993): 22-23.

Head, Andy. "Laser Protection Concepts." *Military Technology*, Vol. 19, No. 5 (May 1995): 17-23.

Heal, Charles. "Nonlethal Technology and The Way We Think of Force." *Marine Corps Gazette*, Vol. 81, No. 1 (January 1997): 26-28.

Hecht, Jeff. "Lasers Designed To Blind." *New Scientist*, Vol. 135, No. 1833 (8 August 1992): 27-31.

- Hemenway, David, and Douglas Weil. "Phasers on Stun: The Case For Less Lethal Weapons." *Journal of Policy Analysis & Management*, Vol. 9, No. 1 (Winter 1990): 94-98.
- Herskovitz, Don. "Killing Them Softly." *Journal of Electronic Defense*, Vol. 16, No. 8 (August 1993): 41-42.
- Hogg, Ian V. "World of Insecurity Remains." *Jane's Defence Weekly*, Vol. 22, No. 19 (12 November 1994): 33-35.
- Holzer, Robert, and Neil Munro. "Microwave Weapon Stuns Iraqis." *Defense News*, Vol. 7, No. 15 (13-19 April 1992): 1-52.
- Horgan, John. "Bang! You're Alive." *Scientific American*, Vol. 270, No. 4 (April 1994): 22-24.
- Hunter, Roger C. "Disabling Systems for the Air Force." *Airpower Journal*, Vol. 8, No. 3 (Fall 1994): 43-47.
- Ijames, Steve. "Less Lethal Force." *The Tactical Edge*, Vol. 13, No. 3 (Summer 1995): 51-55.
- Kelly, John F. "Simulation Support for Nonlethal Weapons." *Marine Corps Gazette*, Vol. 81, No. 8 (August 1997): 17-19.
- Kiernan, Vincent. "Lasers Seen as an Aid to Law Enforcement." *Laser Focus World*, Vol. 30, No. 9 (September 1994): 52-53.
- Kiernan, Vincent. "War Over Weapons That Can't Kill." *New Scientist*, Vol. 140, No. 1903 (11 December 1993): 14-16.
- Kirkpatrick, Jeane. "Clinton's Somalia Withdrawal Sets Bad Military Precedent." *Human Events*, Vol. 51, No. 12 (31 March 1995): 10.
- Klaaren, Jonathon W., and Ronald S. Mitchell. "Nonlethal Technology and Airpower: A Winning Combination for Strategic Paralysis." *Airpower Journal*, Vol. 9, No. SE (Special Edition 1995): 42-51.
- Knoth, Arthur. "Disabling Technologies: A Critical Assessment." *International Defense Review*, Vol. 27, No. 7 (July 1994): 33-39.
- "Lab Assesses Nonlethal Experiment, Plans Joint Effort With Army." *Marine Corps Gazette*, Vol. 80, No. 10 (October 1996): 8.
- Langreth, Robert. "Nonlethal Weapons on the Battlefield." *Popular Science*, Vol. 245, No. 4 (October 1994): 69.
- Langreth, Robert. "Soft Kill." *Popular Science*, Vol. 245, No. 4 (October 1994): 66-68.
- Larson, Erik. "Nonlethal Weapons: Freeze, or I'll Fire My Sticky-Goo Gun." *The Wall Street Journal*, Vol. 224, No. 22 (2 August 1994): A1-A5.
- "Less Than Lethal." *International Defense Review*, Vol. 27, No. 7 (July 1994): 28-30.
- Lesser, Roger. "A DOD's New Years Resolution." *Defense Electronics*, Vol. 26, No. 1 (January 1994): 6.
- "Lethal Cut-Off." *Far Eastern Economic Review*, Vol. 157, No. 23 (9 June 1994): 12.
- Lewer, Nick. "Non-Lethal Weapons." *Medicine and War*, Vol. 11, No. 2 (April/June 1995): 78-90.
- Lewer, Nick. "Non-Lethal Weapons--A New Dimension." *Bulletin of Arms Control*, No. 23 (September 1996): 1-4.
- Linder, James B. "A Case for Employing Nonlethal Weapons." *Military Review*, Vol. 76, No. 5 (September/October 1996): 25-29.

