

AU/AWC/RWP103/97-04

AIR WAR COLLEGE

AIR UNIVERSITY

MILITARY TECHNOLOGY: HAS IT CHANGED THE RULES  
OF WARFARE?

by

Karl A. Kaszuba, Lt Col, USAF

A Research Report Submitted to the Faculty

In Fulfillment of the Curriculum Requirements

Advisor: Colonel Larry G. Carter

Maxwell Air Force Base, Alabama

April 1997

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 01-04-1997		2. REPORT TYPE Thesis		3. DATES COVERED (FROM - TO) xx-xx-1997 to xx-xx-1997	
4. TITLE AND SUBTITLE Military Technology: Has it Changed the Rules of Warfare? Unclassified				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Kaszuba, Karl A. ;				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME AND ADDRESS Air War College Maxwell AFB, AL36112				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME AND ADDRESS ,				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT APUBLIC RELEASE ,					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT This research report examines the impact technology has had upon the rules and laws which govern the conduct of warfare. Using examples from Operation DESERT STORM, such as stealth technology and precision guided munitions, as well as other technology which may or may not be fielded, such as blinding lasers, it discusses whether the standards for applying the laws of armed conflict have changed. More precisely, the author looks at the principles of collateral damage, military necessity, and discrimination. The author concludes that international standards have not changed and therefore do not require a nation-state which possesses such superior technology to use it. Finally, the author examines the area of information warfare and the insufficiency of law to guide the cyber warrior's actions.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:		17. LIMITATION OF ABSTRACT		18. NUMBER OF PAGES	
		Public Release		37	
19. NAME OF RESPONSIBLE PERSON Fenster, Lynn lfenster@dtic.mil					
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified	19b. TELEPHONE NUMBER International Area Code Area Code Telephone Number 703767-9007 DSN 427-9007		
				Standard Form 298 (Rev. 8-98) Prescribed by ANSI Std Z39.18	

## **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 ILLUSTRATIONS .....	iv
ABSTRACT.....	v
INTRODUCTION.....	1
THE LAW OF ARMED CONFLICT A FEW BASIC PRINCIPLES.....	2
Applicable Principles .....	3
Military Necessity.....	3
Proportionality .....	3
Discrimination .....	4
Humanity (Unnecessary Suffering) .....	4
Collateral Damage .....	5
THE MORALITY OF THE LAW OF ARMED CONFLICT .....	7
WEAPONS OF WAR: DESERT STORM AND BEYOND .....	10
Historical Perspective.....	12
Precision Guided Munitions.....	13
Landmines .....	14
Future Weapons, Current Issues.....	16
Blinding Laser Weapons .....	16
Acoustical Weapons .....	19
Sonic Bullets .....	20
Information Warfare.....	20
What Is “Information Warfare”? .....	22
Applying The Law Of Armed Conflict .....	23
CONCLUSIONS.....	28
BIBLIOGRAPHY .....	30

## *Illustrations*

*Page*

Figure1. Crazing Effect Of Laser Radiation In Glass .....	17
---	----

### *Abstract*

This research report examines the impact technology has had upon the rules and laws which govern the conduct of warfare. Using examples from Operation DESERT STORM, such as stealth technology and precision guided munitions, as well as other technology which may or may not be fielded, such as blinding lasers, it discusses whether the standards for applying the laws of armed conflict have changed. More precisely, the author looks at the principles of collateral damage, military necessity, and discrimination. The author concludes that international standards have not changed and therefore do not require a nation-state which possesses such superior technology to use it. Finally, the author examines the area of information warfare and the insufficiency of law to guide the cyber warrior's actions.

## Chapter 1

### Introduction

*I don't know what kind of weapons will be used in the third world war, assuming there will be a third world war. But I can tell you what the fourth world war will be fought with—stone clubs!*

—Albert Einstein

Operation DESERT STORM employed military technology not previously revealed. Stealth aircraft were able to penetrate enemy defenses and drop precision munitions which revealed an increased ability to limit collateral civilian casualties and property damage. The post-DESERT STORM analysis quite logically raised an issue among military legal scholars and students of the law of armed conflict about whether this technology changed the legal principles of collateral damage, discrimination, and military necessity. In other words, is there now an increased responsibility to use precision munitions to further limit civilian casualties when a country possesses that capability? By what standard do we then judge the enemy which does not have a similar capability? And what happens when we expend all our PGMs and Congress does not appropriate the money to purchase additional munitions? This paper examines those questions and concludes that the law does not require the use of PGMs and that there has been no shift in international standards requiring such use.

## Chapter 2

### The Law Of Armed Conflict A Few Basic Principles

*The presence of one of our regular civilian judge advocates in an army in the field would be a first-class nuisance.*

—W.T. Sherman: Memoirs, II, 1875

The law of armed conflict is a subset of international law.<sup>1</sup> In fact, it is one of the oldest branches of international law having its earliest roots as a result of Henri Dunant's witnessing of the horrors during the bloody battle of Solferino in June 1859.<sup>2</sup> The Hague Conventions of 1899 and 1907, as well as the Geneva Conventions of 1949 and the 1977 Protocols, were actually preceded in 1863 by the Lieber Code, the earliest U.S. Army regulation of armed conflicts.<sup>3</sup> In addition to these sources of the law of armed conflict, there is a broad body of customary law (legal principles generally recognized, though not codified, by a majority of nations as binding), as well as some laws resulting from treaties.<sup>4</sup> All nation-states are bound by customary law and by the terms of the treaties to which they are a signatory.<sup>5</sup>

“[The law of armed conflict's] *raison d'etre* is to establish minimum standards of human decency on the battlefield.”<sup>6</sup> Its principles are, in essence, a set of rules generally accepted by a majority of nation-states which embody humanity's standards for the conduct of warfare beyond which is considered excessive brutality unnecessary for the conduct of warfare. It is, in the final analysis, a set of moral standards.



## **Applicable Principles**

There are many general principles of the law of armed conflict, but we need concern ourselves in this paper with a discussion of five: military necessity, proportionality, discrimination, humanity (or unnecessary suffering), and collateral damage.

### **Military Necessity**

Military necessity is “the principle which justifies measures of regulated force not forbidden by international law which are indispensable for securing the prompt submission of the enemy, with the least possible expenditures of economic and human resources.”<sup>7</sup> Dr. Francis Lieber (drafter of what would later be called the Lieber Code referred to above) explained it in simpler terms which would be adopted by Gen Henry Halleck, General-in-Chief of the Union Armies, as General Orders No. 100 during the American Civil War:<sup>8</sup>

Military necessity, as understood by modern civilized nations, consists of those measures which are indispensable for securing the ends of war, and which are lawful according to the modern law and usage’s of war.

This principle is important to this discussion inasmuch as it stands for the proposition that, in warfare, a combatant must seek to injure, disable, destroy, or target only those persons and objects which are indispensable to accomplishing the desired end state of war.

### **Proportionality**

Proportionality is a well-recognized legal principle which places limitations on the use or method of employing certain weapons. It requires that injury or damage to legally protected interests (e.g., noncombatants and hospitals) not be disproportionate to the

legitimate military advantages to be gained by use of the weapon in the manner employed.<sup>9</sup> For instance, although the law of armed conflict does not require that a weapon's effects be strictly confined to military objectives, it does prohibit the use of weapons when their foreseeable effects of which will result in unlawful disproportionate injury to noncombatant civilians or damage to protected objects (e.g., Germany's use of the V-I rocket which was not reasonably capable of navigational control).

### **Discrimination**

Closely akin to the principle of proportionality is the principle of discrimination. The extent to which a weapon seeks as its target military rather than civilian objects generally depends upon the way in which the weapon is employed rather than on the design of the weapon itself. As stated above, the law of armed conflict does not restrict the use of weapons to destruction of military targets or injury of combatants only. However, indiscriminate weapons (those reasonably incapable of being controlled, through design or function, and thus directed at military targets) violate this principle because it is reasonably foreseeable that such weapons will cause unlawful excessive injury to protected individuals and objects.<sup>10</sup>

### **Humanity (Unnecessary Suffering)**

Long a tenet of customary international law, the prohibition against employing weapons and methods of warfare so as to cause superfluous injury or unnecessary suffering has been codified at least since the St. Petersburg Declaration of 1868.<sup>11</sup> At issue at that meeting of the International Military Commission in St. Petersburg was the use of certain projectiles tipped with light explosive or incendiary charges. When used

against human beings, the new projectile was no more effective in incapacitating the enemy than an ordinary rifle bullet; however, it caused far greater wounds and thus greatly aggravated victims' suffering greatly. The resulting declaration prohibiting the use of explosive projectiles under 400 grams was the first international treaty restricting the conduct of war.<sup>12</sup> This principle prohibiting means which cause unnecessary suffering was again codified in the 1899 and 1907 Hague Regulations.<sup>13</sup>

Clearly, all weapons cause suffering. What this principle stands for, however, is that combatants ought not to inflict injury upon their enemy beyond that which will disable them from further fighting or such that will make their death inevitable. Here one sees the hand-in-hand relationship with the principle of proportionality, as well, because it is a prohibition against either needless suffering or that which is disproportionate to the military advantages sought by employment of the weapon. So, for instance, weapons such as those containing glass projectiles are prohibited *per se* because their very nature makes them inherently difficult to detect, even through medical X-ray techniques. Such a factor is unnecessary to disabling that enemy soldier from fighting further.

### **Collateral Damage**

Often misunderstood, the principle of collateral damage does not restrict the use of weapons so as to prohibit the injury or death of noncombatants, or damage to protected objects such as national monuments, schools, and hospitals. Rather, customary international law recognizes the inevitability of collateral damage to, or destruction of, civilian objects in proximity to valid, lawful, military targets.<sup>14</sup> Moreover, Convention IX of the Second Hague Peace Conference in 1907, for the first time, codified that principle

permitting the attacking of targets wherever located. It also provided the only list of lawful targets contained in any law of war treaty.

### Notes

<sup>1</sup> James Leslie Brierly, *The Law of Nations: An Introduction to the International Law of Peace*, 6th ed. (Oxford: Clarendon Press, 1963), 25.

<sup>2</sup> Maj Dennis W. Shepherd, "A Bias-Free LOAC Approach Aimed at Instilling Battle Health in Our Airmen," *The Air Force Law Review* 37 (1994): 27-28.

<sup>3</sup> *Ibid.*, 28.

<sup>4</sup> Maj Ariane L. DeSaussure, "The Role of the Law of Armed Conflict During the Persian Gulf War: An Overview," *The Air Force Law Review* 37 (1994): 42.

<sup>5</sup> *Ibid.*

<sup>6</sup> Shepherd, 25.

<sup>7</sup> Air Force Pamphlet 110-31, *International Law—The Conduct of Armed Conflict and Air Operations* (November 1976) [hereinafter, AFP 110-31], para 1-5.

<sup>8</sup> W. Hays Parks, "Air War and the Law of War," *The Air Force Law Review* 32, no. 1 (1990): 7.

<sup>9</sup> AFP 110-31, para 6-3a.

<sup>10</sup> AFP 110-31, para 6-3c.

<sup>11</sup> AFP 110-31, para 6-3b.

<sup>12</sup> Majors Joseph W. Cook III, David P. Fiely, and Maura T. McGowan, "Nonlethal Weapons: Technologies, Legalities, and Potential Policies," *Airpower Journal* 9 (Special Edition, 1995): 79.

<sup>13</sup> AFP 110-31, para 6-3b.

<sup>14</sup> Parks, "Air War," 18.

## Chapter 3

### The Morality Of The Law Of Armed Conflict

*What is legal is not necessarily moral and what is moral is not always legal; but, particularly with regard to the law of war, the two are inextricably intertwined.*

—W. Hays Parks

Our modern law of armed conflict has its genesis in three sources: Roman law, the canon law of the Church, and the knights' "law of honor" (or code of chivalry).<sup>1</sup> Much of the canon law of war was constructed by Irish monks during the Dark Ages, a time when, much like today, Ireland was plagued by severe violence. Then, in 697 AD, the Medieval church began imposing severe ecclesiastical penalties for the killing of noncombatants, especially when those killed were women, children, and students.<sup>2</sup>

The code of chivalry bound together all nobles and knights, irrespective of nationality, under the cloak of law into an international order of knighthood. This law of honor determined under what conditions war could lawfully be waged, and forbade treachery and bad faith among knights. Because the law of honor was international in nature, a knight violating it could be tried and punished by any prince who could obtain custody of him, even the enemy sovereign.<sup>3</sup>

More recently, our twentieth century development of the law of armed conflict developed from what has come to be known as the "Just War Tradition" developed by

clergy, international lawyers, and philosophers from Western Europe.<sup>4</sup> Under that concept, there developed rules regarding the propriety of the resort to armed conflict (*jus ad bellum*), as well as for the protection of noncombatants at the hands of belligerents (*jus in bello*). Particularly in the case of the rules regarding *jus in bello*, these flow from customary concepts of humanity which, in turn, emanate from the ideologies of morality. That this is the case flows logically from the origins of the law of armed conflict explained at the beginning of this chapter.