- Lorenz, Frederick M. "Less Lethal Force in Operation United Shield." *Marine Corps Gazette*, Vol. 79, No. 9 (September 1995): 68-76.
- Lorenz, Frederick M. "Non-Lethal Force: The Slippery Slope to War?" *Parameters*, Vol. 26, No. 3 (Autumn 1996): 52-62.
- Luddy, John. "A Glimpse at Tomorrow." *Marines*, Vol. 26, No. 8 (August 1997): 16-21.
- Matthews, William. "Cops Put Defense Technology to Work." *Air Force Times*, Vol. 54, No. 36 (11 April 1994): 31.
- Merchant, Julie. "Threat Weapons and Weapons Technologies: Implications for Army SOF." *Special Warfare*, Vol. 7, No. 3 (July 1994): 32-39.
- Metz, Steven, and James Kievit. "The Siren Song of Technology and Conflict Short of War." *Special Warfare*, Vol. 9, No. 1 (January 1996): 2-9.
- Mollick, Ethan. "A Gentler War." *Harvard International Review*, Vol. 18, No. 4 (Fall 1996): 46-49.
- Morris, Chris, Janet Morris, and Thomas Baines. "Weapons of Mass Protection: Nonlethality, Information Warfare, and Airpower in the Age of Chaos." *Airpower Journal*, Vol. 9, No. 1 (Spring 1995): 15-29.
- Morris, Janet. "Enter Nonlethal Weaponry." *IEEE Spectrum*, Vol. 28, No. 9 (September 1991): 58.
- Morrison, David C. "Bang! Bang! You've Been Inhibited!" *National Journal*, Vol. 24, No. 13 (28 March 1992): 758-759.
- Morrison, David C. "Crime-Fighting 2001." *Government Executive*, Vol. 26, No. 10 (October 1994): 42-44.
- Morrison, David C. "War Without Death?" *National Journal*, Vol. 24, No. 45 (7 November 1992): 2589.
- Munro, Neil. "Army Tests Hand-Held Laser Rifles." *Defense News*, Vol. 5, No. 10 (5 March 1990): 4-28.
- Munro, Neil. "Services To Link Forces, Missile-Detection Satellites." *Defense News*, Vol. 8, No. 28 (19-25 July 1993): 36.
- Munro, Neil, and Barbara Opall. "Military Studies Unusual Arsenal." *Defense News*, Vol. 7, No. 42 (19-25 October 1992): 3-44.
- "NATO's Peek." *Aviation Week & Space Technology*, Vol. 140, No. 4 (24 January 1994): 33.
- Neven, Thomas E. "Nonlethal Weapons: Expanding Our Options." *Marine Corps Gazette*, Vol. 77, No. 12 (December 1993): 61-62.
- Nollinger, Mark. "Surrender or We'll Slime You." *Wired*, Vol. 3, No. 2 (February 1995): 90-100.
- "Non-Lethal Defense Exports Get Financing Approval." *Congressional Quarterly Weekly Report*, Vol. 52, No. 39 (8 October 1994): 2861.
- "Non-Lethal Devices Slice Across Science Spectrum." *National Defense*, Vol. 78, No. 491 (October 1993): 25.
- "Non-Lethal Hand Weapons." *Corrections Today*, Vol. 56, No. 4 (July 1994): 251-252.
- "Non-Lethal Weapons Aimed at Lawbreakers." *Design News*, Vol. 49, No. 15 (15 August 1994): 22.
- "Nonlethal Weapons Get a Boost." *Navy Times*, Vol. 43, No. 52 (3 October 1994): 34-38.
- "Nonlethal Weapons Give Peacekeepers Flexibility." *Aviation Week & Space Technology*, Vol. 137, No. 23 (7 December 1992): 50-51.

O'Connell, Edward P., and John T. Dillaplain. "Nonlethal Concepts: Implications for Air Force Intelligence." *Airpower Journal*, Vol. 8, No. 4 (Winter 1994): 26-33.

"One On One." *Defense News*, Vol. 9, No. 14 (11-17 April 1994): 30

Opall, Barbara. "DOD To Boost Nonlethal Options." *Defense News*, Vol. 9, No. 12 (28 March – 3 April 1994): 46.