These rules were relatively easy to apply, to follow, and generally to enforce up until about the eighteenth century because wars were generally fought by small armies on open battlefields generally devoid of civilians. To be sure, there were the sieges and bombardments of fortified towns, but the laws of armed conflict provided chivalrous rules to avoid unnecessary injury to civilians. For instance, in medieval Europe, besieged towns would hope to be able to wait out the siege while the besiegers would hope to take the town before a relief force arrived to attack them. A practice developed from the tradition of chivalry to avoid such situations of extended sieges whereby the town was usually offered an opportunity to surrender. The besieged commander was given three choices: surrender, fight, or set a time after which, if no relief arrived, the commander would be forced to surrender.<sup>5</sup> Failure to surrender forfeited prisoner of war status for the defending forces. Moreover, a failure to surrender promptly was considered to be a war crime and would subject the defending commander to punishment by the attacking forces.<sup>6</sup> Surrender in the face of overwhelming odds, however, was considered honorable and thus a means to protect the civilian occupants was provided.

From about the eighteenth century, however, war and the rules under which it was fought became more complicated. The modern nation-state system developed with professional armies. Then the Industrial Revolution provided technologies which would not only link nation-states together during times of peace, but provide lines of communication and, thus, valid military targets in and around civilian populations (e.g., the railroads during the American Civil War). New rules had to be developed to ameliorate the suffering of innocent civilian noncombatants. Those needs led ultimately to our present-day law of armed conflict, particularly in the Hague and Geneva Conventions, but all still based in the ideals of morality.<sup>7</sup>

### Notes

<sup>1</sup> Maj Burrus M. Carnahan, "Law of Armed Conflict: Aircrew Course," The Air Force Judge Advocate General School (Fall 1976), 1.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Parks, "Air War," 4.

<sup>5</sup> Lt Col H. Wayne Elliott, U.S. Army (Retired), "Open Cities and (UN)defended Places," *The Army Lawyer* (April 1995): 40.

<sup>6</sup> Ibid.

<sup>7</sup> In fact, the International Committee of the Red Cross has gone so far as to openly prefer the term "international humanitarian law" over the "law of armed conflict." See, "Land Mines: a Critical Examination of Existing Legal Instruments," *International Committee of the Red Cross*, 1 May 1995, n.p.; on-line, Internet, 1 February 1997, available from <http://www.icrc.org/icrcnews/312e.htm>. In light of today's military forces' increased involvement in peace operations which, despite the name, may well involve the use of force, this may be an improvement, much as the Air Force's change in terminology from "law of war" to "law of armed conflict" in recognition that a declared war is unlikely, yet our armed forces continue to be involved in armed conflicts to which the same rules apply.

## Chapter 4

### Weapons Of War: Desert Storm And Beyond

*More than any other war in the history of the United States, the Persian Gulf War was a lawyers' war.*

—JA Wartime Planning: A Prime

In January 1991, a little more than six years ago, citizens of the world were glued to their television sets as a war unfolded before their very eyes. They listened intently as frightened Cable News Network (CNN) reporters described, in trembling and excited voices, the explosions emanating from bombs dropped precisely on military targets within the crowded city of Baghdad by virtually unseen stealth fighters and stealthy cruise missiles. These fighters and cruise missiles negotiated the tightly placed and abundantly arrayed Iraqi anti-aircraft defense systems with impunity. Clearly, the coalition forces, particularly the American portion of that coalition, had the technological edge.

Indeed, one could argue that technology contributed more than any other single factor to the success of Operation DESERT STORM. It was this marvelous technology which allowed the coalition forces, in the very opening of the battle, to fly 114 Tomahawk cruise missiles slamming into power plants, military headquarters, and missile sites in crowded downtown Baghdad. It also allowed crews of F117 stealth fighters, as well as F111 fighter/bombers, to thread laser and optically guided bombs through air vents and doorways.<sup>1</sup> Fewer munitions were required to accomplish the same task as before. For



instance, a target which would have required approximately 4,500 B-17 sorties and 9,000 bombs to ensure destruction during World War II only requires one F-117 sortie and one bomb today.<sup>2</sup> Moreover, this technological superiority not only allowed the coalition to gain absolute air superiority rapidly, it insured maximum compliance with the law of armed conflict and, consequently, minimal collateral damage or injuries to noncombatant Iraqi citizens.

The services, quite naturally, continue to push toward modernization of the tools of their trade. The Air Force, for instance, will fly an engineering and manufacturing development model of its next-generation fighter, the F-22, next year with operational capability expected in 2004.<sup>3</sup> Later, the services plan to field the Joint Strike Fighter to replace Air Force F-16s, Navy A-6Es, and Marine AV-8Bs. Meanwhile, the Air Force stood up its first squadron to fly what may become the combat aircraft of the future, uninhabited combat aerial vehicles (UCAVs).<sup>4</sup>

The precision guided munitions (PGMs) which amazed the citizenry with their accuracy during the Gulf War approach a near-zero-miss-distance accuracy with GPs guidance systems being added and, perhaps, allow the use of smaller munitions. Near-term systems include munitions capable of “counting floors” as they penetrate hardened buildings before detonation, and smart weapons which will be able to recognize, identify, and sort targets as their sensors guide them, permitting accuracy’s measured in centimeters rather than meters.<sup>5</sup> Our armed forces, as the Army develops its digital battlefield and “system soldier,” for instance, may also find themselves fighting its battles with directed energy weapons such as lasers and masers.<sup>6</sup> Military researchers are also

developing “information munitions” to attack, destroy, confuse, or fool information systems, including enemy command, control, and computer systems.<sup>7</sup>

With the precision such weapons bring to the warfighter, they also bring the increased capability to minimize injuries to noncombatants and collateral damage to non-military property. Does this imply that a belligerent possessing such capabilities must, to comply with the law of armed conflict, necessarily use such weapons in areas populated by noncombatants?<sup>8</sup> What standard does one apply under the law of armed conflict when one belligerent possesses such technology but the other does not? In other words, do two differing standards result? And, what happens when the technologically superior belligerent expends all its precision weapons stores before war’s end? In this chapter, I will apply the principles of the law of armed conflict discussed earlier to such questions as well as their application to some future weapons systems.

## **Historical Perspective**

The introduction of new military technology onto the battlefield is nothing new. Soldiers during the American Civil War used, for the first time, rifled barrels on their firearms to achieved greater accuracy and distance. Yet neither side was required to lay down its smooth-bore muskets in favor of the new rifles.

World War II saw the first use of radar navigation and the coveted “Norden” and “Sperry” bombsights.<sup>9</sup> The Korean War saw the use of jet fighters for the first time in war.<sup>10</sup> Theoretically, these technological innovations all potentially decreased the chances for collateral damage and greater discrimination between civilian and military objects, yet few would seriously argue that the principles set forth under the law of armed

conflict *required* their use over more conventional methods of navigation and targeting. Why not?

## **Precision Guided Munitions**

Whether one belligerent *must* use precision guided munitions rather than so-called “dumb” bombs is situationally dependent. Each such targeting situation must be analyzed first from an operational need, then under the law of armed conflict.