Opall, Barbara. "Pentagon Forges Strategy on Non-Lethal Warfare." *Defense News*, Vol. 7, No. 7 (17-23 February 1992): 1-50.

Opall, Barbara. "Pentagon Units Jostle over Non-Lethal Initiative." *Defense News*, Vol. 7, No. 9 (2-8 March 1992): 6.

Opall, Barbara. "US Explores Russian Mind-Control Technology." *Defense News*, Vol. 8, No. 1 (11-17 January 1993): 4-29.

Pengelly, Rupert. "Wanted: A Watch on Non-Lethal Weapons." *International Defense Review*, Vol. 26, No. 4 (April 1994): 1.

"Pentagon Eyes Minimum Lethality Weapons." *Aerospace Daily*, Vol. 161, No. 46 (6 March 1992): 377.

Pexton, Patrick. "Policy Group Urges Research in "Less Lethal" Weaponry." *Army Times*, Vol. 55, No. 51 (17 July 1995): 10.

Pilant, Lois. "Less-Than-Lethal Devices." *The Police Chief*, Vol. 63, No. 9 (September 1996): 49-52.

"Policymakers to Take Back Seat to Users in Non-Lethal Defense." *Aerospace Daily*, Vol. 168, No. 32 (17 November 1993): 281.

Raphael, Michael. "Stop That Tank, But Don't Destroy It." *The Philadelphia Inquirer* (22 November 1997): D10

Ricks, Thomas E. "Nonlethal Arms: New Class of Weapons Could Incapacitate Foe Yet Limit Casualties." *The Wall Street Journal*, Vol. 221, No. 1 (4 January 1993): A1-A4.

Rosenberg, Barbara H. "Non-Lethal Weapons May Violate Treaties." *Bulletin of the Atomic Scientists*, Vol. 50, No. 5 (September/October 1994): 44-45.

Rosenberg, Eric. "Pentagon Memo Seeks To Better Explain Non- Lethal Weaponry." *Defense Week*, Vol. 16, No. 10 (6 March 1995): 5.

Rothstein, Linda. "More Roadblocks to Chemical Treaty?" *Bulletin of the Atomic Scientists*, Vol. 48, No. 5 (June 1992): 7.

Rothstein, Linda. "The Soft-Kill Solution." *Bulletin of the Atomic Scientists*, Vol. 50, No. 2 (March-April 1994): 4-6.

Runions, Bradley. "Less Lethal Weapons in Peace Operations." *Peacekeeping and International Relations*, Vol. 25, No. 1 (January/February 1996): 8-10.

Schmitt, Eric. "Now, to the Shores of Somalia With Beanbag Guns and Goo." *New York Times*, Vol. 144, No. 49973 (15 February 1995): A10.

Scott, William B. "Panel's Report Backs Nonlethal Weapons." *Aviation Week and Space Technology*, Vol. 143, No. 16 (16 October 1995): 50-51.

Seffers, George I., and Mark Walsh. "DOD Wants 6-Inch Plans To Fly Stealthy Operations." *Defense News*, Vol. 12, No. 45 (10-16 November 1997): 3.

Serwer, Andrew E. "Crime Stoppers Make a Killing." *Fortune*, Vol. 129, No. 7 (4 April 1994): 109-111.

"Simply...Making Peace." *New Internationalist*, No. 261 (November 1994): 24-25.

- Stanton, Martin N. "Nonlethal Weapons: Can Of Worms." *U.S. Naval Institute Proceedings*, Vol. 122, No. 11 (November 1996): 58-60.
- Stanton, Martin N. "What Price Sticky Foam?" *U.S. Naval Institute Proceedings*, Vol. 122, No. 1 (January 1996): 58-60.
- Starr, Barbara. "Non-Lethal Weapon Puzzle for US Army." *International Defense Review*, Vol. 26, No. 4 (April 1993): 319-320.
- Starr, Barbara. "Pentagon Maps Non-Lethal Options." *International Defense Review*, Vol. 27, No. 7 (July 1994): 30-32.
- Starr, Barbara. "USA Tries to Make War Less Lethal." *Jane's Defence Weekly*, Vol. 18, No. 18 (31 October 1992): 10.
- Stix, Gary. "Fighting Future Wars." *Scientific American*, Vol. 273, No. 6 (December 1995): 92-98.
- Sullivan, Martin J. "The Sword and the Shield: Electronic Warfare and the Marine Corps of 2015." *Marine Corps Gazette*, Vol. 80, No. 8 (August 1996): 33-38.
- Tapscott, Mark. "More Non-Lethal Weapon Bucks." *Defense and Security Electronics*, Vol. 27, No. 9 (September 1995): 7.
- Tapscott, Mark. "Reno Asks Aspin for Non-Lethal, Other DOD Weapons To Fight Crime." *Defense Electronics*, Vol. 25, No. 13 (December 1993): 8.
- Tapscott, Mark. "The Non-Lethal Weapons Battle." *Defence International*, Vol. 24, No. 4 (April 1993): 37.
- Tapscott, Mark, and Kay Atwal. "New Weapons That Win Without Killing on DOD's Horizon." *Defense Electronics*, Vol. 25, No. 2 (February 1993): 41-46.
- Teel, Gina. "Beware of High-Speed Beanbags." *Alberta Report*, Vol. 24, No. 17 (7 April 1997): 24-25.
- Tennenbaum, Abraham N., and Angela M. Moore. "Non-Lethal Weapons: Alternatives to Deadly Force." *Futurist*, Vol. 27, No. 5 (September-October 1993): 20-23.
- "The Sound of Waco." *Journal of Electronic Defense*, Vol. 16, No. 8 (August 1993): 42.
- Tigner, Brooks. "NATO Eyes Peacekeeping Tools." *Defense News*, Vol. 9, No. 27 (11-17 July 1994): 4-20.
- Tigner, Brooks. "NATO Panel to Steer Nonlethal Weapon Use." *Army Times*, Vol. 58, No. 11 (13 October 1997): 37.
- Tillman, Andrew. "Weapons for the 21<sup>st</sup> Century Soldier." *International Defense Review*, Vol. 27, No. 1 (January 1994): 34-38.
- "U.S. Group to Assess Military 'Revolution'." *Jane's Defence Weekly*, Vol. 21, No. 15 (16 April 1994): 20.
- "Virginia." *Marines*, Vol. 26, No. 9 (September 1997): 31.
- Walker, Sam. "Nonlethal Weapons, James Bond Style." *Christian Science Monitor*, Vol. 86, No. 198 (6 September 1994): 12.
- Walsh, Mark. "Hurtles Remain for Deploying US Nonlethal Weapons." *Army Times*, Vol. 58, No. 9 (29 September 1997): 26.
- Walsh, Mark. "Nonlethal Weapons Are Sent to Bosnia." *Air Force Times*, Vol. 58, No. 8 (29 September 1997): 27.
- "Warfighters Want Weapons That Disable But Don't Kill." *National Defense*, Vol. 81, No. 519 (July/August 1996): 24.
- Weinschenk, Andrew. "Boosters Again are Pushing for 'Office of Non-Lethality'." *Defense Week*, Vol. 14, No. 7 (16 February 1993): 2-6.

- Weinschenk, Andrew. "Non-Lethal Weapons Group Set to Form in March." *Defense Week*, Vol. 14, No. 46 (22 November 1993): 1-14.
- Wickens, Barbara. "Sticky 'Em Up." *Maclean's*, Vol. 108, No. 10 (6 March 1995): 11.
- Wilson, Jim, et al. "Knock 'Em Down." *Popular Mechanics*, Vol. 173, No. 5 (May 1996): 20.
- York, Ken. "Army Special Operations Command Pushes the Technology Envelope." *Armed Forces Journal International*, Vol. 132, No. 4 (November 1993): 28-33.
- Zaloga, Steven J. "Soviets Close to Deploying Battlefield Beam Weapons." *Armed Forces Journal International*, Vol. 127, No. 10 (May 1990): 28-30.
- Zinni, Anthony, and Gary Ohls. "No Premium on Killing." *U.S. Naval Institute Proceedings*, Vol. 122, No. 12 (December 1996): 26-28.

### **Video Recordings**

- The Learning Channel. *Non-Lethal Weapons*. Bethesda, MD: Discovery Communications, Inc. 55 minutes, 1997. Videocassette.