Assuming for the sake of argument the United States wishes to bomb a military headquarters building in a crowded and heavily defended city, and assuming that operationally we want to use unguided bombs to do so, one must then analyze the proposed targeting under the principles outlined in Chapter 2 above. Are there noncombatants in or around that building? How many are likely to be killed or injured as a result of our bombing? Would fewer casualties result from the use of a precision guided munitions? If so, how many fewer? What is the military advantage to be gained when compared with the injury or damage to be inflicted on protected persons and places?

On the “operator” side of the coin, one must ask, among others, the following questions: Do we even have the precision guided munitions available? In sufficient quantities? (Military commanders may not employ expensive precision guided munitions which are available in limited quantities early in a conflict, choosing instead to reserve them to ensure their availability later during more optimal employment conditions). Do we have the aircraft capable of delivering them? Will the weather allow their employment? And, concomitantly, what is the urgency for the targets’ destruction?

Notice that this is a balancing test. The law of armed conflict requires belligerents to *minimize* collateral noncombatant injuries and damages; it does not *prohibit* all collateral damage or injuries. This is a test of reasonableness. There is likewise no statement of the law always requiring the use of the best technology available to a belligerent.<sup>11</sup>

Nor does the warfighting commander need to check his or her common sense at the door. Commanders must be concerned not only with making decisions that make sense operationally (e.g., will weather considerations and enemy air defenses permit delivery of precision guided munitions?) and legally, they must also be concerned with a course of action that will be supported by the American public (and with the so-called “CNN effect”).

To the extent, then, that the unguided bombs can, under the circumstances, *reasonably* discriminate between military objectives and protected persons and places, and the military advantage to be gained (including the important timing of the destruction of the target) outweighs the injuries or damage to civilian persons or places, they may be used in lieu of precision guided munitions.

## **Landmines**

One of the most controversial weapons issues today involves ICRC-sponsored additional restrictions on the use of landmines. Unlike most munitions, landmines continue to pose a significant threat to the civilian population long after active hostilities end. The 1995 Vienna session failed to reach agreement on a new protocol.<sup>12</sup>

The current protocol (Protocol II) was adopted in October 1980 at the United Nations Conference on Certain Conventional Weapons (CCW). Among other things, it requires

belligerents to record the location of all preplanned minefields and to reveal the location of any minefields after hostilities have ceased. Remotely delivered mines (e.g., those dispersed by aircraft, rocket, artillery, etc.), may only be used within an “area which is itself a military objective or which contains military objectives.” Furthermore, such mines must be fitted with “neutralizing mechanisms” which will either detonate the mines at some later time, or otherwise render them harmless.<sup>13</sup>

Not surprisingly, the ICRC argues that landmines are unlawful *per se* as indiscriminate weapons and produce unnecessary suffering.<sup>14</sup> The majority of states disagreed, however, at the most recent meeting. They argue that it is not the effect that these weapons have, but rather how they are used.<sup>15</sup> Instead, these states argue, the landmines are weapons which are aimed at military objectives. Accordingly, if warnings are given (as the law generally requires before, for instance, bombing densely populated areas), the landmines could not be considered indiscriminate.<sup>16</sup> Such warnings could include leaflet drops or guarding, fencing, or otherwise clearly marking minefields.

As is so often the case, however, neither side of the argument is completely correct, nor completely wrong. Certainly, if the minefields are clearly marked, the law has been satisfied. But what of the time between remote delivery of the mines and the time the minefield is adequately marked? What happens after hostilities end? Should not the belligerent who laid the minefield be required to clear it so as to avoid unintentional injuries years later to civilians? Nation-states must get beyond the concern over increased material cost of self-destructing mines and concern themselves rather with the human cost. They must go beyond the letter of the law of armed conflict and concern themselves anew with the original spirit of that law—that of its moral underpinnings.<sup>17</sup> Perhaps these

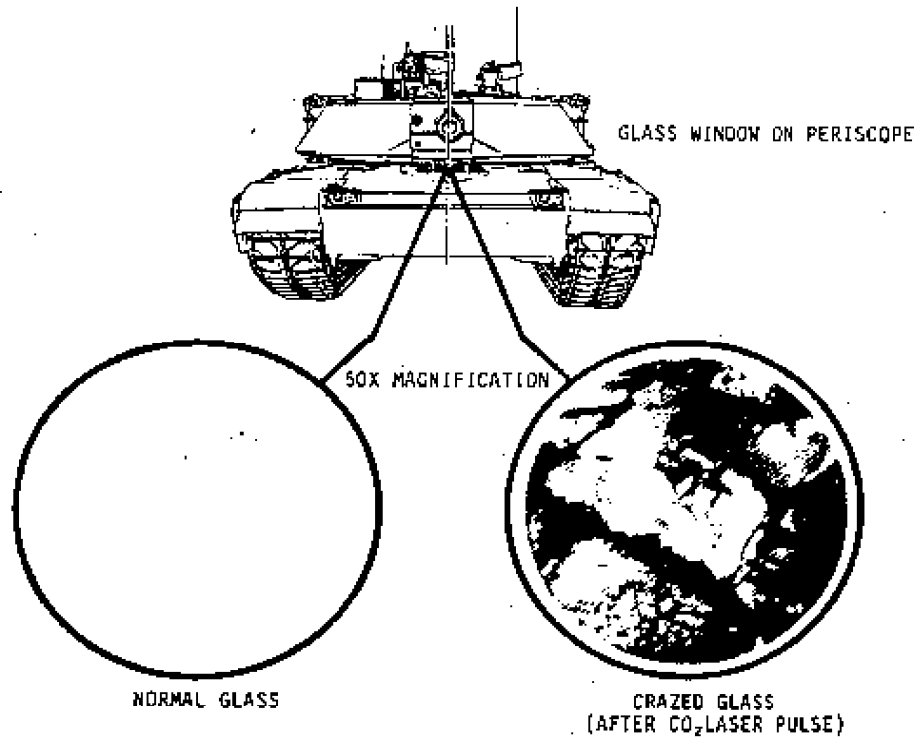
issues over landmines argue strongest for the change in terminology from the “law of armed conflict” to “international humanitarian law” so that it is clear that such moral, if not legal, obligations may continue beyond the termination of “armed conflict.”

## **Future Weapons, Current Issues**

Before any new weapon system may be employed, Department of Defense and Air Force Instructions require that The Judge Advocate General render an opinion concerning its compliance with the law of armed conflict.<sup>18</sup> With the end of the Cold War and the fall of our traditional enemy, the Soviet Union, the armed forces find themselves carrying out new missions. Along with other changes, this also brings with it a need to develop new technology to counter current threats such as terrorism and peacekeeping missions. Accordingly, new weapon technologies often bring new concerns when analyzing the new weapon systems under the law of armed conflict. Some examples follow.

### **Blinding Laser Weapons**

Lasers have been used on the battlefield for quite some time in range finding, as target designators, and as a weapon to damage or incapacitate an enemy’s optical systems on, for instance, tanks. For those purposes, lasers are clearly a lawful weapon system, and secondary or incidental injuries to enemy soldiers, including blindness, using targeted optical systems, for instance, would clearly not constitute a violation of the law of armed conflict.<sup>19</sup> The figure below depicts what happens to the glass window of a tank’s vision block when exposed to the type of high energy laser radiation under discussion here:



**Figure1. Crazing Effect Of Laser Radiation In Glass**

The crazing depicted above results when the optical glass absorbs a high degree of laser energy on its surface. The resulting heat build-up causes a rapid melting and rehardening of the glass surface. This results in a frosted effect which renders the tank's vision block virtually useless. Now imagine the same effects on a human eye's cornea and retina.

In 1988, The Judge Advocate General of the Army rendered an opinion regarding the intentional use of laser weapons to blind an enemy.<sup>20</sup> He concluded that such use of laser weapons does not violate an international law, including the law of armed conflict.<sup>21</sup> Essentially, the opinion argues that many battlefield wounds lead to permanent blindness; that potential laser injuries can be minimized with protective goggles and other defensive measures; that in any event such injuries do not constitute "unnecessary suffering," the

permanency of the blindness notwithstanding; and that it would be inconsistent to hold that a soldier could be legally blinded secondary to the lawful use of an anti-sensor laser, but could not be individually targeted.<sup>22</sup>

The International Committee of the Red Cross (ICRC) disagreed and campaigned for a ban on the use of lasers for the intentional purpose of blinding as a method of warfare. The ICRC argued that intentional blinding would cause “unnecessary suffering” in that it would likely be permanent (i.e., not reversible after the conflict ends); that because 80-90 percent of our sensory perception derives from sight, injured persons would be virtually unable to work or to function independently; and that severe psychological depression would usually ensue.<sup>23</sup>

The legal opinion of The Judge Advocate General of the U.S. Army notwithstanding, on 29 August 1995, the Secretary of Defense issued a policy statement supporting the ban on intentional use of battlefield lasers as an anti-personnel weapon to cause blindness.<sup>24</sup> Subsequently on 13 October 1995, following three weeks of negotiations, the Vienna session of the Review Conference of the 1980 United Nations Convention on Certain Conventional Weapons (CCW), adopted a protocol,<sup>25</sup> largely drafted by the United States, in concert with the Secretary’s policy statement. The protocol prohibits the use and the transfer of laser weapons specifically designed to cause permanent blindness,<sup>26</sup> but does not prohibit laser research, development, or production of such weapons.<sup>27</sup> It is also interesting to note that the State Parties that negotiated and adopted, by consensus, this protocol did not conclude that lasers used intentionally to blind an enemy combatant cause “unnecessary suffering.”<sup>28</sup> The end result, however, is that if the United Nations General Assembly approves this protocol and it is eventually ratified by the member



states, none of the signatories to this protocol may lawfully employ anti-personnel lasers which have as their intended purpose the blinding of enemy combatants.

### **Acoustical Weapons**

British troops use high intensity sound waves, generated at a frequency below the pain threshold, as a riot control method in Northern Ireland.<sup>29</sup> The generated sound causes the inner ear to vibrate sufficiently to cause discomfort and vertigo. At certain lower frequencies, high intensity sound may resonate other inner organs causing a number of physiological results, including death.<sup>30</sup>

At the levels used by the British (i.e., below the pain threshold), even when used on the battlefield, legal concerns under the law of armed conflict are limited to issues involving the method of employment (most specifically, that of military necessity and discrimination). If used at higher intensity levels such that the sound waves cause pain and physiological effects, attention then turns to the principle of unnecessary suffering. Here the argument is much the same as pertains to the use of blinding lasers. Permanent deafness and disorientation on the battlefield as the result of bombardment and directed fires have always affected soldiers. As The Judge Advocate General of the Army opined regarding blinding lasers, high intensity acoustical weapons would create no greater suffering than more conventional weapons. On the battlefield, lower intensity sound such as that used by the British in riot control is unlikely to produce an effect that will disable enemy combatants from further fighting for the duration of the war.

The issue of discrimination remains, however. Certainly on the open battlefield where one would not expect to find many noncombatants, high intensity acoustical weapons would not violate any principle of the law of armed conflict. In more urban

settings, however, perhaps such as those in Bosnia, commanders employing such weapons at lethal intensities would necessarily have to ensure that these were directionally precise and limited enough to reasonably discriminate between targeted belligerents and noncombatant civilians.

### **Sonic Bullets**

Sonic “bullets” are bursts of sonic energy that are propelled toward enemy personnel or materiel. Lest the reader believe this to be science fiction, the Russians reportedly have developed a portable device which can propel a 10-hertz sonic burst the size of a baseball hundreds of yards.<sup>31</sup> Because the sonic energy is a form of *directed* energy, the soldier employing such a weapon is able to discriminate targets to the same extent as the conventional firearms used today. Accordingly, such a weapon does not appear to violate any principle of the law of armed conflict unless, as with conventional firearms, it is employed against unlawful targets.

### **Information Warfare**

*When I first heard about bringing in the lawyers, I thought we had really slipped off the deep end, one more time....The more I thought about bringing lawyers into the equation, the more I realized we need their expertise. Because exploiting the information spectrum will readily cross international borders, we must be cognizant of what the law allows and will not allow. When do you begin information warfare in the spin-up to a conflict? When do you begin to go out there and intrude in somebody's banking system? When do you begin to get into somebody's telecommunications system? These are all very difficult questions. Clearly, information warfare is not something that is focused solely on the confines of a constrained battle area. While we will fight in a theater, information warfare will force us to be engaged worldwide. And so, we must have some good advice as we pursue this capability.*

—General Ronald R. Fogleman, 16 May 1995

A new form of “warfare” is on the horizon and some would even suggest that it is already occurring.<sup>32</sup> The unseen “enemy” is hackers who break into military or corporate computer systems, steal, then sell, secrets to others; or manipulate data systems or electrical power grids and telephone systems; and those who develop and distribute computer viruses which destroy computer systems such as banking networks. So serious is the threat, that Winn Schwartau, one of the leading experts on information security, warns that we face “an electronic Pearl Harbor waiting to happen” and that “tomorrow’s terrorist may be able to do more damage with a keyboard than with a bomb.”<sup>33</sup> The Pentagon’s own computer security technicians succeeded in penetrating more than 85 percent of the DOD systems they attacked and, worse yet, over 95 percent of those successful penetrations went undetected.<sup>34</sup> And former Director of the Central Intelligence Agency Dr. John M. Deutch testified before Congress that:

My greatest concern is that hackers, terrorist organizations, or other nations might use information warfare techniques as part of a coordinated attack designed to seriously disrupt: infrastructures such as electric power distribution, air traffic control, or financial sectors; international commerce; and deployed military forces in time of peace or war.<sup>35</sup>

What laws apply to this information “war”? Can we even define what “information warfare” is? And if this is warfare, does the law of armed conflict apply? A full and complete answer to these questions is beyond the scope of this paper. Indeed, given an absence of legal precedents, most answers are little more than educated theories. What follows is rather an attempt to raise some of the issues involved and to thereby stimulate much-needed and serious academic thought about how best to deal with such issues.

## **What Is “Information Warfare”?**

What the law proscribes in this area, in fact which laws, if any, apply, largely depends initially upon how one defines the term “information warfare.” Unfortunately, despite the term’s common usage today, the definitions are many and varied. Joint Publication 3-13.1 defines Information Warfare as:

Actions taken to achieve information superiority by affecting adversary information, information-based processes, information systems, and computer-based networks while defending one’s own information, information-based processes, information systems, and computer-based networks.

The Secretary of the Air Force and the Chief of Staff of the U.S. Air Force, however, offer the following definition:

Any action to deny, exploit, corrupt, or destroy the enemy’s information and its functions; protecting ourselves against those actions; and exploiting our own military information functions.<sup>36</sup>

To be sure, the terms may cover a broad spectrum of tactics, techniques, and procedures from passive firewalls in computer systems, to psychological operations, to active offensive actions. The discussion which follows, however, will be limited to a discussion of issues involved in active offensive operations using information and information systems as its “weapons.”

- Examples of Offensive Information Warfare Legal Issues
- Does the law of armed conflict apply to state-sponsored intentional information systems corruption when no conventional weapons have been used? In other words, is this an “armed conflict”?
- If the United States, during time of international conflict, shuts off or substantially degrades its global positioning system to prevent its use by an enemy state and commercial aircraft which rely upon that system for navigation crash as a result, what is our government’s liability and responsibility?
- More and more commercial communications capabilities, some in use or soon to be used by the U.S. armed forces as it “privatizes” and “outsources,” are owned by multinational consortiums, including China. What, if any, rights does the United

States possess should it wish to prevent an enemy who owns a share in that consortium from using its own satellite system?

- What right does one belligerent have to attack, via cyberspace, certain information systems of the other belligerent such as computerized medical records or financial systems? What of the effect that has upon noncombatants?
- What of psychological operations where an enemy leader's voice and electronic image are electronically altered to appear to issue orders to his nation's soldiers to immediately surrender?
- What are the legal implications of using Internet web sites which are available to the general public around the world to spread misinformation to the enemy?
- Because "cyberspace" is transnational in nature, when one launches an electronic attack against another nation-state, the "cyber bomb" will likely travel over networks through a number of "neutral" states. What rights do these neutral states have? Has their neutrality been violated? And, because the attack traveled through their sovereignty, do they have the international right to prosecute such intrusions as violations of their criminal laws?

Accordingly, the law as it stands today simply is inadequate to answer all of the issues raised above. Domestically, Congress must become immediately and actively engaged. Internationally, such issues not capable of resolution under the law of armed conflict and treaty law, should be addressed by an international body such as the United Nations' International Law Commission whose recommendations should, in turn, be resolved by the General Assembly.

### **Applying The Law Of Armed Conflict**

The first issue above, once again, suggests the argument either that the terminology "law of *armed* conflict" should be changed or that it does not apply to the situation posited. Perhaps it is time to recognize that both are true. If the principles are, as this paper argues, grounded in the principles of morality, redefining them as the "international law of humanity" could allow their application even absent an armed conflict. The principles of humanity (unnecessary suffering), proportionality, discrimination, and

collateral damage should still apply to an aggressive act of “information warfare” by one nation-state against another.<sup>37</sup>

It has long been recognized that power grids and communications systems, including telephone systems, are valid military objectives in time of armed conflict even though their disruption may significantly affect the civilian populace. Here, application of the principle of military necessity and proportionality outweigh the adverse affects upon the noncombatants even if many will perish as a result of the loss of electrical heat or unsanitary water resulting from the loss of the electricity, for instance. Similarly, during times of armed conflict, destroying or disrupting power grids and communications systems by means of a “virtual cyber bomb” yields the same answer.

The solution is not as clear when one posits the situation in which a belligerent brings down a country’s stock market, banking system, air traffic control system, or emergency response system. Now one must also weigh in with an analysis using the principles of proportionality and discrimination. Is the collateral damage too great when weighed against the military necessity? Certainly one could argue that destroying all banking and stock market records and thereby leaving a state’s entire civilian population destitute may not be proportionate to the military advantage gained.

Major Richard Aldrich raises yet another issue when he asks, “..who is a ‘combatant’ in the information age?”<sup>38</sup> If a 10-year-old computer progeny, from his bedroom, decides for patriotic reasons to hack into and disrupt the enemy’s military or governmental computer system, has he thereby forfeited his noncombatant protection and now become a valid target for attack? Under a strict reading of the law of armed conflict, maybe. After all, had that same 10-year-old pointed a firearm at an enemy soldier, the

boy would forfeit his protection as a noncombatant because he “took up arms.” The soldier would certainly have the right of self defense, but even absent an immediate threat to his life, the boy still forfeited his protection. However, one must still question whether the boy has “taken up arms” when he uses the computer and the Internet as his weapons, even though he intends to cause as much, or more, injury where, for instance, he erases all computer medical records so that soldiers are treated with medications that kill them because they contraindicate with others the soldier has taken, a fact recorded in his medical records. What if, instead, he alters rather than erases (i.e., sabotage?) only military members’ medical records of soldiers’ blood type information such that the soldiers die as a result of receiving the wrong type blood during blood transfusions? What if, instead of the 10-year-old, an enemy cyber-warrior changes those blood type records? Does that cross the line?

Finally in this section raising yet unanswered legal questions, in whom does the authority to execute information warfare offensive operations lie within our own country? With whom should it lie? The President? The Secretary of Defense? The warfighting theater CINC? Or, given the global nature of information warfare, should we establish a specified CINC for information warfare? Of course, though this certainly has legal implications and effects once the decision is made, it is first a matter of policy and strategy. The problem is that, today, we seem not to have a clear answer to that question. We need to define that authority clearly and to determine under what circumstances it should, or at least may, be exercised.

## Notes

<sup>1</sup> Stephen Budiansky, *et al.*, “Air Power’s Ultimate Test,” *U.S. News & World Report* 110, no. 3 (January 28, 1991): 28-32.

<sup>2</sup> Douglas Pasternak, “Technology’s Other Payoff,” *U.S. News & World Report* 110, no. 5 (February 11, 1991): 27.

<sup>3</sup> Benjamin S. Lambeth, “Technology and Air War,” *AIR FORCE Magazine* 79, no. 11 (November 1996): 50.

<sup>4</sup> *Ibid.*

<sup>5</sup> *Ibid.*

<sup>6</sup> Lasers emit concentrated light energy at a single frequency. Similarly, masers emit concentrated microwave energy.

<sup>7</sup> *Ibid.*, 51.

<sup>8</sup> Clearly this argument does not suggest that a belligerent cannot still use, for instance, 2000-pound dumb bombs on purely military targets such as the Iraqi Republican Guard tanks in the desert sands along the Saudi Arabian and Kuwaiti borders.

<sup>9</sup> Interestingly, though the improved bombsights increased accuracy, of all bombs dropped during World War II, only about 20 percent fell within 305 meters of the aiming point. See, “Bombsight,” *Microsoft Encarta ‘95*, CD-ROM, Microsoft Corporation, 1994.

<sup>10</sup> *Ibid.*

<sup>11</sup> Maj Gen Walter D. Reed, The Judge Advocate General of the U.S. Air Force, “The Impact of Protocol I on Air and Naval Bombardment,” address to the Conference on Humanitarian Laws of Armed Conflict, 26 November 1979.

<sup>12</sup> ICRC, “Vienna Review Conference.”

<sup>13</sup> Louise Doswald-Beck and Peter Herby, “Land Mines: A Critical Examination of Existing Legal Instruments,” *International Committee of the Red Cross*, 1 May 1995, n.p.; on-line, Internet, 1 February 1997, available from <http://www.icrc.org/icrcnews/312e.htm>.

<sup>14</sup> *Ibid.*

<sup>15</sup> *Ibid.*

<sup>16</sup> *Ibid.*

<sup>17</sup> More specifically, those mores generally accepted by the majority of nation-states.

<sup>18</sup> Department of Defense Instruction 5500.15, *Review of Legality of Weapons Under International Law* (16 October 1974); Air Force Policy Directive 51-4, *Compliance With the Law of Armed Conflict* (26 April 1993), para 1.4; and Air Force Instruction 51-402, *Weapons Review* (13 May 1994), para 1.1.

<sup>19</sup> Maj Gen Hugh R. Overholt, “Memorandum of Law: The Use of Lasers as Antipersonnel Weapons,” *The Army Lawyer* (November 1988): 3.

<sup>20</sup> The International Committee of the Red Cross (ICRC) claims that weapons under development in 1994 included vehicle-mounted lasers which could scan the battlefield with a lower-power laser and once it is reflected back from the glass in certain optics, it would fire a high-power burst. Its concern was that this would also subject soldiers looking through binoculars to the high-power burst. Additionally, the ICRC claims that an anti-personnel laser small enough to clip onto a normal rifle was under development.



## Notes

“Blinding laser weapons: questions and answers,” *International Committee of the Red Cross*, 16 November 1994, n.p.; on-line, Internet, 1 February 1997, available from <http://www.icrc.org/icrcnews/4002.htm>.

<sup>21</sup> Overholt, 3-4.

<sup>22</sup> *Ibid.*, 4.

<sup>23</sup> ICRC, “Blinding laser weapons.” Interestingly, the ICRC also argues that anti-personnel lasers are indiscriminate weapons, and therefore unlawful as such, because “there is nothing inherent in laser weapons which ensures their discriminate use or renders civilians safe from their effects.” Because the same could be said for any weapon, this argument will not be addressed further herein.

<sup>24</sup> W. Hays Parks, Special Assistant for Law of War Matters, International and Operational Law Division, Office of The Judge Advocate General of the U.S. Army, to Maj Kilgallin, TMO, letter, subject: Effect of Laser Protocol on U.S. Army Programs, 1 November 1995, 1.

<sup>25</sup> “The Vienna Review Conference: success on blinding laser weapons but deadlock on landmines,” *International Committee of the Red Cross*, 1 November 1995, n.p.; on-line, Internet, 1 February 1997, available from <http://www.icrc.org/icrcnews/26ea.htm>.

<sup>26</sup> *Ibid.*

<sup>27</sup> W. Hays Parks letter, “Effects of Laser Protocol on U.S. Army Programs” letter, 1 November 1995, 2.

<sup>28</sup> *Ibid.*

<sup>29</sup> Cook, Fiely, and McGowan, “Nonlethal Weapons,” 85.

<sup>30</sup> *Ibid.*

<sup>31</sup> *Ibid.*, 86.

<sup>32</sup> Winn Schwartau, *Information Warfare: Chaos on the Electronic Superhighway* (New York: Thunder’s Mouth Press, 1994), 11.

<sup>33</sup> *Ibid.*, 13.

<sup>34</sup> John Fialka, “Pentagon Studies Art of ‘Information Warfare’ To Reduce Its Systems’ Vulnerability To Hackers,” *Wall Street Journal* (July 3, 1995): 1/20.

<sup>35</sup> Dr. John Deutch, former Director, Central Intelligence Agency, “Foreign Information Warfare Programs and Capabilities,” *Testimony Before the U.S. Senate Committee on Governmental Affairs, Permanent Subcommittee on Investigations*, 25 June 1996, n.p.; on-line, Internet, 19 February 1997, available from [http://www.ocdi.gov/cia/public\\_affairs/speeches/dci\\_testimony\\_062596.html](http://www.ocdi.gov/cia/public_affairs/speeches/dci_testimony_062596.html).

<sup>36</sup> *Cornerstones of Information Warfare*, United States Air Force (1996): 3-4.

<sup>37</sup> Of course, one may argue that a “cyber warrior” is, indeed, armed with electronic weapons such as computer viruses instead of physical ones such as rifles and tanks.

<sup>38</sup> Maj Richard W. Aldrich, “The International Legal Implications of Information Warfare,” *Airpower Journal* 10, no. 3 (Fall 1996): 106.

## Chapter 5

### Conclusions

*It has been said of the world's history hitherto that might makes right. It is for us and for our time to reverse the maxim, and to say that right makes might.*

—Abraham Lincoln

Nation-states have attempted throughout history to restrict technological advances in weaponry. This has occurred since at least 1139 when the Lutheran Council attempted to ban the cross-bow because of the more aggravated wounds it inflicted over the long bow.\* The underlying reasons for such restrictions were rooted in a sense of chivalry and of humanity. In the end, the laws of armed conflict are a set of moral standards.

As technology continues to advance with the speed of a runaway train, there are situations in today's advanced militaries which suggest that the law of armed conflict principles apply to information warfare. State-sponsored "info-warriors" are attacking US government computer systems with electronic viruses. Yet the law is not settled in this area. Too many issues remain unresolved and, without any legal precedents to point to, we are woefully unprepared to meet them. The answer lies within the international community, most likely with the United Nations. Given the transnational nature of information warfare, the international community of nation-states must negotiate and

conclude treaties to answer the questions raised by this paper. Only then will we be prepared to go forth into battle in cyberspace.

Within the foreseeable future, however, wars will not be limited to cyberspace. The psychological effect alone will continue the practice of fighting wars with bombs and bullets, though with the ever-increasing accuracy of stand-off weapons. When the world witnessed the precision with which the United States military could strike military targets in Baghdad, at the same time inflicting few, if any, injuries to civilian noncombatants and their property, some argued for more restrictions. They argued that those states possessing such precision munitions should be required to always use them when bombing near noncombatants or protected property. Clearly that is not a requirement under the law of armed conflict. Rather, a belligerent must make a reasonable attempt to minimize collateral damage and civilian casualties. The law of armed conflict is viable in warfare today and does not require a shift of standards.

This notwithstanding, the “law of armed conflict” should be renamed the “international law of humanity.” This new name, given official stature, would re-emphasize the law’s roots in the principle of humanity and suggest that it must be observed even during times not amounting to armed conflict. We must apply the law of humanity to our technological advances, particularly to blinding lasers and landmines, to guide us to do what is right, not simply with what merely complies with the letter of the law.

### Notes

\* Wg Cdr. EE Casagrande, *Air Bombardment and the Law of Armed Conflict*, ISBN 0-642-19002X, Paper No. 10 (Fairbairn RAAF Base, Australia: Air Power Studies Centre, February 1993), 4.

## ***Bibliography***

- AFI 51-402. *Weapons Review*. 13 May 1994.
- AFP 110-31. *International Law—The Conduct of Armed Conflict and Air Operations*. November 1976.
- AFPD 51-4. *Compliance With the Law of Armed Conflict*. 26 April 1993.
- Aldrich, Maj Richard W. "The International Legal Implications of Information Warfare." *Airpower Journal* 10, no. 3 (Fall 1996).
- Brierly, James Leslie. *The Law of Nations: An Introduction to the International Law of Peace*. 6th ed. Oxford: Clarendon Press, 1963.
- Budiansky, Stephen, *et al.* "Air Power's Ultimate Test." *U.S. News & World Report* 110, no. 3 (January 28, 1991).
- Carnahan, Maj Burrus M. "Law of Armed Conflict: Aircrew Course." The Air Force Judge Advocate General School (Fall 1976).
- Cook, Majors Joseph W., III, David P. Fiely, and Maura T. McGowan. "Nonlethal Weapons: Technologies, Legalities, and Potential Policies." *Airpower Journal* 9 (Special Edition, 1995).
- DeSaussure, Maj Ariane L. "The Role of the Law of Armed Conflict During the Persian Gulf War: An Overview." *The Air Force Law Review* 37 (1994).
- Deutch, Dr John M. *Foreign Information Warfare Programs and Capabilities*. Testimony before the U.S. Senate Committee on Governmental Affairs, Permanent Subcommittee on Investigations, 25 June 1996, n.p. On-line. Internet, 19 February 1997. Available from [http://www.ocdi.gov/cia/public\\_affairs/speeches/dci\\_testimony\\_062596.html](http://www.ocdi.gov/cia/public_affairs/speeches/dci_testimony_062596.html).
- DOD I 5500.15. *Review of Legality of Weapons Under International Law*. 16 October 1974.
- Doswald-Beck, Louise, and Peter Herby. International Committee of the Red Cross. *Land Mines: A Critical Examination of Existing Legal Instruments*, May 1995, n.p. On-line. Internet, 1 February 1997. Available from <http://www.icrc.org/icrcnews/312e.htm>.
- Elliott, Lt Col H. Wayne Elliott, U.S. Army (Retired). "Open Cities and (UN)defended Places." *The Army Lawyer* (April 1995).
- Fialka, John. "Pentagon Studies Art of 'Information Warfare' to Reduce Its Systems' Vulnerability to Hackers." *Wall Street Journal* (3 July 1995).
- Gerhardt, Igor D., and Col Peter Heimdahl. "The Tactical Utility of Directed Energy Weapons." *The BDM Corporation and the Dept. of Mechanics, United States Military Academy*. Unpublished paper (1 September 1984).
- Humphries, Lt Col John G. (Ret) and Maj Dorothy K. Cannon, USAFR. "JA Wartime Planning: A Primer." *The Air Force Law Review* 37 (1994).

- International Committee of the Red Cross. *Blinding Laser Weapons: Questions and Answers*, 16 November 1994, n.p. On-line. Internet, 1 February 1997. Available from <http://www.icrc.org/icrcnews/4002.htm>.
- International Committee of the Red Cross. *The Vienna Review Conference: Success on Blinding Laser Weapons But Deadlock on Landmines*, 1 November 1995, n.p. On-line. Internet, 1 February 1997. Available from <http://www.icrc.org/icrcnews/26ea.htm>.
- Lambeth, Benjamin S. "Technology and Air War." *AIR FORCE Magazine* 79, no. 11 (November 1996).
- Microsoft Encarta '95. *Bombsight*. CD-ROM. Microsoft Corporation, 1994.
- Overholt, Maj Gen Hugh R. "Memorandum of Law: The Use of Lasers as Antipersonnel Weapons." *The Army Lawyer* (November 1988).
- Parks, W. Hays. "Air War and the Law of War." *The Air Force Law Review* 32, no. 1 (1990).
- Parks, W. Hays. Subject: "Effect of Laser Protocol on U.S. Army Programs." Special Assistant for Law of War Matters, International and Operational Law Division, Office of The Judge Advocate General of the U.S. Army, to Maj Kilgallin, TMO. Letter, 1 November 1995.
- Pasternak, Douglas. "Technology's Other Payoff." *U.S. News & World Report* 110, no. 5 (February 11, 1991).
- Reagan, Michael, and Bob Phillips. *The All-American Quote Book*. Eugene, Oregon: Harvard House Publishers, 1995.
- Reed, Maj Gen Walter D. *The Impact of Protocol I on Air and Naval Bombardment*. Address to the Conference on Humanitarian Laws of Armed Conflict, 26 November 1979.
- Schwartau, Winn. *Information Warfare: Chaos on the Electronic Superhighway*. New York: Thunder's Mouth Press, 1994.
- Shepherd, Maj Dennis W. "A Bias-Free LOAC Approach Aimed at Instilling Battle Health in Our Airmen." *The Air Force Law Review* 37 (1994).
- United States Air Force. *Cornerstones of Information Warfare* (1996).

DISTRIBUTION A:

Approved for public release; distribution is unlimited.

Air War College  
Maxwell AFB, Al 36112